| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 1 | Tier # | 1 | 1 |
| K/A Statement: Reactor Trip Stabilization: | Group # | 1 | 1 |
| Interrelation with Reactor Trip Status Panel | K/A # | EPE.007.K2.03 | |
| Proposed Question: | Importance Rating | 3.5 | 3.6 |

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

1. Power Range NIS Channel N43 (Protection Set 3) fails low.
2. The crew enters AOP 3571, *Instrument Failure Response.*
3. The US directs the RO to "Check the existing bistable status to ensure a reactor trip will not occur when the failed channel is tripped."

Which Channel 1 (Red) bistable status light on Main Board 4 would result in an automatic reactor trip and entry into ES-0.1, *Reactor Trip Response,* if the bistables associated with NIS Channel N-43 were to be tripped?

a) Source Range Hi Flux, since tripping the N43 Bistables will result in the clearing of the P-10 permissive.

b) Intermediate Range Hi Flux, since tripping the N43 Bistables will result in the clearing of the P-10 permissive.

c) OPΔT, since a second OPΔT bistable needs to be tripped for the failed NIS Channel.

d) OTΔT, since a second OTΔT bistable needs to be tripped for the failed NIS Channel.

Proposed Answer: D

Explanation (Optional): "D" is correct since the Channel 1 OTDT bistable needs to be tripped, since PRNIs input to OTDT, with a 2/4 coincidence. "C" is wrong, since PRNIs do not input to OPDT, but plausible, since NIS does input to OTDT. "A" and "B" are wrong, since P-10 will not change state (2/4 coincidence) with one failed PR channel. "A" and "B" are plausible, since P-10 is affected by PRNIs, have a 1/2 coincidence, receive input from P-10, and the PRNI has failed low.

Technical Reference(s): AOP 3571 (Rev 9-7), Att. D, step 4.c and 5 (Attach if not previously provided)
AOP 3571(Rev 9-7), Att. D, Table, page 7 of 7
Functional Dwgs 3 (Rev. G), 4 (Rev. G), and 5 (Rev. K)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05493 Describe the operation of the following RPS controls and interlocks... Reactor Trip Signals (As available)

Question Source: Bank 85287

Question History:

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 # 2 | Tier # | 1 | 1 |
| K/A Statement: Small Break LOCA: | Group # | 1 | 1 |
| Reasons for actions contained in the EOP | K/A # | EPE.009.EK3.21 | |
| Proposed Question: | Importance Rating | 4.2 | 4.5 |

The plant has tripped due to a small break LOCA. The crew is currently in ES-1.2, *Post LOCA Cooldown and Depressurization*, and the following conditions exist:

- Pressurizer Level is 18% and steady.
- RCS hot leg temperature is 365°F and steady.
- The crew is checking whether they should isolate SI accumulators.
- The crew notes that the RCS does NOT have adequate subcooling to isolate the accumulators.
- ES-1.2 directs the crew to isolate SI accumulators in spite of the lack of subcooling, since RCS hot leg temperature is less than 440°F.

Why is the crew directed to isolate accumulators without adequate subcooling?

a) RCS hot leg temperature has dropped to where a pressurized thermal shock concern exists. The SI accumulators are isolated to allow the RCS to continue to depressurize, and prevent cold accumulator water from entering the RCS Cold Legs.

b) RCS hot leg temperature has dropped to less than the point corresponding to accumulator pressure after water discharge. The contents have been discharged, and isolation prevents accumulator nitrogen injection into the RCS.

c) RCS hot leg temperature is less than the saturation temperature corresponding to RHR pump discharge pressure. The RHR pump running in the injection mode will ensure RCS subcooling is maintained after the SI accumulators are isolated.

d) RCS hot leg temperature is at the saturation temperature corresponding to accumulator injection pressure. The SI accumulators are isolated to allow RCS pressure to drop to the point where RHR pumps will be able to inject.

Proposed Answer: B

Explanation (Optional): Adequate subcooling insures that accumulator injection is not required. Below 440°F with inadequate subcooling, RCS pressure has dropped to the accumulator pressure AFTER accumulator water has injected. If accumulators are not isolated, nitrogen will inject, producing either a "hard" bubble in the Pressurizer or gas binding in the SG U-Tubes ("B" correct, "A", "C", and "D" wrong). "A" is plausible since the RCS has cooled down, and FR-P.1 terminates SIS to prevent RCS repressurization, and starts an RCP to mix warm RCS water with cold injection water. "C" is plausible since this is the basis for stopping a Charging pump with inadequate subcooling if RCS hot legs are below 340°F. "D" is plausible, since accumulator injection holds up RCS pressure, and is related to the basis for isolating accumulators if adequate subcooling exists.

Technical Reference(s): ES-1.2 (Rev 18-0), step 22; WOG Bkgd Doc (Rev 2) for ES-1.2, step 23 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

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: Bank 77419

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 # 3 | Tier # | 1 | 1 |
| K/A Statement: RCP Malfunctions: | Group # | 1 | 1 |
| Determine/interpret abnormalities in RCP air vent | K/A # | APE.015/017.AA2.02 | |
| path and/or oil cooling system | Importance Rating | 2.8 | 3.0 |

Proposed Question:

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

1. The "A" Reactor Coolant Pump motor upper oil reservoir level starts slowly increasing.
2. The RCP A UPR OIL RSVR LVL HI annunciator is received on MB4.
3. No other abnormal annunciators are lit.

What is causing the increasing level in the oil reservoir?

a) Reactor Plant Component Cooling Water (RPCCW) is leaking into the reservoir.

b) Reactor Plant Chilled Water (CDS) is leaking into the reservoir.

c) Cooling water has been isolated to the reservoir, and the oil is expanding as it heats up.

d) The lube oil fill valve is leaking by into the reservoir.

Proposed Answer: A

Explanation (Optional): "A" is correct since RPCCW pressure is above oil pressure, so increasing oil reservoir level is indicative of a cooling water leak. OP3353.MB4B 4-2A directs the operators to check RPCCW surge tank for indications of in-leakage. "B" is wrong since CDS does not supply the upper oil reservoir. "B" is plausible since CDS does cool RCP components. "C" is wrong since no other annunciators are lit, and loss of cooling water would result in a and a RCP A Cooler Supply Pressure Lo annunciator (MB4B, 3-2B). "C" is plausible, since oil expands as it heats up. "D" is wrong since oil is added to the RCPs via drums that are not normally lined up to the RCP.. "D" is plausible, since a manual oil makeup valve exists, and if it leaked by with an oil source attached, level would increase.

Technical Reference(s): OP3353.MB4B (Rev 4-12), 4-2A (Attach if not previously provided)
P&ID 102A (Rev 31)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05431 Describe the operation of the RCPs under the following abnormal conditions… Conditions requiring a Manual RCP Trip… (As available)

Question Source: Bank 70675

Question History: Millstone 3 2009 NRC Exam

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.3 and 41.5

Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 4 | Tier # | 1 | 1 |
| K/A Statement: Loss of RHR System: | Group # | 1 | 1 |
| Reasons for isolating RHR low pressure | K/A # | APE.025.AK3.02 | |
| piping prior to raising pressure | Importance Rating | 3.3 | 3.7 |

Proposed Question:

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

- The "A" Train of RHR is in operation.
- The "B" Train of RHR is aligned for injection.

The following sequence of events occurs:

1. Annunciator MB2C, 1-6, RHR A SUCT VLV OPEN AND RCS PRESS HI illuminates.
2. Per the annunciator response procedure, the crew stops 3RHS*P1A (MB2).
3. Per the annunciator response procedure, the crew closes 3RHS*MV8701B, "A ISOL (OUT)" (MB2)
4. The crew transitions to EOP 3505, *Loss of Shutdown Cooling and/or RCS Inventory.*

Why is the crew required to close 3RHS*MV8701B prior to transitioning to EOP 3505?

a) Ensure COPPS remains available while aligning the "A" Train of RHR for injection.

b) Ensure letdown is maintained while aligning the "A" Train of RHR for injection.

c) Prevent the RHR Pump Suction Piping from exceeding 260°F.

d) Protect the low-pressure RHR System piping from high RCS pressures.

Proposed Answer: D

Explanation (Optional): The RHS is designed to be isolated from the RCS whenever the RCS pressure exceeds the RHS design pressure of 600 psig, and this action is directed per the ARP with RCS pressure at 765 psia (750 psig). The RHS is isolated from the RCS on the suction side by three normally closed, motor-operated valves in series on each suction line. Two of the motor-operated valves are interlocked to prevent its opening if RCS pressure is greater than 412.5 psia and alarm in the control room if RCS pressure exceeds 440 psig and the valve is open. If the plant is in Mode 1, 2, or 3, the operator is required to close all three suction valves. Per the FSAR, if the plant is in mode 4, 5, or 6 and the RCS pressure increases to 750 psig, the operator is required to close the motor-operated valve closest to the pump ("D" correct). "A" is wrong, since COPPS is also available through the Pzr PORVs, and these actions will isolate the RHR relief valves from the RCS. "B" is wrong, since the letdown from RHR will be isolated by these actions, but will be maintained through the CHS letdown orifices. "C" is wrong, since RHR is not required to be available for ECCS in MODE 5. "A" and "B" are plausible, since part of lining up a train of RHR for injection is to isolate its suction from the RCS, and RHR is used for COPPS and provides a letdown path in MODE 5. "C" is plausible, since RCS cooling has been lost, and on a cooldown, the crew delays placing the second RHR Train in the cooldown mode until RCS is less than 260°F to avoid boiling in the suction line if it has to be aligned for injection.

| | | |
|---|---|---|
| Technical Reference(s): | OP 3353.MB2C (Rev 0-0), 1-6, steps 5.1-5.3<br>FSAR, Table 5.4-8 (Rev 16)<br>FSAR 5.4.7.1 (Rev 21.3) Page 5.4-23 and 24 | (Attach if not previously provided) |

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-05457 Describe the major administrative or procedural precautions and limitations placed on the operation of the Residual Heat Removal system, including the basis for each. | (As available) |

Question Source: New

Question History:

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 # 5 | Tier # | 1 | 1 |
| K/A Statement: Loss of Component Cooling Water: | Group # | 1 | 1 |
| Ability to verify alarm setpoints and operate | K/A # | APE.026.GEN.2.4.50 | |
| controls per the alarm response manual | Importance Rating | 4.2 | 4.0 |

Proposed Question:

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

1. The RPCCW SURGE TK LEVEL HI annunciator is received on MB1C.
2. The crew enters the appropriate Annunciator Response Procedure.
3. The US directs the RO to compare the two train-related Surge Tank level indications (3CCP-LI20A and B) on Main Board 1 (MB1).

Will the crew be able to initially determine which RPCCW train is responsible for the increasing level by comparing the two level indications; and is a control switch available at MB1 to manually close the Surge Tank Fill Valve (3CCP-LV20) if it still indicates OPEN?

a) The crew WILL be able to determine the affected train at MB1, and a Control Switch IS able to attempt to manually close the Surge Tank Fill Valve at MB1.

b) The crew WILL be able to determine the affected train at MB1, but a Control Switch IS NOT able to attempt to manually close the Surge Tank Fill Valve at MB1.

c) The crew WILL NOT be able to determine the affected train at MB1, but a Control Switch IS able to attempt to manually close the Surge Tank Fill Valve at MB1.

d) The crew WILL NOT be able to determine the affected train at MB1, and a Control Switch IS NOT able to attempt to manually close the Surge Tank Fill Valve at MB1.

Proposed Answer: C

Explanation (Optional): There is a divider plate separating the two trains of RPCCW in the surge tank ("A" and "B" plausible), but the divider plate only goes up to about 88%, which is below the high level alarm setpoint, so both trains will indicate the same ("A" and "B" wrong). "C" is correct, and "D" wrong, since the Surge Tank Fill Valve has both automatic and manual controls and indication available at MB1. "D" is plausible, since numerous indications exist on the Main Boards without corresponding controls.

Technical Reference(s): OP 3353.MB1C (Rev 6-3), 2-7A, steps 1 and 2 (Attach if not previously provided)
P&ID 121A (Rev 32)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04150 Describe the operation of the following RPCCW System equipment controls and interlocks: Surge Tank Makeup Control Valve... (As available)

Question Source: New

Question History:

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 # 6 | Tier # | 1 | 1 |
| K/A Statement: Pressurizer Pressure Control Malfunction: | Group # | 1 | 1 |
| Determine/interpret letdown flow indication | K/A # | APE.027.AA2.08 | |
| Proposed Question: | Importance Rating | 3.2 | 3.2 |

Initial Conditions:

- A Reactor Startup is in progress per OP 3202, *Reactor Startup*.
- Reactor power is stable at $1x10^{-8}$ Amps in the intermediate range.

Controlling Pressurizer Pressure channel 3RCS*PT455 fails high.

Assuming no operator actions are taken, what effect, if any, will this malfunction have on letdown flow?

a) Flow will remain constant, due to no input to letdown from this transmitter.

b) Flow will increase due to actual RCS pressure increasing.

c) Flow will decrease due to being routed through a relief valve to the PRT.

d) Flow will isolate due to receipt of an automatic Safety Injection.

Proposed Answer: D

Explanation (Optional): The controlling pressure channel failing high will cause Pzr Spray Valves to open, causing actual pressure to decrease ("B" wrong). "B" is plausible, since RCS pressure would increase if the transmitter had failed low, or if the controller output had failed high. "D" is correct, and "A" and "C" wrong, since backup heaters will not energize on lowering pressure with the controlling channel of pressure failed high, and Pzr Low Pressure SI is armed (1892 psia) since during a reactor startup, RCS pressure is above P-11 (2000 psia). "A" is plausible, since at Millstone 3, letdown flow does not receive a direct input from Pressurizer Pressure Control, and below P-11, SIS would be blocked. "C" is plausible, since the letdown line relief valve discharges to the PRT, and would lift if letdown were isolated downstream of the relief valve, but one of the letdown Containment Isolation Valves is upstream of this valve.

Technical Reference(s): Functional Dwgs 6 (Rev H) and 11 (Rev H) (Attach if not previously provided)
P&ID 104A (Rev 54)

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: New

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.3, 41.5, and 41.7

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 7 | Tier # | 1 | 1 |
| K/A Statement: ATWS: | Group # | 1 | 1 |
| Determine/interpret Rod Step Counters and RPI | K/A # | EPE.029.EA2.08 | |
| Proposed Question: | Importance Rating | 3.4 | 3.5 |

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

1. A spurious reactor trip occurs due to the "A" reactor trip breaker failing open.
2. During the immediate actions of E-0, *Reactor Trip or Safety Injection* the RO reports that four (4) control rods are indicating fully withdrawn on the DRPI display.
3. The RO observes all Rod Group Demand Counters still indicate fully out.
4. SIS has NOT actuated.

What is the status of the reactor; and which procedure will the crew use to address the stuck rods?

a) The reactor IS tripped. The stuck rods will be addressed in E-0, *Reactor Trip or Safety Injection.*

b) The reactor IS tripped. The stuck rods will be addressed in ES-0.1, *Reactor Trip Response.*

c) The reactor IS NOT tripped. The stuck rods will be addressed in E-0, *Reactor Trip or Safety Injection.*

d) The reactor IS NOT tripped. The stuck rods will be addressed in FR-S.1, *Response to Nuclear Power Generation/ATWS.*

Proposed Answer: B

Explanation (Optional): "C" and "D" are wrong, since the reactor is interpreted as "tripped" when any two of the following three items are met: 1) Reactor Trip and Bypass Breakers OPEN (They are, since the "A" trip breaker failed open, and on the trip, a valid trip signal will be generated (e. g. SG Lo-Lo Level), causing the "B" trip breaker to open as well. 2) Rod bottom lights - LIT (They aren't, since several rods are stuck out). 3) Neutron flux – decreasing (It is, since the majority of the rods inserted on the trip). "B" is correct, and "A" wrong, since for this event, SIS will not actuate, and stuck rods are addressed in ES-0.1 step 6, where the crew will initiate immediate boration. Also, Group Demand Indicators to not automatically reset to zero on a reactor trip. "C" and "D" are plausible, since several rods stuck out on the trip, the Group Demand Counters are still out (as expected), and the applicants must determine that flux would decrease on this event. "A" and "C" are plausible, since E-0 would address the stuck rods if SIS had actuated, and E-0 attempts to trip the reactor, if required prior to transitioning to FR-S.1. "D" is plausible, since the crew would transition to FR-S.1 if the reactor could not be tripped in E-0, step 1.

Technical Reference(s): FR-S.1 (Rev 19-0), Entry Conditions (Attach if not previously provided)
E-0 (Rev 27-0), step 1, including Note
ES-0.1 (Rev 25-0), step 6

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04624 Identify plant conditions requiring entry into EOP 35 FR-S.1. (As available)

Question Source: Bank 60755

Question History:

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 # 8 | Tier # | 1 | 1 |
| K/A Statement: Steam Gen. Tube Rupture: | Group # | 1 | 1 |
| Knowledge of limiting conditions for | K/A # | EPE.038.GEN.2.2.22 | |
| operations and safety limits | Importance Rating | 4.0 | 4.7 |

Proposed Question:

The plant is operating at 75% power and the latest leak rate data shows:

- 7.18 GPM Total RCS leakage rate
- 4.50 GPM Leakage into the Pressurizer Relief Tank
- 1.20 GPM Leakage into the Containment Drain Transfer Tank
- 0.35 GPM - Leakage into "A" SG
- 0.33 GPM - Leakage into "B" SG
- 0.20 GPM - Leakage into "C" SG
- 0.10 GPM - Leakage into "D" SG

Which of the following RCS Leakage Technical Specifications, if any, have been exceeded?

a) Reactor-to-Secondary

b) Unidentified

c) Identified

d) None, all leakage limits are met

Proposed Answer: A

Explanation (Optional): Reactor to secondary leakage is included as Identified Leakage, and its total leakrate into all four SGs is 0.98 gpm, however, the leakage from the "A" steam generator is 504 gpd (0.35 x 60 x 24) which is greater than the 500 gpd allowed ("A" correct, "D" wrong, but plausible). Identified leakage is at least 6.68 gpm (PRT + CDTT + Reactor to Secondary), and total leakage is 7.18, meaning identified leakage is less than 10 gpm ("C" wrong, but plausible). Total leakage minus identified leakage is at most 7.18 gpm – 6.68 gpm = 0.5 gpm, which is less than the 1 gpm unidentified allowed ("B" wrong but plausible).

Technical Reference(s): Tech Spec 3.4.6.2 (Amend 238) (Attach if not previously provided)
Tech Spec Defn 1.16 .2, Page 1-3 (Amend 246)
Tech Spec Defn 1.16.2.c and 1.16.4(Amend 238)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05444 Describe the major administrative or procedural precautions and limitations placed on the operation of the Reactor Coolant System… (As available)

Question Source: Bank 80098

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.2

Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 9 | Tier # | 1 | 1 |
| K/A Statement: Loss of Main Feedwater: | Group # | 1 | 1 |
| Ability to perform specific system and integrated | K/A # | APE.054.GEN.2.1.23 | |
| plant procedures during all modes of operation | Importance Rating | 4.3 | 4.4 |

Proposed Question:

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

1. The BOP Operator reports main feedwater flow is decreasing.
2. The TDFW PP A/B EAP CONST SIG LOST annunciator comes in on MB5.
3. The crew references the ARP.
4. The US directs the BOP to take manual control of the "A" TDMFP.

How will the BOP operator regain manual control of the "A" TDMFP?

a) The TDMFP master speed controller is taken to MANUAL and used to adjust TDMFP "A" speed.

b) The "PP A SPEED CNTL" controller for TDMFP "A" (3FWS-SK46A) is taken to MANUAL and used to adjust TDMFP "A" speed.

c) The Manual Speed Controller (3TFC-M1A) is lowered until TDMFP speed starts to decrease, and then the "PP A SPEED CNTL" controller for TDMFP "A" (3FWS-SK46A) is taken to MANUAL and raised to the high speed stop.

d) The Manual Speed Controller (3TFC-M1A) is lowered until TDMFP speed starts to decrease, and the hydraulic jack for TDMFP "A" is placed to "ON"

Proposed Answer: D

Explanation (Optional): The specified annunciator comes in when the Westinghouse speed control signal is lost. This locks the EAP controllers for both TDMFPs at the "last called for" signal. "A" and "B" are wrong, since both of these require the EAP controller to respond, either to the input from the master controller, or from manual control. "D" is correct, and "C" is wrong, since TDMFP speed is controlled by the lower speed setting of either 3FWS-SK46A "TD FW A" "PP A SPEED CNTL," or the Manual Speed Controller, and 3FWS-SK46A "TD FW A" "PP A SPEED CNTL," cannot be raised out of the way manually with this failure unless the hydraulic jack is used. The hydraulic jack blocks the hydraulic bleed path from the EAP positioner, driving it to the high speed stop.

Technical Reference(s): OP 3353.MB5C (Rev 4-7), 4-6 (Attach if not previously provided)
LSK 6-1.2E (Rev 10)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04660 Describe the operation of the following Main Feedwater & Steam Generator Water Level Control 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 Master Speed Controller (FWS-SK509A), Turbine Driven Main Feed Pump Hydraulic Jack… (As available)

Question Source: Bank 75608

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.4

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 10 | Tier # | 1 | 1 |
| K/A Statement: Station Blackout: | Group # | 1 | 1 |
| Knowledge of setpoints, interlocks and automatic | K/A # | EPE.055.GEN.2.4.2 | |
| actions associated with EOP entry conditions | Importance Rating | 4.5 | 4.6 |

Proposed Question:

A total loss of AC power occurs and the following sequence of events occurs:

1. The crew enters ECA-0.0, *Loss of AC Power*.
2. After about 25 minutes, the "A" Emergency Diesel is locally started.
3. Power is restored to the "A" Train Emergency Bus.

Current conditions are as follows:

- Highest Core Exit TC: 552°F.
- RCS Pressure: 1340 psia.
- Pressurizer Level: 18%.

What procedural action is required to be taken by the crew?

a) Remain in ECA-0.0, *Loss of AC Power* and commence a rapid cooldown of the RCS.

b) Transition to ECA-0.1, *Loss of ALL AC Power - Recovery Without SI Required.*

c) Transition to ECA-0.2, *Loss of All AC Power - Recovery With SI Required.*

d) Transition to ES-0.2, *Natural Circulation Cooldown.*

Proposed Answer: C

Explanation (Optional): "C" is correct, and "A", "B", and "D" wrong, since transition to ECA-0.2 is required for either of the following:

- CETC less than 32°F subcooling (Subcooling is about 28°F)
- Pressurizer level is less than 16% (Pzr level is 18%)

If none of the requirements are met, then transition to ECA-0.1 is appropriate ("B" plausible). "A" is plausible, since only one bus has been restored, and ECA-0.0 conducts a rapid cooldown of the RCS if no Emergency Busses are restored. "D" is plausible, since ES-0.2 would be transitioned to after completion of ECA-0.1 or ECA-0.3, to cooldown the RCP seals and take the plant to cold shutdown.

Technical Reference(s): ECA-0.0 (Rev 23-0), Step 30 (Attach if not previously provided)
Steam Tables

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

Learning Objective: MC-03860 Identify plant conditions requiring entry into EOP 35 ECA-0.2 (As available)

Question Source: Modified Bank 64322 (Parent question attached)

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.10

Comments:

Bank Question 64322 (prior to modification) is attached on the following page.

Original Bank Question 64322 (Prior to modification):

A total loss of AC power occurs and the following sequence of events occurs:

1. The crew enters ECA-0.0 *Loss of AC Power* and carries out the appropriate actions.
2. After about 25 minutes, both emergency diesel generators are locally started.
3. Power is restored to both emergency busses.

Current conditions are as follows:

- Highest Core Exit TC: 550°F.
- RCS Pressure: 1400 psia.
- Pressurizer Level: 10%.
- Containment pressure: 18.5 psia

Which procedure is the crew required to transition to from ECA-0.0?

a) ES-0.2, *Natural Circulation Cooldown.*

b) Transition to ECA-0.1, *Loss of ALL AC Power - Recovery Without SI Required*

c) Transition to ECA-0.2, *Loss of All AC Power - Recovery With SI Required*

d) FR-Z.1, *Response to High Containment Pressure.*

Correct Answer: C

Considered Modified since the transition in the original question is based on low Pressurizer level. The modified question has adequate pressurizer level, but subcooling in the original version of the question was adequate at >32°F, but the modified question is 28°F, requiring transition to ECA-0.2. Also, Distractor "D" has been replaced with a different procedure transition.

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 11 | Tier # | 1 | 1 |
| K/A Statement: Loss of Off-site Power: | Group # | 1 | 1 |
| Determine/interpret Sequencer status lights | K/A # | EPE.056.EA2.38 | |
| Proposed Question: | Importance Rating | 3.7 | 3.8 |

Initial Conditions:

- The plant is at 100% power.
- The RO is at the "A" Train Sequencer Cabinet taking daily rounds.

The following sequence of events occurs:

1. Offsite power is lost.
2. Thirty-nine (39) seconds after the EDGs energize the Emergency Busses, the RO observes the following red lights lit at the "A" Sequencer:
   - The "A" RPCCW Pump Sequenced Safeguard Start (SSS) Signal Light.
   - The "A" MDAFW Pump LOP Trip Signal Light.
   - The "A" (Lead) SWP Pump Sequenced Safeguard Start (SSS) Signal Light.
   - The "A" RHR Pump LOP Trip Signal Light.

Which of these lit red status lights is UNEXPECTED?

a) The "A" RHR Pump LOP Trip Signal Light

b) The "A" MDAFW Pump LOP Trip Signal Light

c) The "A" (Lead) SWP Pump SSS Signal Light

d) The "A" RPCCW Pump SSS Signal Light

Proposed Answer: B

Explanation (Optional): The sequencer will initiate an LOP-Only bus strip and load sequence. All 4KV Pumps except for the running Charging Pump will initially strip. The lead SWP pump will start at about 20 seconds, the RPCCW Pump will start at about 25 seconds, and the MDAFW Pump will start at about 30 seconds. "A" is wrong, since the RHR Pump received a strip signal, and not a start signal, and the LOP Trip Red light means the trip relay has operated as expected. "C" and "D" are wrong, since these pumps should have already started, and the SSS red light means the start signal output relay has actuated as expected. "B" is correct, since the MDAFW Pump should have received an auto-start signal at 30 seconds, and the Red light means the LOP Trip logic is still met, which is unexpected. "A", "C", and "D" are plausible, since each of these lights are lit at some point in the LOP/SIS strip/load sequence.

Technical Reference(s): LSK 24-9.4A (Rev 12) (Attach if not previously provided)

Sequencer Tech Man, Page 15

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04412 Describe the operation of the following Emergency Diesel Load Sequencer controls and interlocks… SSS/MTB and LOP Trip split indicators… (As available)

Question Source: New

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.7

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 |
| Reasons for actions contained in the EOP | K/A # | APE.057.K3.01 | |
| Proposed Question: | Importance Rating | 4.1 | 4.4 |

With the plant at 100% power, VIAC 1 is lost and the crew enters AOP 3564, *Loss Of One Protective System Channel.*

AOP 3564, step 4 directs the crew to "Verify Normal Letdown - IN SERVICE"

Why does the AOP direct the crew to verify normal letdown in service?

a) Control Power has been lost to the Letdown Orifice Isolation Valves (3CHS*AV8149A, B, or C), causing them to fail closed.

b) Control Power has been lost to the Letdown Containment Isolation Valves (3CHS*CV8152 or 3CHS*CV8160), causing them to fail closed.

c) A Pressurizer level channel has failed low, closing Letdown Containment Isolation Valves (3CHS*CV8152 or 3CHS*CV8160).

d) A Pressurizer level channel has failed low, closing Letdown Orifice Isolation Valves (3CHS*AV8149A, B, or C).

Proposed Answer: D

Explanation (Optional): VIAC 1 feeds vital instruments. Loss of VIAC 1 or 2 will cause a Pressurizer Level Channel that feeds into the letdown isolation circuit to fail low ("D" correct, "A", "B", and "C" wrong). The Response Not Obtained column directs the crew to select an operable PZR level channel and then restore letdown. "A" and "B" are plausible, since AOP 3563, *Loss of DC Bus*, deals with loss of control power. "C" is plausible, since these valves also are capable of isolating letdown and are interlocked with the Letdown Orifice Isolation Valves.

Technical Reference(s): AOP 3564 (Rev 10-0), step 4 (Attach if not previously provided)
Functional Dwg 11 (Rev H)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03956 Discuss the basis of major precautions, procedure steps and/or sequence of steps within AOP 3564, Loss of One Protective System Channel. (As available)

Question Source: Bank 73474

Question History:

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 # 13 | Tier # | 1 | 1 |
| K/A Statement: Loss of DC Power: | Group # | 1 | 1 |
| Operational implications of Battery Charger | K/A # | APE.058.AK1.01 | |
| equipment and instrumentation | Importance Rating | 2.8 | 3.1 |

Proposed Question:

With the plant initially at 100% power, DC Bus 4 deenergizes, resulting in the following sequence of events:

1. The crew enters AOP 3563, *Loss of DC Bus Power.*
2. The crew reenergizes DC Bus 4 from Battery 4.
3. The US directs a PEO to place Charger 4 in service on DC Bus 4 per OP 3345C, *125 Volt DC.*
4. The PEO closes the Charger 4 DC Supply Breaker on Battery Bus 4.
5. The PEO then closes the Charger 4 DC Output Breaker to connect the Charger to the DC bus.

What is a potential impact of this operation, and what implication exists if this occurs?

a) An in-rush of current may damage the Charger rectifier stack. If this occurs, the operators are required to open the Battery Output Breaker, and then energize the DC Bus from the Swing Charger.

b) An in-rush of current may damage the Charger rectifier stack. If this occurs, the operators are required to energize the DC Bus from the Swing Charger after closing its AC Input Breaker.

c) An in-rush of current may trip the DC output breaker. If this occurs, the operators are to wait at least 5 minutes, then cycle the DC Output breaker off and on.

d) An in-rush of current may trip the DC output breaker. If this occurs, the operators are to cycle the DC Output breaker off and on as promptly as possible.

Proposed Answer: D

Explanation (Optional): When returning a charger to service, the DC breakers connecting the charger to the bus are closed first, before the charger AC input breaker, in order to allow the DC battery bus to charge the charger filter capacitors, and if there is very little or no residual charge on the capacitors, the in-rush current may be high enough to cause one or more DC output breakers to trip. If this occurs, the operators are to as promptly as possible cycle the DC breakers, to tie the charger to the DC bus prior to the capacitors discharging again ("D" correct, "C" wrong). "A" and "B" are wrong, but plausible, since this is a misapplication of a Caution warning the operators of the potential to damage the Charger rectifier stack if the crew places a charger in service on a deenergized DC bus. "C" is plausible, since this is the correct impact, and as a general rule, operators are not to respond "as promptly as possible" to an unexpected system response.

| | | |
|---|---|---|
| Technical Reference(s): | AOP 3563 (Rev 10-1), Att. D, step 2 | (Attach if not previously provided) |
| | OP 3345C (Rev 16-8), Precaution 3.6 | |
| | OP 3345C (Rev 16-8), Note prior to step 4.16.4 | |
| | OP 3345C (Rev 16-8), Section 4.16 | |

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-03307 Describe the major administrative or procedural precautions and limitations associated with the 125 VDC Distribution System, including the basis for each… | (As available) |

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

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 14 | Tier # | 1 | 1 |
| K/A Statement: Loss of Nuclear Service Water: | Group # | 1 | 1 |
| Reasons for actions contained in the EOP | K/A # | APE.062.AK3.03 | |
| Proposed Question: | Importance Rating | 4.0 | 4.2 |

The plant is at 100% power, and Current Plant Conditions are as follows:

- The crew has entered AOP 3560, *Loss of Service Water.*
- No "A" train Service Water (SWP) Pumps can be started.

Why does AOP 3560 direct the crew to start a second "B" train SWP Pump?

a) To ensure sufficient pressure exists in the "B" SWP Train to supply the MCC/Rod Control Area ACU.

b) To ensure sufficient pressure exists in the "B" SWP Train to supply the Control Building Chillers.

c) To ensure sufficient flow exists to supply two Reactor Plant Component Cooling Water (RPCCW) Heat Exchangers.

d) To ensure sufficient flow exists to supply two Turbine Plant Component Cooling Water (TPCCW) Heat Exchangers.

Proposed Answer: D

Explanation (Optional): "A" and "C" are wrong, since trains are not cross connected to protect the operable train by not placing the plant in an unanalyzed condition. "A" and "C" are plausible, since SWP is capable of being cross-connected at several locations including at the RPCCW Heat Exchangers. "B" is wrong, but plausible, since the MCC/RCA Booster Pump ensures adequate pressure exists at the MCC/RCA ACU, which is at a high elevation. "D" is correct, since the service water supply is required to two TPCCW heat exchangers to cool the secondary plant with the plant on line.

Technical Reference(s): AOP 3560 Basis Doc (Rev 8-1), step 2 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03928 Discuss the basis of major precautions, procedure steps, and/or step sequence (in AOP 3560). (As available)

Question Source: Bank 70389

Question History:

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 # 15 | Tier # | 1 | 1 |
| K/A Statement: Loss of Instrument Air: | Group # | 1 | 1 |
| Operate/monitor RPS | K/A # | APE.065.A1.05 | |
| Proposed Question: | Importance Rating | 3.3 | 3.3 |

With the plant at 100% power, a leak in the instrument air system occurs, and the following sequence of events occurs:

1400 The RO reports that instrument air pressure is decreasing at a moderate rate.
1401 The crew enters AOP 3562, *Loss of Instrument Air.*
1412 Letdown isolates
1414 PZR spray valves close
1415 Feed Reg Valves close
1417 Reactor Plant Chilled Water CTMT header isolates

At what time did AOP 3562 require the crew to shutdown the reactor via manual reactor trip?

a) 1412

b) 1414

c) 1415

d) 1417

Proposed Answer: C

Explanation (Optional): The crew is directed to trip the reactor and go to E-0 when instrument air pressure is decreasing rapidly or when feedwater control is lost ("C" correct). "A", "B", and "D" are plausible since they are plant responses that will occur on a loss of air that have adverse effects on the plant.

Technical Reference(s): AOP 3562 (Rev 7-1), step 1 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03941 Discuss conditions which require transition to other procedures (As available)

Question Source: Bank 76194

Question History:

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 # 16 | Tier # | 1 | 1 |
| K/A Statement: LOCA Outside Containment: | Group # | 1 | 1 |
| Operational implications of emergency systems | K/A # | W/E04.EK1.1 | |
| Proposed Question: | Importance Rating | 3.5 | 3.9 |

A LOCA outside Containment occurs, and the following sequence of events occurs:

1. The crew enters E-0, *Reactor Trip or Safety Injection.*
2. At the E-0 step 16 brief, the RO reports the following parameters:
   - RCS pressure: 1650 psia and decreasing.
   - RHR flow: 300 gpm per pump.
   - SIH flow: 0 gpm per pump.
3. The crew enters ECA-1.2, *LOCA outside Containment.*
4. The US directs the RO to close Cold Leg Injection Valve 3SIL*MV8809A.

Immediately after closing 3SIL*MV8809A, the RO reports the following:

- RCS pressure: 1400 psia, and monitoring to determine a trend.
- RHR flow: 0 gpm per pump.
- SIH flow: 100 gpm per pump.

Was the RCS LOCA originally into the RHR system or into the SIH system, and has the RCS leak been isolated?

a) The RCS leak is into the RHR system. The leak is NOT isolated from the RCS.

b) The RCS leak is into the SIH system. The leak is NOT isolated from the RCS.

c) The RCS leak was into the RHR system. The leak is isolated from the RCS.

d) The RCS leak was into the SIH system. The leak is isolated from the RCS.

Proposed Answer: A

Explanation (Optional): Since RHR flow initially existed with RCS above RHR pump shutoff head, the leak was into the RHR System. Since RHR flow dropped to zero with the discharge valve closed, the leak is on the RCS side of the isolation valve, so the leak is still active ("C" and "D" wrong). The leak is not into SIH since RHR flow went to zero when the SIL valve was closed ("A" correct, "B" wrong). Note that isolating RHR will not seat the check valve, so leak remains active. "B" is plausible, since RHR flow dropped to zero when the SIL valve was closed. "C" and "D" are plausible, since SIH flow has also changed, but this was due to RCS pressure dropping below SIH pump shutoff head (1550 psia).

Technical Reference(s): P&ID 112A (Rev 50) (Attach if not previously provided)

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: Bank 75467

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.7

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 17 | Tier # | 1 | 1 |
| K/A Statement: Loss of Secondary Heat Sink: | Group # | 1 | 1 |
| Ability to diagnose and recognize trends utilizing | K/A # | GEN.2.4.47 | |
| reference material | Importance Rating | 4.2 | 4.2 |

Proposed Question:

Initial Conditions:

- The crew is at E-0, *Reactor Trip or Safety Injection*, step 17, "Verify Adequate Heat Sink."
- No AFW Pumps are running, and none can be started.

The crew is preparing to transition to FR-H.1, *Loss of Secondary Heat Sink*, and current parameters and trends are as follows:

- RCS pressure: 800 psia and slowly decreasing.
- SG pressures: 900 psig and slowly decreasing.
- CTMT temperature: 160°F and slowly increasing.
- SG levels:
  - "A" SG: 33% Wide Range (0% NR), and slowly decreasing
  - "B" SG: 35% Wide Range (0% NR), and stable
  - "C" SG: 35% Wide Range (0% NR), and stable
  - "D" SG: 27% Wide Range (0% NR), and slowly decreasing

Based on current parameters and trends, what strategy will FR-H.1 direct with Heat Sink?

a) FR-H.1 will direct the crew to return to E-0, since all SG pressures are decreasing.

b) FR-H.1 will direct the crew to return to E-0, since RCS pressure is less than Steam Generator pressure.

c) FR-H.1 will attempt to restore a heat sink from the Main Feed System.

d) FR-H.1 will attempt to restore a heat sink by tripping all RCPs and establishing Bleed and Feed of the RCS.

Proposed Answer: B

Explanation (Optional): "B" is correct, and "A", "C", and "D" wrong, since with RCS pressure less than SG pressures, break flow is removing all decay heat and SGs are not required for heat sink. "A" is plausible, since SG pressure stable or decreasing is one of the criteria used to verify adequate natural circulation in the EOP network. "C" is plausible, since this is first method attempted in FR-H.1 with no AFW pumps available to restore heat sink. "D" is plausible, since CTMT temperature is elevated, and bleed and feed criteria for adverse CTMT is met (assuming RCS pressure is above SG pressure).

Technical Reference(s): FR-H.1 (Rev 21-0), step 1 (Attach if not previously provided)

FR-H.1 (Rev 21-0), Caution prior to step 3

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04536 Discuss conditions requiring transition to other procedures from EOP 35 FR-H.1... (As available)

Question Source: Modified Bank 78378 (Parent Question attached)

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.10, 41.14, and 43.5

Comments:

Original Bank Question 78378 (prior to modification):

With the plant initially at 100% power, a large break LOCA occurs, and current conditions are as follows:

- The crew is performing EOP-FR-H.1, *Response to Loss of Secondary Heat Sink*, Step 1 "Check if Secondary Heat Sink is Required."
- The RCS had depressurized to CTMT pressure.

What action, if any, will FR-H.1 direct the crew to take concerning heat sink, and why?

a) FR-H.1 will not direct any actions to be taken to restore secondary heat sink, since a secondary heat sink is NOT required.

b) FR-H.1 will direct the crew to attempt to restore feed in order to establish a heat sink and minimize core uncovery.

c) FR-H.1 will direct the crew to attempt to restore feed in order to avoid SG dryout, minimizing thermal stresses on the affected S/G tubes.

d) FR-H.1 will direct the crew to attempt to restore feed in order to establish a thermal layer above the SG tubes, minimizing rad release should a SG tube rupture occur.

Correct answer: A

Considered "Modified" since original question was a large break LOCA, and modified question is small break LOCA. Also, modified question includes individual SG levels and CTMT temperature. Distractors have been modified to include returning to E-0 versus remaining in FR-H.1, and method of restoring heat sink in FR-H.1

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 18 | Tier # | 1 | 1 |
| K/A Statement: Generator Voltage and Electric Grid | Group # | 1 | 1 |
| Disturbances: Determine/interpret Generator | K/A # | 077.A2.03 | |
| current outside the capability curve | Importance Rating | 3.5 | 3.6 |

Proposed Question:

A partial loss of Main Generator hydrogen pressure has occurred, resulting in the following Initial Conditions:

- Real Load: 1225 MWe
- Reactive Load: 100 MVARs Out
- Generator Hydrogen Pressure: 60 psig

The Grid becomes unstable, and the BOP operator reports the following:

- Real Load: 1225 MWe
- Reactive Load: 300 MVARs Out
- Generator Hydrogen Pressure: 60 psig

**Using OP3324A, Attachment 1, attached to this exam**, is the Main Generator operating inside or outside the Turbine Generator Capability Curve; and what Main Generator parameter is most challenged by this transient?

a) The Main Generator is operating INSIDE the curve; and Main Generator armature heating is most challenged.

b) The Main Generator is operating INSIDE the curve; and Main Generator field heating is most challenged.

c) The Main Generator is operating OUTSIDE the curve; and Main Generator armature heating is most challenged.

d) The Main Generator is operating OUTSIDE the curve; and Main Generator field heating is most challenged.

Proposed Answer: C

Explanation (Optional): The transient has resulted in real load staying constant (grid frequency has not changed) and reactive load increasing (grid voltage has decreased). "A" and "B" are wrong, since parameters are now outside the Generator Capability Curve. "A" and "B" are plausible, since the new combination of MWe and MVAR is close to the curve, and several variables input to whether the point is inside or outside the curve, and if hydrogen pressure were normal, parameters would still be inside the curve. "C" is correct, and "D" wrong, since the combination of MWe and MVAR has placed the Generator outside of the BC curve, which is limited by armature heating. "D" is plausible, since if MWe were lower, and MVAR higher, the AB curve would be challenged, and this is limited by field heating.

Technical Reference(s): OP 3324A (Rev 10-6), Attachment 1 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: **OP 3324A, Attachment 1**

Learning Objective: MC-04685 Describe operation of Main Generator… System under… Abnormal Voltage Operations… (As available)

Question Source: New

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.4 and 41.5

Comments:

| | | | | |
|---|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 19 | Tier # | 1 | 1 |
| K/A Statement: Loss of Condenser Vacuum: | Group # | 2 | 2 |
| Knowledge of specific bases for EOPs | K/A # | APE.051.GEN.2.4.18 | |
| Proposed Question: | Importance Rating | 3.3 | 4.0 |

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

1. The crew enters AOP 3559, *Loss of Condenser Vacuum.*
2. The crew commences rapidly reducing reactor power.
3. Power reaches 30% reactor power with backpressure greater than 5 inches Hg absolute, and per AOP 3559 foldout page criteria, the crew trips the reactor.

What is the basis for tripping the reactor at this vacuum and power level?

a) Prevent a rupture of LP turbine diaphragms due to overpressure.

b) Prevent damage to the LP turbine blades due to blade stall flutter.

c) Prevent damage to the turbine shaft seals due to insufficient cooling.

d) Prevent damage to the turbine shaft seals due to excessive leakage.

Proposed Answer: B

Explanation (Optional): AOP 3559 commences a rapid downpower when condenser backpressure exceeds 5.0"Hg Absolute to minimize energy input to the condenser while it is losing vacuum. AOP 3559 foldout page criteria contains a Reactor Trip requirement if backpressure exceeds 5.0"HgA while operating at less than or equal to turbine load of 30% (389 MWe). "B" is correct, and "A", "C", and "D" wrong, since this requirement is due to the risk of low pressure turbine blade stall flutter and the vibration damage that can be caused by such an event. "A" is plausible, since Condenser backpressure is elevated. "C" and "D" are plausible, since differential pressure across the seals is being affected by the loss of vacuum, and leakage across the seals may be the cause of the loss of vacuum.

Technical Reference(s): AOP 3559 (Rev 10-0), Foldout Page (Attach if not previously provided)
OP 3323A (Rev 15-5), Precaution 3.8

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03923 Discuss the basis of major precautions, procedure steps/or sequence of steps contained within AOP 3559. (As available)

Question Source: Bank 69563

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.4, 41.10, and 41.14

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 20 | Tier # | 1 | 1 |
| K/A Statement: High Reactor Coolant Activity: | Group # | 2 | 2 |
| Determine/interpret corrective actions | K/A # | APE.076.AA2.02 | |
| Proposed Question: | Importance Rating | 2.8 | 3.4 |

With the plant at 100% power, RCS activity starts increasing.

The crew enters AOP 3553, *High RCS Activity.*

What ALARA-based action is required; and what other corrective action is required?

a) Consider restricting access to the Auxiliary Building, and consult with Reactor Engineering about increasing letdown flow.

b) Consider restricting access to the Auxiliary Building, and consult with Health Physics about placing SLCRS in service.

c) Consider restricting access to the ESF Building, and consult with Reactor Engineering about increasing letdown flow.

d) Consider restricting access to the ESF Building, and consult with Health Physics about placing SLCRS in service.

Proposed Answer: A

Explanation (Optional): Reactor coolant with increasing activity levels is circulating through the Aux Bldg, resulting in increasing radiation levels in the Auxiliary Bldg. "C" and "D" are wrong, since Reactor Coolant is not flowing through the ESF Building at 100% power. "C" and "D" are plausible, since this action is required in lower MODES when RHR is in service, and ESF Bldg radiation levels are also an issue during a LOCA when the RCS is on sump recirculation. AOP 3553 step 7 directs the operators to consult with RE about increasing letdown flow ("A" correct) to increase flow through the demins and filters to enhance purification of Reactor Coolant. "B" is wrong, since SLCRS is effective at removing airborne activity, but not higher activity levels in the charging and letdown piping. "B" is plausible, since SLCRS draws on both the ESF and Aux Bldg, and if an RCS leak occurs in either building, increasing radiation levels in either building will drive starting the SLCRS system per AOP 3573, *Radiation Monitor Alarm Response.*

Technical Reference(s): AOP 3553 (Rev 6-4), Note prior to step 1 (Attach if not previously provided)
AOP 3553 (Rev 6-4), step 7

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07530 Given a set of plant conditions, properly apply the notes and cautions of AOP 3553. (As available)

Question Source: Bank 76174

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.10 and 41.12

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 21 | Tier # | 1 | 1 |
| K/A Statement: Steam Generator Over-pressure | Group # | 2 | 2 |
| Knowledge of parameters and logic used to | K/A # | EPE.W/E13.GEN. 2.4.21 | |
| assess the status of safety functions | Importance Rating | 4.0 | 4.6 |

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 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%

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

a) RED, due to inadequate heat sink

b) YELLOW, due to SG overpressure

c) YELLOW, due to SG high level

d) YELLOW, due to SG low level

Proposed Answer: B

Explanation (Optional): The parameters and logic used to assess the status of the Heat Sink safety function are as follows: Heat Sink Red is ALL SG NR Levels <8% AND AFW flow <530 gpm ("A" wrong, but plausible). Yellow on SG overpressure is ANY SG >1220 psig ("B" correct). Yellow on SG high level is ANY SG NR >80% ("C" wrong, but plausible). Yellow on SG low level is ANY SG NR <8% ("D" wrong, but plausible).

Technical Reference(s): EOP 35 F-0.3 (Rev 5-1) (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: New

Question History:

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 # 22 | Tier # | 1 | 1 |
| K/A Statement: Post LOCA Cooldown Depress: | Group # | 2 | 2 |
| Operational implications of procedures | K/A # | W/E03.EK1.2 | |
| Proposed Question: | Importance Rating | 3.6 | 4.1 |

A fault occurs in 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.

Why is it important that the operators 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 and hot leg recirculation is not desired for a steam line break.

Proposed Answer: A

Explanation (Optional): "A" is correct, since if the operators proceed past Step 9 in E-1 with a depressurizing SG, they will be directed to ES-1.2, *Post LOCA Cooldown And Depressurization* ("D" wrong), and encounter more restrictive SI termination criteria than necessary, since ES-1.2 is designed to cooldown the plant and sequentially terminate ECCS injection with a small break LOCA in progress. For a faulted SG, RCS inventory will rapidly recover after the faulted SG has completed blowing down. By looping back at E-1, step 9, the crew will transition to ES-1.1, *SI Termination*, and terminate ECCS injection much more quickly. "B" and "C" are wrong, since operators are not directed to start a cooldown in E-1, and the faulted SG has already been addressed in E-2, *Faulted Steam Generator Isolation*. "B", "C", and "D" are plausible, since E-1 will transition the crew to the appropriate procedure with a faulted SG, a small break LOCA, or a large break LOCA. Also, ES-1.2 will conduct a cooldown of the RCS.

Technical Reference(s): E-1 (Rev 26-0), step 9 (Attach if not previously provided)
WOG Bkgd Doc (Rev 2), E-1, Step 9 Basis

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 History:

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 # 23 | Tier # | 1 | 1 |
| K/A Statement: Turbine Trip: Operational | Group # | 2 | 2 |
| implications of systems or procedures | K/A # | AOP 3550.AK1.01 | |
| Proposed Question: | Importance Rating | Site Priority | Site Priority |

With the plant initially at 30% power, the following sequence of events occurs:

1. The Main Turbine trips.
2. The crew enters AOP 3550, *Turbine/Generator Trip.*
3. The Reactor does NOT trip during the initial transient.

What action will AOP 3550 direct the crew to take with Control Rods, and why?

a) Verify the Control Rods are in AUTO, so they are available to automatically insert to restore Tave to program.

b) Verify the Control Rods are in AUTO, so they are available to automatically insert in the event of a Condenser Steam Dump malfunction.

c) Place the Control Rods in MANUAL when reactor power decreases to 20 to 25%, to stabilize reactor power and obtain feedwater control on the SG Feed Reg Bypass Valves.

d) Place the Control Rods in MANUAL when reactor power decreases to 20 to 25%, to allow Condenser Steam Dumps to automatically close over time to lower reactor power in a controlled manner.

Proposed Answer: C

Explanation (Optional) AOP 3550, step 2 will direct the crew to place rods in manual when power is between 20 and 25% ("A" and "B" wrong). The purpose of this step is to stabilize reactor power in the 20% to 25% power range in order to obtain feedwater control on the SG feed regulating bypass valves ("C" correct, "D" wrong). The rod control system must be placed in manual operation to stabilize reactor power in order to provide for turbine recovery or a controlled reactor shutdown. Without these actions, the rod control system would automatically insert the control rods to; 1), return Tavg to the no-load Tavg ("A" plausible), and 2), to close the condenser steam dump valves which would be open due to the temperature mismatch generated by the proportional only Tavg Mode steam dump controller ("B" and "D" plausible).

Technical Reference(s): AOP 3550 Basis Doc (Rev 8-0), step 2 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-03897 Discuss the basis of major procedure steps and/or sequence of steps in AOP 3550. | (As available) |
| Question Source: | New | |
| Question History: | | |
| Question Cognitive Level: | Comprehension or Analysis | |
| 10 CFR Part 55 Content: | 55.41.1, 1, 6, 7, and 10 | |
| Comments: | | |

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 24 | Tier # | 1 | 1 |
| K/A Statement: Severe Weather: | Group # | 2 | 2 |
| Determine/interpret conditions or procedures | K/A # | AOP 3569.A2.01 | |
| Proposed Question: | Importance Rating | Site Priority | Site Priority |

Current Conditions:

- A hurricane warning has been issued for southeastern Connecticut.
- Winds are projected to exceed 90 mph in the next 6 hours.
- CONVEX has reported that offsite power is NOT reliable.
- A plant shutdown is being performed as required by AOP 3569, *Severe Weather Conditions*.

What final plant conditions are required to be established by the crew prior to the hurricane arriving?

a) RCS $T_{cold}$ at 557°F, and Pressurizer level at 28%

b) RCS $T_{cold}$ at 557°F, and Pressurizer level at 60%

c) RCS $T_{cold}$ less than 400°F, and Pressurizer level at 28%

d) RCS $T_{cold}$ less than 400°F, and Pressurizer level at 60%

Proposed Answer: D

Explanation (Optional): "D" is correct since with expected winds greater than 90 mph or offsite power not reliable or with either EDG inoperable, Pressurizer level will be increased to approximately 60% to provide an additional margin to core uncovery ("A" and "C" wrong). A cooldown will be conducted to cool the RCS to less than 400°F to provide a stable condition consistent with ECA-0.0, Loss of All AC Power., to protect the RCP seals. ("D" correct and "B" wrong), maintaining RCS pressure GREATER THAN 850 psia so that the SI accumulators do not inject. The accumulator isolation valves are kept open so that the accumulators are available in the event of a loss of all AC power. "A", "B", and "C" are plausible, since 557°F is normal HOT STANDBY program temperature and 28% Pzr level is normal HOT STANDBY program Pzr level; and numerous Technical Specification Action Statements require going to HOT STANDBY within 6 hours.

Technical Reference(s): AOP 3569 (Rev 18-0), steps 11 and 14 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-06216 Identify conditions which require transition to other procedures from AOP 3569, Severe Weather Conditions (As available)

Question Source: Bank 64019

Question History: Millstone 3 2002 NRC Exam

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.10 and 43.5

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 25 | Tier # | 1 | 1 |
| K/A Statement: Rapid Downpower: | Group # | 2 | 2 |
| Operate/monitor indications, plant behavior, | K/A # | AOP 3575.A1.01 | |
| and/or desired results | Importance Rating | Site Priority | Site Priority |

Proposed Question:

The crew is performing a CONVEX requested emergency generation reduction from 100% power to 80% power, and the following sequence of events occurs:

1. During the load reduction axial flux difference goes out of the target band in the negative direction.
2. At 85% power, a PEO is dispatched to degrade condenser vacuum.
3. The Rod Bank LO-LO setpoint is reached.
4. The crew reaches the desired 80% power level.

Did AOP 3575 require the crew to stop the downpower prior to them reaching 80% power? If so, why?

a) The crew was required to temporarily stop the downpower when AFD went outside the target band. After borating to restore AFD, they could recommence the load reduction.

b) The crew was required to stop the downpower when the Rod LO-LO annunciator was received, and transition to AOP 3566, *Immediate Boration.*

c) The crew was required to stop the downpower at 85% power while waiting for condenser vacuum to degrade to minimize the chance of turbine rubbing.

d) The crew was NOT required to stop the downpower prior to reaching 80% power for the AFD, Rod LO-LO, or turbine rubbing concerns.

Proposed Answer: D

Explanation (Optional): "D" is correct, and "A", "B", and "C" wrong, since none of the three conditions requires the downpower to be stopped. "A" is plausible, since continuing the downpower will cause rods to continue to insert, aggravating the condition, but the downpower is important for grid stability, so the crew will be directed to increase the boration rate to minimize rod insertion while the downpower continues. "B" is plausible, since rod lo-lo requires immediate boration, but this is accomplished in AOP 3575 while the downpower is allowed to continue. "C" is plausible, since turbine rubbing is a concern during a rapid downpower, but only after lower power levels (<75%) are reached.

Technical Reference(s): AOP 3575 (Rev 18-0), Note prior to step 1 (Attach if not previously
AOP 3575 (Rev 18-0), steps 6.h, 7. a-d, and 9 provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07570 Given a set of plant conditions, properly apply the notes and cautions of AOP 3575. (As available)

Question Source: Bank 68689

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.10

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 26 | Tier # | 1 | 1 |
| K/A Statement: Loss of Emergency Bus: | Group # | 2 | 2 |
| Operational implications of systems or | K/A # | AOP 3577.K1.01 | |
| procedures and/or desired results | Importance Rating | Site Priority | Site Priority |

Proposed Question:

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

1. The BUS 34C BUS DIFF annunciator is received on MB8A.
2. The BOP reports Bus 34C is deenergized.
3. The crew enters AOP 3577, *Loss of Normal and Offsite Power to a 4.16 KV Emergency Bus.*

Which of the following actions is **NOT** procedurally directed for a loss of Bus 34C?

a) Locally Shift the RCP seal return path to the top of the VCT.

b) Cross-connect the RPCCW Containment headers at MB1.

c) Simultaneously isolate Charging and Letdown at MB3.

d) Isolate Auxiliary Steam to the Auxiliary Building at MB6.

Proposed Answer: A

Explanation (Optional): "A" is correct, since the seal water heat exchanger is cooled from the "B" RPCCW train. "B" is wrong since RPCCW containment headers must be cross-tied to maintain cooling to RCPs. "C" is wrong, since the "A" RPCCW train cools the letdown heat exchanger. "D" is wrong, since cooling has been lost to the "A" RPCCW non-safety header, and relief valves may lift on associated Aux Steam equipment. "B" and "D" are plausible, since these actions are taken in AOP 3577 for loss of either train. "C" is plausible, since this action is taken on loss of the "A" Train.

Technical Reference(s): AOP 3577 (Rev 1-4), Steps 1, 5, 8, and 9 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07395 Describe the major action categories contained within AOP-3577, Loss Of Normal and Offsite Power to a 4.16kv Emergency Bus. (As available)

Question Source: Bank 78907

Question History:

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 # 27 | Tier # | 1 | 1 |
| K/A Statement: Loss of All AC Power – Recovery with the SBO Diesel: Interrelations with Control, Safety, and/or Heat Removal Systems | Group # | 2 | 2 |
| | K/A # | ECA-0.3.K2.01 | |
| | Importance Rating | Site Priority | Site Priority |

Proposed Question:

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

1. A loss of all AC Power occurs.
2. The crew restores power to the "A" Train with the SBO Diesel.
3. The crew enters ECA-0.3, *Loss of all AC Power – Recovery with the SBO Diesel.*
4. The crew starts the "A" RPCCW Pump.

Which other loads are assumed to be started to meet the 8-hour SBO coping requirement?

a) A Service Water Pump and a Charging Pump

b) A Service Water Pump and an RHR Pump

c) A Motor Driven Aux Feed Pump and a Charging Pump

d) A Motor Driven Aux Feed Pump and an RHR Pump

Proposed Answer: A

Explanation (Optional): The SBO diesel is not rated to support full loading of an emergency bus, so ECA-0.3 will control loading in a prioritized fashion. "A" is correct, since Service Water is required to support Charging Pump cooling, and the Charging pump ensures the 8-hour coping duration is met. "B" and "D" are wrong, since the RHR Pump is not needed during normal operations until MODE, and the 8 hour coping time does not require a plant cooldown. Also, no LOCA is assumed, so RHR is not needed for RCS Injection. If injection is needed, ECA-0.3 will increase flow from the running Charging pump by opening a Cold Leg Injection Valve. "C" is wrong, since the Turbine Driven Aux Feedwater Pump is assumed to supply Feedwater from the DWST to maintain heat sink for this event. "B", "C", and "D" are plausible, since each of these are safety related pumps involved with maintaining either RCS inventory or heat removal.

Technical Reference(s): ECA-0.3 (Rev 13-2), steps 5, 6, 7, and 23 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03866 Describe the major action categories within EOP35 ECA-0.3 (As available)

Question Source: New

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.8 and 41.10

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 28 | Tier # | 2 | 2 |
| K/A Statement: Reactor Coolant Pump: | Group # | 1 | 1 |
| Design feature/interlock which provides for: | K/A # | 003.K4.11 | |
| Isolation valve interlocks | Importance Rating | 3.0 | 3.0 |

Proposed Question:

Which of the following combinations of valve positions will meet the electrical interlock for starting a RCP?

a) RCS Cold Leg Isolation - CLOSED
RCS Hot Leg Isolation - CLOSED
RCS Bypass Isolation - OPEN

b) RCS Cold Leg Isolation - CLOSED
RCS Hot Leg Isolation - OPEN
RCS Bypass Isolation - CLOSED

c) RCS Cold Leg Isolation - OPEN
RCS Hot Leg Isolation - CLOSED
RCS Bypass Isolation - OPEN

d) RCS Cold Leg Isolation - OPEN
RCS Hot Leg Isolation - CLOSED
RCS Bypass Isolation - CLOSED

Proposed Answer: A

Explanation (Optional): Either of two sets of valve positions are required to meet the interlock to allow starting an RCP: 1) The Hot and Cold leg isolation valves OPEN (None of the given alignments meets this portion of the interlock), or 2) The Cold leg isolation valve CLOSED ("C" and "D" wrong) with the Bypass Valve OPEN ("A" correct, and "B" wrong). "B", "C", and "D" are plausible, since they each have at least one valve open and involve the three valves that feed into the interlock.

Technical Reference(s): LSK 25-1.1A (Rev 8) (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: Bank 67470

Question History:

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 # 29 | Tier # | 2 | 2 |
| K/A Statement: Chemical and Volume Control | Group # | 1 | 1 |
| Effect of a malfunction on: PZR level and pressure | K/A # | 004.K3.07 | |
| Proposed Question: | Importance Rating | 3.8 | 4.1 |

With the plant at 100% power, an 8 gpm leak starts downstream of Charging Flow Control Valve 3CHS*FCV121.

Assuming no operator action, what indications will exist thirty minutes after the leak started?

a) VCT level constant and pressurizer level decreasing.

b) Increased VCT makeup and pressurizer level restored to normal.

c) Increased VCT makeup and pressurizer level decreasing.

d) Charging pump suction swapped to the RWST and PZR level restored to normal.

Proposed Answer: B

Explanation (Optional): A leak downstream of CHS*FCV121 would INITIALLY result in a decrease in pressurizer level. FCV 121 will open to restore PZR level and then maintain level ("A" and "C" wrong). Because charging is now greater than letdown, VCT level will decrease to the makeup setpoint, and 8 gpm is within the capacity of VCT makeup ("B" correct and "D" wrong).

Technical Reference(s): Functional Dwg 11 (Rev H) (Attach if not previously provided)
P&ID 104A (Rev 54)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04202 Describe the operation of the Chemical and Volume Control System under normal, abnormal, and emergency operating conditions. (As available)

Question Source: Bank 68571

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.7

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 30 | Tier # | 2 | 2 |
| K/A Statement: Residual Heat Removal: | Group # | 1 | 1 |
| Effect of a malfunction on: RCS | K/A # | 005.K3.01 | |
| Proposed Question: | Importance Rating | 3.9 | 4.0 |

The plant is initially in MODE 5, preparing to return the plant to power at the end of a refueling outage. Initial conditions are as follows:

- The Pressurizer is solid.
- The "A" RHR train is in service.
- RCS Temperature is stable at 145°F.

A large instrument air header rupture occurs, and instrument air pressure rapidly depressurizes to zero psig.

Assuming NO operator action, what effect will the loss of instrument air pressure have on RCS temperature, and why?

a) RCS temperature will increase due to decreased RPCCW flow through the RHR Heat Exchanger.

b) RCS temperature will increase due to decreased RHR flow through the RHR Heat Exchanger.

c) RCS temperature will decrease due to increased RPCCW flow through the RHR Heat Exchanger.

d) RCS temperature will decrease due to increased RHR flow through the RHR Heat Exchanger.

Proposed Answer: D

Explanation (Optional): The plant is post-refueling, so decay heat is at a minimum, meaning 3RHS* FCV606 is initially throttled mostly closed. A loss of IAS will cause 3CCP*FV66A to fail AS IS resulting in NO change in RCS temperature from CCP flow ("A" and "C" wrong). "D" is correct, and "B" wrong, since RHR Flow Control Valve 3RHS*HCV 606 fails open on a loss of IAS, resulting in maximum flow through the RHR HX. "A", "B", and "C" are plausible, since temperature varies in the appropriate direction based on the assumed fail position in the distractor.

Technical Reference(s): AOP 3562 (Rev 7-1), page 3 (Attach if not previously provided)
P&ID 112A (Rev 50)
P&ID 121A (Rev 32), and 121C (Rev 36)

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: Bank 73098

Question History:

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 # 31 | Tier # | 2 | 2 |
| K/A Statement: Residual Heat Removal: | Group # | 1 | 1 |
| Predict impact and mitigate: RHR valve | K/A # | 005.A2.04 | |
| malfunction | Importance Rating | 2.9 | 2.9 |

Proposed Question:

Initial Conditions:

- RCS temperature is 150°F.
- RCS Pressure is 150 psia.
- No RCPs are running.
- The "B" Train outage is in progress.

The following sequence of events occurs:

1. "A" RHR Pump Suction Valve 3RHS*MV8701A spuriously CLOSES.
2. The crew enters EOP 3505, *Loss of Shutdown Cooling and/or RCS Inventory.*

In accordance with EOP 3505, what is the crew required to do with RCS pressure?

a) The crew must raise RCS pressure to greater than 170 psia, to ensure subcooled natural circulation occurs.

b) The crew must vent the RCS to the PRT, to establish bleed and feed cooling of the RCS.

c) The crew must depressurize the RCS to atmospheric to prevent lifting COPPS relief valves as the natural circulation ΔT develops.

d) The crew must depressurize the RCS to atmospheric to prevent a cold overpressure event as makeup is added to the RCS.

Proposed Answer: A

Explanation (Optional): The "A" RHR Pump has lost suction, and must be tripped. The RCS is already full and steam generators are available. The procedure establishes conditions for natural circulation. This includes increasing RCS pressure to support the heatup and the steam generators are used to dump steam. "A" is correct, since natural circulation will proceed when RCS temperature increases to approximately 50°F greater than the saturation temperature of the secondary water. The required RCS pressure to maintain the RCS subcooled at the lowest pressure point in the RCS (SG U-Tubes), including instrument uncertainties, is 170 psia. "B" is wrong, since the 170 psia requirement is part of establishment of conditions for natural circulation. "C" and "D" are wrong, since the RO will be maintaining RCS pressure between 170 and 330 psia. "B" is plausible, since there is a pressure requirement for RCS pressure in EOP 3505 when running an RCP, but the pressure band is 310 to 375 psia. "C" is plausible, since the PZR may be solid when in MODE 5, and a heatup will cause an increase in RCS pressure. "D" is plausible, since this is a misapplication of the PTS caution that applies when adding makeup via a high head source.

| | | |
|---|---|---|
| Technical Reference(s): | EOP 3505 (Rev 11-0), Att. B, steps 11 and 12<br>EOP 3505 (Rev 11-0), Att. B, Caution prior to step 1<br>OP 3260A (Rev 17-6), step 1.3.2 | (Attach if not previously provided) |

Proposed references to be provided to applicants during examination: None

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|---|---|---|
| Learning Objective: | MC-04352 Discuss the bases of major procedure steps and/or sequence of steps in EOP 3505, Loss of Shutdown Cooling and/or RCS Inventory | (As available) |

| | |
|---|---|
| Question Source: | Bank 80858 |
| Question History: | |
| Question Cognitive Level: | Comprehension or Analysis |
| 10 CFR Part 55 Content: | 55.41.10 and 41.14 |
| Comments: | |

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 32 | Tier # | 2 | 2 |
| K/A Statement: Emergency Core Cooling: | Group # | 1 | 1 |
| Physical connections and/or cause-effect | K/A # | 006.K1.09 | |
| relationship with: Nitrogen | Importance Rating | 2.6 | 2.9 |

Proposed Question:

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

1. The RO is directed to raise pressure in the "D" SIL Accumulator using OP 3310B, *Low Pressure Safety Injection*.
2. The RO opens the Nitrogen Supply Containment Isolation Valves (3SIL*CV8880 and 8968) at MB2.
3. After the N2 header pressurizes, the RO opens one "D" Accumulator N2 Supply Valve (3SIL*SV8875D).
4. The RO reports pressure in the "D" SIL Accumulator has started increasing.

Per the notes in OP 3310B, what other effects may occur while the "D" Accumulator is pressurizing?

a) Pressure in the other three Accumulators may start <u>decreasing</u>; and if the N2 header remains pressurized for an extended period of time, the Containment atmosphere may inert with nitrogen.

b) Pressure in the other three Accumulators may start <u>decreasing</u>; and if the N2 header remains pressurized for an extended period of time, the "D" Accumulator may over-pressurize.

c) Pressure in the other three Accumulators may start <u>increasing</u>; and if the N2 header remains pressurized for an extended period of time, the Containment atmosphere may inert with nitrogen.

d) Pressure in the other three Accumulators may start <u>increasing</u>; and if the N2 header remains pressurized for an extended period of time, the "D" Accumulator may over-pressurize.

Proposed Answer: C

Explanation (Optional): The Accumulators are all supplied by a normally-depressurized common nitrogen header. All four Accumulators vent to the Containment atmosphere through two parallel-path vent valves via a common vent header that taps off of the supply header. The accumulator pressurization valves are designed to unseat when the nitrogen header is pressurized, so other accumulators may pressurize as the "D" Accumulator pressurizes ("A" and "B" wrong). "A" and "B" are plausible, since the other accumulator pressurization valves are all in the closed position, and they are all tied to the same vent header that leaks by to the Containment atmosphere. "C" is correct, since the vent header taps off of the pressurization header, and the vent valves leak by to the Containment atmosphere. "D" is wrong, since the header is supplied by a nitrogen line with a regulator set for 660 psig, which is below the Tech Spec high pressure limit of 694 psia. "D" is plausible, since nitrogen is supplied from a high pressure source.

| | | |
|---|---|---|
| Technical Reference(s): | OP 3310B (Rev 15-6), Section 4.6 | (Attach if not previously provided) |
| | OP 3310B (Rev 15-6), Precautions 3.3, 3.5, and 3.6 | |
| | P&ID 112B (Rev 23) | |

Proposed references to be provided to applicants during examination: None

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|---|---|---|
| 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: | New |
| Question History: | |
| Question Cognitive Level: | Memory or Fundamental Knowledge |
| 10 CFR Part 55 Content: | 55.41.8 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 |
| Ability to manually operate and/or monitor: | K/A # | 007.A4.10 | |
| Recognition of leaky PORV/code safety | Importance Rating | 3.6 | 3.8 |

Proposed Question:

With the plant at 100% power, a Pressurizer PORV starts leaking by, and the following indications exist:

- Pressurizer pressure: 2235 psig and DECREASING.
- Tave: 587°F.
- PRT pressure: 20 psia and INCREASING

The RO monitors PORV tail pipe temperature on MB4.

What will tail pipe temperature indicate?

a) 230°F

b) 300°F

c) 617°F

d) 650°F

Proposed Answer: A

Explanation (Optional): "A" is correct, and "B", "C", and "D" wrong, since the enthalpy of the saturated steam in the PZR vapor space does not change as it passes through a relief valve, resulting in a temperature indication corresponding to the pressure in the PRT. The Mollier diagram shows that enthalpy of the PZR steam is approximately 1120 BTU/lb. Move across (left to right) to the PRT pressure, demonstrating that the steam will be saturated at PRT pressure. Follow the constant pressure line up to the saturation curve, which reads about 230°F. "B" is plausible, since this is the temperature obtained if a constant entropy process is assumed. "C" and :D: are plausible, since these are the approximate temperatures of the RCS hot leg temperature for the current Tave, and the temperature of the Pressurizer, and would then be corrrect if a constant temperature process is assumed (TMI).

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

Proposed references to be provided to applicants during examination: **Steam Tables (Mollier Diagram)**

Learning Objective: MC-05349 Describe the Pressurizer Relief Tank System operation… under the following… Pressurizer Safety Valve or Power Operated Relief Valve discharge… (As available)

Question Source: Bank #75623

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.3 and 41.5

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 34 | Tier # | 2 | 2 |
| K/A Statement: Component Cooling Water: | Group # | 1 | 1 |
| Predict and/or monitor parameters associated with | K/A # | 008.A1.02 | |
| operating controls including: CCW temperature | Importance Rating | 2.9 | 3.1 |

Proposed Question:

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

- The plant is at 340°F.
- The "B" Train of RHR has just been aligned for plant cooldown.

The RO slowly throttles open 3CCP-HK66B1, "RPCCW HX FLOW."

What effect, if any, will this have on RPCCW System temperature?

a) No effect, since "B" RHR has been placed in the "Cooldown" mode. In the Cooldown Mode, full RPCCW flow is already directed through the "B" Train RPCCW Heat Exchanger.

b) No effect, since "B" RHR has been placed in the "Cooldown" mode. In the Cooldown Mode, full RPCCW flow is already directed through the "B" RHR Heat Exchanger.

c) Temperature will begin to increase. When higher RPCCW temperature as sensed at the discharge of the "B" Train RPCCW Heat Exchanger, RPCCW Temperature Control Valve 3CCP*TV32B will modulate to provide more RPCCW flow through the RPCCW Heat Exchanger to help mitigate the temperature rise.

d) Temperature will begin to increase. When higher RPCCW temperature as sensed at the discharge of the "B" RHR Heat Exchanger, RPCCW Temperature Control Valve 3CCP*TV32B will modulate to provide more RPCCW flow through the RPCCW Heat Exchanger to help mitigate the temperature rise.

Proposed Answer: C

Explanation (Optional): At this point, RHR has been selected to the Cooldown Mode This restores instrument air to the RHR Heat Exchanger outlet flow control valve and bypass valve, allowing them to modulate ("A" and "B" wrong). "A" and "B" are plausible, since placing RHR into the Normal Mode isolates instrument air to the RHR Heat Exchanger outlet flow control valve and bypass valve, causing them to fail open. Also, if RPCCW temperature continues to rise as sensed at the RHR Heat Exchanger , the RHR Heat Exchanger Total Flow Control Valve 3RHS*FCV619 will fail open. "C" is correct, since as RHR System temperature increases, as sensed at the discharge of the "B" Train RPCCW Heat Exchanger ("D" wrong, but plausible), RPCCW Temperature Control Valve 3CCP*TV32B will modulate to provide more RPCCW flow through the RPCCW Heat Exchanger to help mitigate the temperature rise.

Technical Reference(s): OP 3208 (Rev 22-4), steps 4.3.15 and 16 (Attach if not previously provided)
P&ID 112A (Rev 50) and 121A (Rev 32)

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… Plant Cooldown… (As available)

Question Source: New

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.5, 41.7, and 41.10

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 35 | Tier # | 2 | 2 |
| K/A Statement: Component Cooling Water: | Group # | 1 | 1 |
| Knowledge of low power/shutdown implications | K/A # | 008.GEN.2.4.9 | |
| in accident mitigation strategies | Importance Rating | 3.8 | 4.2 |

Proposed Question:

A plant heatup is in progress per OP 3201, *Plant Heatup*, and Initial Conditions are as follows:

- RCS temperature is 360°F.
- All four Reactor Coolant Pumps are running.
- The "C" RPCCW Pump and Heat Exchanger are in standby and aligned to the "B" Train.

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. The crew is preparing to open the RPCCW Containment Cross-tie Valves to restore cooling to the "A" and "D" RCPs, when the STA reports the following parameters:
   - RCP A and D bearing oil temperatures are 180°F and increasing.
   - RCP A and D Number 1 seal inlet temperatures are 200°F and increasing.
   - VCT Temperature is 140°F and stable.

At this point, based on AOP 3561 Foldout page criteria, what action is the crew required to take with the RCPs?

a) Trip the "A" and "D" RCPs due to exceeding maximum bearing oil temperatures.

b) Trip the "A" and "D" RCPs due to exceeding maximum Number 1 Seal inlet temperature.

c) Trip all four RCPs due to exceeding maximum allowed VCT temperature.

d) All four RCPs can continue to run. Open the RPCCW Containment Cross-Tie Valves.

Proposed Answer: D

Explanation (Optional): "A" and "D" RCPs have lost thermal barrier cooling. RCP Trip Criteria include RCP Bearing Oil temperature >195°F ("A" wrong, but plausible) and Number 1seal inlet temperature ≥ 230°F ("A" wrong, but plausible). Above 400°F, all four RCPs are required to be tripped if VCT temperature is >135°F ("C" plausible) but with the plant shutdown and cooled down to <400°F, the trip criterion becomes VCT temperature >150°F ("D" correct, "C" wrong). Opening the Ctmt Cross-tie valves will restore RCP cooling.

Technical Reference(s): AOP 3561 (Rev 11-2), Foldout Page (Attach if not previously provided)
AOP 3561 (Rev 11-2), Att A, steps 1 and 2

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07542 Given a set of plant conditions, properly apply the notes, cautions, and foldout page items of AOP 3561. (As available)

Question Source: New

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.10

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 36 | Tier # | 2 | 2 |
| K/A Statement: Pressurizer Pressure Control: | Group # | 1 | 1 |
| Design feature/interlock which provides for: | K/A # | 010.K4.03 | |
| Over pressure control | Importance Rating | 3.8 | 4.1 |

Proposed Question:

The plant is initially at 100% power with PZR pressure stable at 2250 psia.

Pressurizer control heater group 3RCS-HIC fails to the fully energized condition.

Assuming no operator action is taken, how will the Pressurizer Pressure Control System respond to the increase in RCS pressure?

a) RCS pressure will increase to the spray valve open setpoint of 2325 psia, and spray valve(s) will open to lower pressure to 2275 psia, where the spray valve(s) will close. Pressure will cycle between 2325 psia and 2275 psia.

b) RCS pressure will increase to the spray valve open setpoint of 2325 psia, and spray valve(s) will open to lower pressure back to 2250 psia.

c) RCS pressure will increase to the spray valve setpoint of 2275 psia, and spray valve(s) will throttle open to maintain pressure at 2275 psia.

d) RCS pressure will increase to the spray valve setpoint of 2275 psia, and spray valve(s) will throttle open to stabilize pressure, and then slowly continue to throttle open to lower pressure back to 2250 psia.

Proposed Answer: D

Explanation (Optional): "D" is correct, since the spray valves start to throttle open at 2275 psia ("A" and "B" wrong), and receive a full open signal at 2325 psia; and the controller is a PID controller, so the longer the error exists, the "I" portion will cause the output to continue to increase to lower pressure until pressure is restored to 2250 psia ("C" wrong). "A" is plausible, since these pressures relate to spray valve operations and this is how PORVs work to control pressure. "B" is plausible, since this has the "PI" function of spray valve operations. "C" is plausible since this is how the controller would work if it were a "P" controller.

Technical Reference(s): Functional Dwg 11 (Rev H) (Attach if not previously provided)
Process Dwg 26 (Rev J)
Training Drawing PPL010C-4 (Rev 0)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05338 Describe the operation of the Pressurizer Pressure and Level Control System Controls and Interlocks… Pressurizer Master Pressure Controller… (As available)

Question Source: Bank 80879

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.7

Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 37 | Tier # | 2 | 2 |
| K/A Statement: Reactor Protection: | Group # | 1 | 1 |
| Effect of a malfunction on: CRDS | K/A # | 012.K3.01 | |
| Proposed Question: | Importance Rating | 3.9 | 4.0 |

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

1. The Reactor Protection System generates an automatic trip signal.
2. The "B" Train of RPS fails to actuate.

Assuming the "A" Train of RPS operates as designed, how do the reactor trip and bypass breakers respond to this event?

a) Both Reactor Trip Breakers receive trip signals only.

b) Reactor Trip Breaker "A" and Bypass Breaker "A" receive trip signals only.

c) Reactor Trip Breaker "A" and Bypass Breaker "B" receive trip signals only.

d) Both Reactor Trip Breakers and Both Bypass Breakers receive trip signals.

Proposed Answer: C

Explanation (Optional): "C" is correct since the AUTO trip signal from "A" Train RPS sends shunt and UV trip signals to the "A" Trip Breaker and a UV trip to the "B" Bypass Breaker. "A" and "D" are wrong since Reactor Trip Breaker "B" does not receive an auto trip signal from the "A" train. "B" is wrong since Bypass Breaker "A" does not receive an auto trip signal from the "A" train. "A", "B", and "D" are plausible, since depending on the trip signal type (auto versus manual) and train, shunt and UV trips are sent to all four breakers.

Technical Reference(s): Functional Dwg 2 (Rev N) (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05493 Describe the operation of the following RPS controls and interlocks… Reactor Trip and Bypass Breakers… (As available)

Question Source: Bank 65770

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.6, 41.7, and 41.8

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 38 | Tier # | 2 | 2 |
| K/A Statement: Engineered Safety Features Actuation: | Group # | 1 | 1 |
| Operational implications of: Definitions of safety train and | K/A # | 013.K5.01 | |
| ESF channel | Importance Rating | 2.8 | 3.2 |

Proposed Question:

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

1. A steam break occurs on the "A" SG, causing Containment pressure to rapidly rise.
2. Protection Set II CTMT pressure transmitter (3LMS*PT936) fails as-is, and does NOT detect the pressure rise.

What is the coincidence (minimum ESF Channels to trip, versus total ESF Channels, including the failed channel) that must sense the Containment high-pressure condition to generate a Safety Injection signal; and to how many safety trains will the trip signal be sent?

a) 2 of 3 channels must sense the Ctmt high pressure condition. The Hi-1 SIS signal will be sent to the A Train of SSPS only.

b) 2 of 3 channels must sense the Ctmt high pressure condition. The Hi-1 SIS signal will be sent to the A and B Train of SSPS.

c) 2 of 4 channels must sense the Ctmt high pressure condition. The Hi-1 SIS signal will be sent to the A Train of SSPS only.

d) 2 of 4 channels must sense the Ctmt high pressure condition. The Hi-1 SIS signal will be sent to the A and B Train of SSPS.

Proposed Answer: B

Explanation (Optional): The coincidence for CTMT Hi-1 SIS is 2 (allowing for one failed channel without a reactor trip) out of 3 signals, since no control functions are tied to CTMT pressure ("C" and "D" wrong). A SIS signal is sent to both trains of RPS for redundancy ("B" correct, and "A" wrong). "C" and "D" are plausible, since SIS signals with control systems (such as Pzr pressure) require 2/4 coincidence. "A" is plausible, since the "B" Train-powered Protection Set II CTMT pressure transmitter failed.

Technical Reference(s): Functional Dwg 8 (Rev K) (Attach if not previously provided)
AOP 3571 (Rev 9-7), Att. R, Page 3

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: 1. Safety Injection… Ctmt Hi-1… (As available)

Question Source: New

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.5

Comments:

| | | | | |
|---|---|---|---|---|
| Examination Outline Cross-reference: | | Level | RO | SRO |
| Question # 39 | | Tier # | 2 | 2 |
| K/A Statement: Engineered Safety Features Actuation | | Group # | 1 | 1 |
| Ability to manually operate and/or monitor: | | K/A # | 013.A4.01 | |
| ESF-initiated equipment which fails to actuate | | Importance Rating | 4.5 | 4.8 |

Proposed Question:

A LOCA has occurred, and initial conditions are as follows:

- The crew is performing actions in E-1, *Loss of Reactor or Secondary Coolant.*
- Both RHR pumps have just been stopped.
- RCS pressure: 600 psia and stable.
- PZR Level: Empty.
- CTMT Pressure: 20 psia
- CTMT Temperature: 175°F
- CTMT Rad levels: $10^4$ R/hr

The LOCA increases in size, and the following sequence of events occurs:

| Time | Event |
|---|---|
| 0900: | RCS Pressure drops to less than 500 psia. |
| 0908: | CTMT Temperature increases above 180°F. |
| 0916: | CTMT Radiation increases above $10^5$ R/hr. |
| 0924: | RCS Pressure drops to less than 300 psia. |

When was the crew first required to restart the RHR Pumps?

a) When RCS pressure dropped below 500 psia.

b) When CTMT temperature increased above 180°F.

c) When CTMT radiation increased above $10^5$ R/hr.

d) When RCS pressure dropped below 300 psia.

Proposed Answer: B

Explanation (Optional): To provide adequate ECCS flow, RCS pressure should be monitored to ensure that the RHR pumps are manually restarted if pressure decreases to LESS THAN 300 psia ("D" plausible, but wrong, since Adverse Containment conditions came in prior to dropping below 300 psia) (500 psia ADVERSE CONTAINMENT "A" wrong, but plausible, since when pressure initially dropped below 500 psia Adverse Ctmt conditions did not exist). "B" is correct, and "C" wrong, but plausible, since both numbers indicate Adverse Ctmt conditions (>180°F, or 10-5 R/hr), causing the pressure setpoint to increase to 500 psia, but the CTMT temperature condition came in first.

Technical Reference(s): E-0 (Rev 27-0), Step 15 (Attach if not previously provided)

E-1 (Rev 26-0), Step 8 Caution

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07422 Given a set of plant conditions, properly apply the notes, cautions, and foldout page items of E-1. (As available)

Question Source: Bank 63963

Question History:

Question Cognitive Level: Comprehension or Analysis

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 |
| Predict and/or monitor parameters associated with | K/A # | 022.A1.03 | |
| operating controls including: Containment humidity | Importance Rating | 3.1 | 3.4 |

Proposed Question:

The crew is restoring from an inadvertent CIA per AOP 3578, *Response to an Inadvertent Containment Isolation Phase A*.

The crew realigns Reactor Plant Chilled Water to supply the CAR Fans at Main Board 1.

How will the crew's actions affect Containment humidity; and where can the crew monitor Containment humidity in the control room?

a) Humidity will increase. This can be monitored on the dew point meter on MB2.

b) Humidity will increase. This can be monitored on the dew point meter at VP1.

c) Humidity will decrease. This can be monitored on the dew point meter on MB2.

d) Humidity will decrease. This can be monitored on the dew point meter at VP1.

Proposed Answer: C

Explanation (Optional): Each CAR fan draws air across the cooling coil assembly and discharges the air to a common duct which distributes it through secondary ducts to different levels of the containment. The crew has just realigned Reactor Plant Chilled Water (CDS) to the CAR fans, replacing RPCCW. Since CDS is colder (about 45°F) than RPCCW (about 85°F), this will increase CTMT cooling, decreasing CTMT temperature. Also, the colder (below the dew point) cooling coils will condense water vapor from the CTMT air as it passes over the coils, decreasing CTMT humidity ("A" and "B" wrong). Dewpoint meter 3LMS-ME22C indicates Containment humidity on MB2 ("C" correct, "D" wrong). "A" and "B" are plausible, since increasing cooling affects humidity. "D" is plausible, since VP1 contains Ctmt Ventilation System Controls.

Technical Reference(s):
P&ID 154A (Rev 26) (Attach if not previously provided)
OP 3313B (Rev 7-2), Section 1.2
OP 3330A (Rev 18-6), Step 4.1.4
OP 3330C (Rev 10-2), Section 1.2
www.newworldencyclopedia.org/entry/Air_conditioning, Page 40

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04253 Describe the purpose of the following Containment Ventilation Sub-systems… Containment Air Recirculation System… (As available)

Question Source: Bank 86749

Question History: Millstone 3 2011 NRC Exam

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.4 and 41.9

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 41 | Tier # | 2 | 2 |
| K/A Statement: Containment Spray: | Group # | 1 | 1 |
| Bus power supplies to: Containment Spray Pumps | K/A # | 026.K2.01 | |
| Proposed Question: | Importance Rating | 3.4 | 3.6 |

Initial Conditions:

- The plant is at 100% power.
- The "A" Containment Recirculation Pump (3RSS*P1A) is running for a breaker operability check.

The Main Generator Output Breaker spuriously trips open, resulting in a reactor trip.

What is the source of electrical power to the "A" Containment Recirculation Pump?

a) 4160 Volt Bus 34A, which is receiving power from the Normal Station Service Transformer.

b) 4160 Volt Bus 34C, which is receiving power from the Normal Station Service Transformer via the 34A to 34C Cross-Tie Breaker.

c) 4160 Volt Bus 34A, which is receiving power from the Reserve Station Service Transformer via the 34A to 34C Cross-Tie Breaker.

d) 4160 Volt Bus 34C, which is receiving power from the Reserve Station Service Transformer.

Proposed Answer: B

Explanation (Optional): The normal source of power for 4160 Volt Busses 34A and 34C with the plant on line is from the output of the Main Generator, through the "A" Normal Station Service Transformer (NSST), to Bus 34A and 34C. On a loss of the Main Generator, offsite power will back-feed through the GSU Transformers, through the "A" NSST to supply bus 34A and 34A ("C" and "D" wrong). The RSS Pumps are powered from Emergency Bus 34C ("B" correct, "A" wrong). "A" is plausible, since the RSS pumps are supplied by 4160 Volt power and many of the pumps supplied by bus 34A are "A" pumps. "C" and "D" are plausible, since the Generator Output Breaker has tripped open, and the "A" Reserve Station Service Transformer is designed to automatically supply the 4160 Volt Busses on a loss of the "A" NSST.

Technical Reference(s): EE-1A (Rev 25), and 1L (Rev 17) (Attach if not previously provided)
FSAR Section 8.3, pages 8.3-2 and 8.3-4 (Rev 24-4)

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… Main Generator Trip… (As available)

Question Source: New

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.7

Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 42 | Tier # | 2 | 2 |
| K/A Statement: Containment Spray: | Group # | 1 | 1 |
| Monitor automatic operation, including: | K/A # | 026.A3.02 | |
| Verification that cooling water is supplied to the containment spray heat exchanger | Importance Rating | 3.9 | 4.2 |

Proposed Question:

A CDA has occurred, and the crew has entered E-1, *Loss of Reactor or Secondary Coolant.*

The CTMT Recirc (RSS) Pumps have just started, and the crew is transitioning to ES-1.3, *Transfer to Cold Leg Recirculation.*

What is the expected position of the RPCCW heat exchanger Service Water inlet isolation valves (3SWP*MOV50A/B), and the Service Water inlet valves to the Containment Recirculation coolers (3SWP*MOV54A/B/C/D)?

a) Both the RPCCW heat exchanger service water inlet isolation valves and the service water inlet valves to the containment recirc coolers should be OPEN.

b) The RPCCW heat exchanger service water inlet isolation valves should be OPEN and the service water inlet valves to the containment recirc coolers should be CLOSED.

c) The RPCCW heat exchanger service water inlet isolation valves should be CLOSED and the service water inlet valves to the containment recirc coolers should be OPEN.

d) Both the RPCCW heat exchanger service water inlet isolation valves and the service water inlet valves to the containment recirc coolers should be CLOSED.

Proposed Answer: C

Explanation (Optional): On a CDA, the RPCCW heat exchanger service water inlet isolation valves receive a CLOSE signal ("A" and "B" wrong), and the service water inlet valves to the containment recirc coolers receive an OPEN signal ("C" correct, "D" wrong). There is a 3 minute time delay prior to 3SWP-MOV54C and D opening, but since the RSS pumps start on RWST LO-LO level, at least 35 minutes have passed since the CDA actuated.

Technical Reference(s): P&ID 133B (Rev 86) (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... Containment Depressurization Actuation (As available)

Question Source: Bank 69683

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 # 43 | Tier # | 2 | 2 |
| K/A Statement: Main and Reheat Steam: | Group # | 1 | 1 |
| Ability to manually operate and/or monitor: | K/A # | 039.A4.04 | |
| Emergency feedwater pump turbines | Importance Rating | 3.8 | 3.9 |

Proposed Question:

Initial Conditions:

- The Reactor is at 7% power.
- A plant startup is in progress per OP 3203, *Plant Startup*.

The following sequence of events occurs:

1. A control room evacuation is required, and the crew enters EOP 3503, *Shutdown Outside Control Room*.
2. Prior to evacuating the Control Room, the US directs the BOP to confirm the Turbine Driven AFW Pump is running, and if not, to start it at Main Board 5.

What actions, if any, is the BOP operator required to perform to manually start the TDAFW Pump?

a) The BOP is required to open only the Steam Supply AOVs (3MSS*AOV31A, B, and D).

b) The BOP is required to open only the Steam Supply MOVs (3MSS*MOV17A, B, and D).

c) The BOP is required to open both the Steam Supply AOVs and MOVs.

d) No actions are required, since the TDAFW Pump auto-started when the RO tripped the reactor.

Proposed Answer: A

Explanation (Optional): With the plant initially at 7% power, the crew has already shifted from AFW to Main Feed to supply the SGs. The standby lineup for AFW has the Steam Supply AOVs closed ("B" wrong) and MOVs open ("A" correct, "C" wrong). "B" and "C" are plausible, since the AOVs and MOVs are in series in the steam supply line to the TDAFW Pump. "D" is wrong, since on the reactor trip, the TDAFW Pump does NOT auto-start, since there will be minimal shrink on a trip from low power. "D" is plausible, since the crew does trip the reactor at step 1 of EOP 3503, and normally, the TDAFW Pump does auto start on a trip from high power levels on SG Lo-Lo level due to shrink.

Technical Reference(s): EOP 3503 (Rev 15-3), step 7 (Attach if not previously provided)
P&ID 123A (Rev 55)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04365 Describe the operation of the following Auxiliary Feedwater System components, controls, and interlocks… Turbine Driven Auxiliary Feedwater Pump… (As available)

Question Source: New

Question History:

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 # 44 | Tier # | 2 | 2 |
| K/A Statement: Main Feedwater System | Group # | 1 | 1 |
| Predict and/or monitor parameters associated with operating | K/A # | 059.A1.07 | |
| controls including: Feed Pump speed normal control | Importance Rating | 2.5 | 2.6 |

Proposed Question:

The plant is at 48% power, and the following sequence of events occurs:

1. The crew commences placing the second Turbine Driven Main Feed Pump, 3FWS-P2B in service.
2. The BOP operator starts raising 3FWS-P2B speed using Manual Speed Control Switch 3TFC-M1B.

At what approximate speed will 3FWS-P2B initially stop increasing when raising speed with the Manual Speed Control Switch; and how is the BOP operator procedurally required to control "B" TDMFP speed at that point?

a) 3FWS-P2B speed stops increasing at 2200 rpm. The BOP will raise the Manual Speed Control Switch to the high speed stop, and then raise speed using Feed Pump Master Speed Controller 3FWS-SK509B.

b) 3FWS-P2B speed stops increasing at 2200 rpm. The BOP will raise the Manual Speed Control Switch to the high speed stop, and then raise speed using NUS controller 3FWS-SK46B.

c) 3FWS-P2B speed stops increasing at 5000 rpm. At this point, the BOP operator will raise the Manual Speed Control Switch to the high speed stop, and then control speed using Feed Pump Master Speed Controller 3FWS-SK509B.

d) 3FWS-P2B speed stops increasing at 5000 rpm. At this point, the BOP will raise the Manual Speed Control Switch to the high speed stop, and then control speed using NUS controller 3FWS-SK46B.

Proposed Answer: B

Explanation (Optional): The lower set of the NUS speed controller and the manual speed controller controls feed pump speed. The low speed switch for the NUS takes control at about 2200 rpm ("C" and "D" wrong), after which the manual control is taken to the high speed stop to allow full range of control by the NUS controller. "B" is correct, since the NUS controller is used to raise speed to the normal operating speed of 5000 rpm ("C" and "D" plausible) before placing the master speed controller in service ("A" wrong, but plausible).

Technical Reference(s): OP3321 (Rev 17-11), steps 4.4.36 - 4.4.44 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04663 Describe operation of main feed water and steam generator water level control systems under the following normal, abnormal, and emergency conditions… Normal at-power operations while increasing or decreasing power between 25 & 100%... (As available)

Question Source: Bank 69863

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.5

Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 45 | Tier # | 2 | 2 |
| K/A Statement: Auxiliary Feedwater: | Group # | 1 | 1 |
| Effect of a malfunction on: RCS | K/A # | 061.K3.01 | |
| Proposed Question: | Importance Rating | 4.4 | 4.6 |

The reactor trips due to a loss of all Main Feedwater, and the following sequence of events occurs:

1. On the trip, NO Auxiliary Feedwater Pumps can be started, either automatically or manually.
2. The crew enters FR-H.1, *Response to Loss of Secondary Heat Sink.*

What is the most significant concern with the RCS if there is a delay in restoring AFW flow?

a) After a certain point in the event, PZR PORVs will not be able to adequately depressurize the RCS, and at least partial core uncovery is unavoidable.

b) After a certain point in the event, subsequent recovery actions could cause failure of SG U-tubes.

c) After a certain point in the event, subsequent recovery actions could lead to a Pressurized Thermal Shock condition in the Reactor Coolant System.

d) After a certain point in the event, ECCS flow will cause water relief through the PZR Safety Valves.

Proposed Answer: A

Explanation (Optional): "A" is correct, and "B", "C", and "D" wrong, since the greatest concern without AFW flow is that the RCS will continue to heat up and pressurize, while RCS Δ Temperature decreases with no heat being removed via the SGs. If allowed to heat up and pressurize to the point where the PORVs start lifting to relieve RCS pressure, opening a PORV will not be able to adequately depressurize the RCS due to high saturation temperature/pressure in the RCS, and insufficient RCS feed flow will occur. The mass loss when PORVs are opened at this point would lead to deep core uncovery and core damage before SI flow could recover the core. "B" is plausible, since SG tube failure is a concern when feeding a hot-dry SG. "C" is plausible, since the RCS has a temperature transient in progress, and has pressurized (but PTS is more of a concern with cooldown stress, not heatup stress). "D" is plausible, since the Pzr Safety Valves are not qualified to pass water. This is a concern on an inadvertent SIS.

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

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-04939 Assuming no Operator Action, ANALYZE the events following a Reactor Trip on Loss of Feedwater. | (As available) |

Question Source: Bank 72415

Question History:

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 # 46 | Tier # | 2 | 2 |
| K/A Statement: Auxiliary/ Emergency Feedwater: | Group # | 1 | 1 |
| Predict impact and mitigate: Loss of dc power | K/A # | 061.A2.03 | |
| Proposed Question: | Importance Rating | 3.1 | 3.4 |

A plant heatup to normal operating temperature and pressure has just been completed, and initial conditions are as follows:

- The Reactor Trip Breakers are open.
- Both Motor Driven Auxiliary Feedwater Pumps are running.

The following sequence of events occurs:

1. DC Bus 1 loses power.
2. The crew enters AOP 3563, *Loss of DC Bus Power*.

What effect does the loss of DC Bus 1 have on the Turbine Driven Auxiliary Feedwater (TDAFW) Pump; and what actions will AOP 3563 direct the operators to take to regain control of AFW flow?

a) The TDAFW Pump CANNOT be started from MB5. The crew will control AFW flow to the "A" and "D" SG's using the "A" MDAFW Pump path, and flow to the "B" and "C" SG's using the "B" MDAFW Pump path.

b) The TDAFW Pump CANNOT be started from MB5. The crew will control AFW flow to all four SG's using the "B" MDAFW Pump via the discharge cross-connect valves.

c) The TDAFW Pump automatically STARTS. The crew will control AFW flow to the "A" and "D" SG's using the TDAFW Pump path, and flow to the "B" and "C" SG's using the "B" MDAFW Pump path.

d) The TDAFW Pump automatically STARTS. The crew will control AFW flow to all four SG's using the "B" MDAFW Pump via the discharge cross-connect valves.

Proposed Answer: C

Explanation (Optional): On a loss of DC Bus 1, the TDAFW Pump Steam Supply Valves fail OPEN, causing the TDAFW Pump to automatically start ("A" and "B" wrong). Also, the following Flow Control Valves fail open: "A" MDAFW Pump discharge path to the "A" and "D" SGs, and one of two series TDAFW Pump discharge valves to each of the four SGs. Also, the "A" Train AFW cross-connect valve fails closed, and the "A" MDAFW Pump suction valve from the DWST opens. The crew will be directed to isolate the "A" MDAFW paths to SG's "A" and "D", since this is no longer a throttleable path. The crew will control AFW flow to the "A" and "D" SG's using the one functioning TDAFW Pump throttle valve in each path, and flow to the "B" and "C" SG's using the "B" MDAFW Pump path ("C" correct and "D" wrong). "A" and "B" are plausible, since the TDAFW Pump is a backup to the MDAFW Pumps, and DC power to its steam supply valves has been lost. Also, DC power has been lost to several AFW flow control valves. "D" is plausible, since the TDAFW Pump has automatically started, and DC power has been lost to several AFW flow control valves.

| | | |
|---|---|---|
| Technical Reference(s): | AOP 3563 (Rev 10-1), Att. A, Step 2 | (Attach if not previously provided) |
| | AOP 3563 (Rev 10-1), Att. A load list, page 5 of 8 | |
| | P&ID 130B (Rev 47) | |

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: | New |
| Question History: | |
| 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 # 47 | Tier # | 2 | 2 |
| K/A Statement: AC Electrical Distribution | Group # | 1 | 1 |
| Effect of a malfunction on: Major system loads | K/A # | 062.K3.01 | |
| Proposed Question: | Importance Rating | 3.5 | 3.9 |

The plant is at 50% power when the following events occur:

- The NSST BACKUP1 TRIP alarm actuates on MB8A.
- The NSST Supply Breaker to bus 34A trips open.

What is the effect of this fault on the major loads supplied by the 4KV Electrical System?

a) A fast-transfer to the RSST occurs. Power is maintained to both Emergency and Non-Emergency loads.

b) A fast-transfer to the RSST occurs. Power is maintained to Emergency loads, but lost to Non-Emergency loads.

c) A slow-transfer to the RSST occurs. Power is restored after a few seconds to both Emergency and Non-Emergency loads.

d) A slow-transfer to the RSST occurs. Power is restored after a few seconds to Emergency loads, but lost to Non-Emergency loads.

Proposed Answer: D

Explanation (Optional): While Primary lockout (Ground or Phase Differential) results in a fast transfer ("A" and "B" plausible), Backup Lockout (Ground or Phase Over-current) attempts to isolate a fault potentially on the non-emergency bus by opening the tie breaker before reenergizing the emergency bus via slow transfer ("D" correct, "A" and "B" wrong). "Fast transfer" closes in the RSST Breaker with the bus tie breaker still closed, keeping all loads energized ("C" plausible); while Slow Transfer trips the crosstie breaker, deenergizing the Non-Emergency Bus and hopefully isolating the fault, prior to the RSST closing in ("C" wrong).

Technical Reference(s): OP 3353.MB8A (Rev 3-2), 2-7 (Attach if not previously provided)
LSK-24-2D (Rev 8)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03333 Describe the operation of 4kV Distribution System controls and interlocks… Fast Transfer… Slow Transfer… (As available)

Question Source: Bank 79948

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.7

Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 48 | Tier # | 2 | 2 |
| K/A Statement: | Group # | 1 | 1 |
| Physical connections and/or cause-effect | K/A # | 063.K1.03 | |
| relationship with: Battery charger and battery | Importance Rating | 2.9 | 3.5 |

Proposed Question:

An equalize-charge is almost complete on Battery 5.

What voltage is expected on DC Bus 5?

a) 125V

b) 135V

c) 139V

d) 141V

Proposed Answer: C

Explanation (Optional): "C" is correct, and "A", "B", and "D" wrong, since voltage supplied to the battery from the charger on an equalizing charge is 139V. "A" is plausible, since this is the battery rating. "B" is plausible, since this is the voltage supplied on a float charge. "D" is plausible, since the output of the rectifier is normally 140V, and this distractor tests the prerequisite not to exceed 140V on a DC Bus.

Technical Reference(s): C SP 760 (Rev 4-1), Note 4 prior to step 4.7.1 (Attach if not previously provided)
OP 3345C (Rev 16-8), Prerequisites 2.1.2 and 2.1.3

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05015 Describe the 125 VDC distribution system operation under normal, abnormal, and emergency conditions… Placing a battery on equalizing charge… (As available)

Question Source: New

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.7

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 49 | Tier # | 2 | 2 |
| K/A Statement: Emergency Diesel Generator: | Group # | 1 | 1 |
| Design feature/interlock which provides for: | K/A # | 064.K4.11 | |
| Automatic load sequencer: safeguards | Importance Rating | 3.5 | 4.0 |

Proposed Question:

A large-break LOCA occurs, resulting in the following sequence of events:

1. The crew enters ES-1.3, *Transfer to Cold Leg Recirculation.*
2. The crew reaches ES-1.3, step 4, "Complete Cold Leg Recirculation Alignment."

Which valve manipulation will switch the sequencers to the "Recirculation Mode"?

a) Opening either the SI/CHG Pump Cross-connect Valves (3SIH*MV8807A/B), OR the Recirculation Spray to RHR Isolation Valves (3RSS*MV8837A/B).

b) Closing the RHR Pump Cross-over Valves (3RHS*MV8716A/B), AND opening the RHR to CHG and SI Suction Isolation Valves (3SIL*MV8804A/B).

c) Closing the RHR Pump Cross-over valves (3RHS*MV8716A/B), AND opening the SI/CHG Pump Cross-connect Valves (3SIH*MV8807A/B).

d) Opening either the RHR to CHG and SI Suction Isolation Valves (3SIL*MV8804A/B), or the Recirculation Spray to RHR Isolation Valves (3RSS*MV8837A/B).

Proposed Answer: D

Explanation (Optional): "D" is correct, and "A", "B", and "C" wrong, since opening either MV8804A/B or MV8807A/B will signal the sequencer that the plant is in the "Recirculation Mode." "A", "B", and "C" are plausible, since each of these valve operations are taken to align the RCS for Cold Leg Recirculation.

Technical Reference(s): LSK 24-9.4C (Rev 11) (Attach if not previously provided)
ES-1.3 (Rev 15-1), step 3.k and 3.l

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04408 List the seven different modes (including each modes associated input signals) of emergency diesel load sequencer. (As available)

Question Source: Bank 70266

Question History:

Question Cognitive Level: Memory or fundamental Knowledge

10 CFR Part 55 Content: 55.41.7

Comments:

| | | | | |
|---|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 50 | Tier # | 2 | 2 |
| K/A Statement: Process Radiation Monitoring | Group # | 1 | 1 |
| Design feature/interlock which provides for: Release | K/A # | 073.K4.01 | |
| termination when radiation exceeds setpoint | Importance Rating | 4.0 | 4.3 |

Proposed Question:

Process Radiation Monitor 3HVR-RE12 (Degassifier Area Exhaust Ventilation Radiation Monitor) goes into ALARM.

Which automatic signal does **NOT** occur as a result of this alarm?

a) Gaseous Waste Discharge Valve to the Millstone Stack (3GWS-PV49) receives a close signal.

b) Degassifier effluent to Boron Recovery (3GWS-AOV54 and AOV58) receives a divert signal.

c) Gaseous Drains to the Degassifier (3DGS-AOV57) receives a close signal.

d) Letdown flow to the Volume Control Tank (3CHS*AOV71) receives a divert signal.

Proposed Answer: A

Explanation (Optional): “A” is correct, since 3HVR-RE12 does NOT automatically close 3GWS-PV49. "B", "C", and "D" are wrong, since 3HVR-RE12 causes each of these signals to occur. “B”, “C”, and “D” are plausible, since the Degassifier normally discharges to the Gaseous Waste System, and 3GWS-PV49 auto-closes on a 3GWS-RE48 Alarm.

Technical Reference(s): AOP 3573 (Rev 18-3), Att. A, page 8 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04727 Describe the operation of the… GWS components controls and interlocks… (As available)

Question Source: New

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.7

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 51 | Tier # | 2 | 2 |
| K/A Statement: Process Radiation Monitoring: | Group # | 1 | 1 |
| Knowledge of setpoints, interlocks and automatic | K/A # | 073.GEN.2.4.2 | |
| actions associated with EOP entry conditions | Importance Rating | 4.5 | 4.6 |

Proposed Question:

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

1. A RADIATION ALERT annunciator illuminates on Main Board 2.
2. The crew enters AOP 3573, *Radiation Monitor Alarm Response.*
3. The RO goes to the RMS Console to determine the cause of the alarm.

Which Radiation Monitor has both an automatic action associated with it AND requires the crew to take action using another EOP/AOP in addition to AOP 3573?

a) 3ARC-RE21, Condenser Air Ejector

b) 3CCP-RE31, RPCCW

c) 3LWS-RE70, Liquid Waste Effluent

d) 3SSR-RE08, SG Blowdown Effluent

Proposed Answer: D

Explanation (Optional): "D" is correct, since SSR08 automatically isolates blow down, AND requires the crew to take action per AOP 3576, *Steam Generator Tube Leak.* "A" is wrong, since ARC21 has no automatic action associated with it, but plausible, since ARC21 requires the crew to take action per AOP 3576, *Steam Generator Tube Leak.* "B" is wrong, since CCP31 has no automatic actions associated with it, but plausible, since it requires the crew to take action per AOP 3555, *Reactor Coolant Leak.* "C" is wrong, since LWS70 does not require actions per another AOP, but plausible, since it automatically closes the Liquid Waste Discharge Valve to the Circ Water Tunnel.

Technical Reference(s): AOP 3573 (Rev 18-3), Att A, Pages 1, 11- 12 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-05467 Describe the operation of the following Radiation Monitoring System Radiation Monitors Controls and Interlocks… SSR-RE08… | (As available) |
| Question Source: | New | |
| Question History: | | |
| Question Cognitive Level: | Memory or Fundamental Knowledge | |
| 10 CFR Part 55 Content: | 55.41.7 and 41.10 and 41.11 | |
| Comments: | | |

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 52 | Tier # | 2 | 2 |
| K/A Statement: Service Water: | Group # | 1 | 1 |
| Effect of a malfunction on ESF loads | K/A # | 076.K3.07 | |
| Proposed Question: | Importance Rating | 3.7 | 3.9 |

A loss of all service water occurs, and the following sequence of events occurs:

1. The crew enters AOP 3560, *Loss of Service Water.*
2. NO service water pumps can be started.
3. The RO is directed to trip the reactor and go to E-0, *Reactor Trip or Safety Injection*, while continuing to use the guidance in AOP 3560, Attachments A and B.

Per AOP 3560, Attachment "B", which Pumps are being affected and require prompt action after the crew transitions to E-0, *Reactor Trip or Safety Injection*?

a) The Containment Recirculation Pumps.

b) The Residual Heat Removal Pumps.

c) The Safety Injection Pumps.

d) The Charging Pumps.

Proposed Answer: D

Explanation (Optional): AOP 3560 directs using Attachments "A" and "B" if a transition to E-0 is made. Attachment "A" has RCP trip criteria, which will not initially be met, and Attachment "B" aligns feed and bleed cooling to the Charging Pumps ("D" correct, and "A", "B", and "C" wrong), which is required since Charging Pump cooling is supplied by Service Water. "A", "B", and "C" are plausible, since each of these pumps are ESF pumps, and cooling may become an issue if the pumps are required to be run prior to restoration of Service Water.

Technical Reference(s): AOP 3560 (Rev 8-1), note prior to step 2 (Attach if not previously provided)
AOP 3560 (Rev 8-1), Att B, page 1 of 6

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03927 Describe the major action categories contained within AOP-3560. (As available)

Question Source: Bank 63926

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.8 and 41.10

Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 53 | Tier # | 2 | 2 |
| K/A Statement: Service Water: | Group # | 1 | 1 |
| Knowledge of annunciator alarms, indications, | K/A # | 076.GEN.2.4.31 | |
| or response procedures | Importance Rating | 4.2 | 4.1 |

Proposed Question:

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

1. The CHLR A CNDSR SW FLOW HI (MB1C, 4-1A) annunciator is received.
2. The crew enters the associated Annunciator Response Procedure (ARP).
3. A PEO is dispatched, and reports a Service Water (SWP) piping rupture downstream of the "A" Control Building Chiller (3HVK*CHL1A).
4. The BOP Operator stops 3HVK*CHL1A, and a PEO closes the Control Building Air Conditioning Service Water Return Valve (3SWP*V15).

What other valve will the ARP direct the operators to close?

a) The "A" Charging Pump Cooling System Heat Exchanger Return Valve.

b) The "A" Safety Injection Pump Cooling System Heat Exchanger Return Valve.

c) The "A" Emergency Diesel Service Water Return Valve.

d) The "A" MCC/Rod Control Area ACU Return Valve.

Proposed Answer: C

Explanation (Optional): The ARP directs the crew to stop the "A" Emergency Diesel, if running, then close the "A" Emergency Diesel Service Water Return Valve ("C" correct), and go to AOP 3560, *Loss of Service Water* ("A", "B", and "D" wrong). This action is required since the Control Building Chiller and the Emergency Diesel share a common return line prior to discharging to the Circulating Water System. "A", "B", and "D" are plausible, since these are all loads supplied by the "A" Train of Service Water.

Technical Reference(s): OP 3353. MB1C (Rev 6-3), 4-1A, Steps 1- 2 (Attach if not previously provided)
P&ID 133D (Rev 44)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07125 Given a failure, partial or complete, of the Service Water System, determine the effects on the system and interrelated systems. (As available)

Question Source: New

Question History:

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 # 54 | Tier # | 2 | 2 |
| K/A Statement: Instrument Air: | Group # | 1 | 1 |
| Design feature/interlock which provides for: | K/A # | 078.K4.01 | |
| Manual/automatic transfers of control | Importance Rating | 2.7 | 2.9 |

Proposed Question:

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

1. The plant trips due to a loss of offsite power.
2. The crew enters ES-0.1, *Reactor Trip Response*.
3. The crew resets LOP at MB2 per ES-0.1 direction.
4. The crew manually starts an Instrument Air Compressor at MB1.

Which Instrument Air Compressor did the RO manually start, and would the Air Compressor have started if the crew failed to reset LOP at MB2?

a) The RO started the "A" IAS compressor. The compressor would NOT have started if the LOP signal had not been reset at MB2.

b) The RO started the "A" IAS compressor. The compressor WOULD have started even if the signal had not been reset at MB2.

c) The RO started the "B" IAS compressor. The compressor would NOT have started if the LOP signal had not been reset at MB2.

d) The RO started the "B" IAS compressor. The compressor WOULD have started even if the LOP signal had not been reset at MB2.

Proposed Answer: D

Explanation (Optional): On an LOP, the EDGs will re-energize the emergency busses. The "A" instrument air (IAS) compressor will not have power available, since it is powered from non-emergency bus 32P ("A" and "B" wrong). The "B" IAS compressor has power ("B" plausible), but its breaker tripped on the LOP signal. ES-0.1 directs the crew to close the "B" IAS compressor breaker at MB1 to manually restore IAS header pressure. Resetting LOP is not necessary, since the MB2 LOP reset allows manually stopping loads, but the manual start block ("C" plausible) clears automatically 40 seconds after the EDG energizes the bus, and this time has passed well before reaching the step in ES-0.1 ("D" correct, "C" wrong).

Technical Reference(s): ES-0.1 (Rev 25-0), steps 3.d and 3.h (Attach if not previously provided)
OP 3332A-004 (Rev 4-3), page 2
LSK 12-1E (Rev 7), 24.9.4.A (Rev 12)
LSK 24.9.4.B (Rev 12), 24.9.4.P (Rev 10)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05323 Describe operation of plant air systems under the following normal, abnormal, and emergency operating conditions… Loss of offsite power (LOP) (As available)

Question Source: Bank 86756

Question History: Millstone 3 2011 NRC Exam

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.4, 41.7, and 41.10

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 55 | Tier # | 2 | 2 |
| K/A Statement: Containment: | Group # | 1 | 1 |
| Ability to manually operate and/or monitor: | K/A # | 103.A4.04 | |
| Phase A and phase B resets | Importance Rating | 3.5 | 3.5 |

Proposed Question:

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

1. The crew enters E-0, *Reactor Trip or Safety Injection.*
2. The crew transitions to ES-1.3, *Transfer to Cold Leg Recirculation.*
3. Per ES-1.3, step 1, the US directs the RO to reset ESF Actuation Signals.

Which procedurally directed sequence is used to reset CIA, CIB, SIS, and CDA to ensure all signals will reset properly?

a) CIA is reset first, followed by a bulleted reset of the remaining signals.

b) CIB is reset first, followed by a bulleted reset of the remaining signals.

c) SIS is reset first, followed by a bulleted reset of the remaining signals.

d) CDA is reset first, followed by a bulleted reset of the remaining signals.

Proposed Answer: C

Explanation (Optional): ES-1.3, step 1 directs the operators to reset SI first (sub-step a), to ensure the CIA reset will function properly. CIB can be reset with CDA still present, so each of the 3 remaining resets (CIA, CIB, and CDA) are bulleted (may be performed in any order) in sub-step b ("A", "B", and "D" wrong). "C" is correct, since alpha-numeric steps are to be performed in sequence. "A", "B", and "D" are plausible, since all four signals are reset in this step.

Technical Reference(s): ES-1.3 (Rev 15-1), step 1 (Attach if not previously provided)
ES-1.3 Step Deviation Doc (Rev 15), step 1

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 Reset & Block Switches (As available)

Question Source: New

Question History:

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 # 56 | Tier # | 2 | 2 |
| K/A Statement: Reactor Coolant: | Group # | 2 | 2 |
| Design feature/interlock which provides for: | K/A # | 002.K4.01 | |
| Filling and draining the RCS | Importance Rating | 2.7 | 3.0 |

Proposed Question:

Initial Conditions:

- The plant is in MODE 6.
- Refueling has been completed.

The crew is preparing to drain the RCS via the Loop Drain Valves (3RCS*AV8037A-D).

What is the flowpath for the water as it drains?

a) From the RCS Crossover Legs to the Containment Drains Transfer Tank (CDTT).

b) From the RCS Crossover Legs to the Primary Drains Transfer Tank (PDTT).

c) From the RCS Hot Legs to the Containment Drains Transfer Tank (CDTT).

d) From the RCS Hot Legs to the Primary Drains Transfer Tank (PDTT).

Proposed Answer: A

Explanation (Optional): The RCS Loop Drain Path is from the RCS Crossover Legs ("C" and "D" wrong) to the Containment Drains Transfer Tank ("A" correct, "B" wrong). "C" and "D" are plausible, since manual drain valves are connected to the RCS Hot Legs. "B" is plausible, since the Primary Drains Transfer Tank receives numerous primary plant drains.

Technical Reference(s): OP 3216 (Rev 10-3), Steps 4.3.12.e and f (Attach if not previously provided)
P&IDs 102A (Rev 31) and 102F (Rev 17)
P&ID 107A (Rev 27)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05446 Describe the operation of the Reactor Coolant System under normal, abnormal, and emergency operating conditions. (As available)

Question Source: New

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41. 3

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 57 | Tier # | 2 | 2 |
| K/A Statement: Pressurizer Level Control: | Group # | 2 | 2 |
| Knowledge of the effect of a malfunction of the following will have on Pressurizer Level Control: Function of PZR level gauges as post-accident monitors | K/A # | 011.K6.05 | |
| | Importance Rating | 3.1 | 3.7 |

Proposed Question:

The reactor has tripped, and the crew has entered the EOP network.

The RO is checking if SI is required, and is currently checking the three Pressurizer level channels on Main Board 4.

What is the meaning of the blue "PAM" Lamicord label under each of the three Pressurizer level indicators on MB4?

a) These indications have instruments at the Auxiliary Shutdown Panel, since they are required to ensure sufficient capability is available from outside the Control Room to shutdown the plant to MODE 3 and cooldown the plant to MODE 5.

b) These indications have backup detectors that can be selected at the Fire Transfer Switch Panel, since they are required to ensure sufficient capability is available to shutdown and cooldown the plant in the event of a fire in any area of the plant.

c) These detectors are designed to continue to function during accident conditions, since this is a key parameter for assessing plant conditions.

d) These detectors are not vulnerable to inaccuracies during accident conditions, and do not required Adverse Containment numbers in the EOPs.

Proposed Answer: C

Explanation (Optional): "C" is correct, and "A" and, "B" wrong, since PAM monitors are designed to continue to function during accident conditions, since they monitor key parameters required for assessing plant conditions during an accident. "A" is plausible, since this is a basis for Remote Shutdown Instrumentation. "B" is plausible, since this is a basis for Fire Related Safe Shutdown indications. "D" is wrong, since adverse containment numbers are applied to Pzr level indication during an accident due to reference leg heating. "D" is plausible, since Pzr level detectors are designed to provide continue to function during an accident.

| | | |
|---|---|---|
| Technical Reference(s): | Tech Spec Bases for LCO3/4.3.3.6 (Oct 21, 2008) | (Attach if not previously provided) |
| | SP 3673.6-001 (Rev 9-8) | |
| | E-1 (Rev 26-0), step 6 | |
| | Process Drawing 11 (Rev J) | |

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-05340 Describe the major administrative or procedural precautions and limitations placed on the operation of the Pressurizer Pressure and Level Control System, and the basis for each. | (As available) |

Question Source: New

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.7, 41.10, and 43.2

Comments:

| | | | | |
|---|---|---|---|---|
| Examination Outline Cross-reference: | | Level | RO | SRO |
| Question # 58 | | Tier # | 2 | 2 |
| K/A Statement: Rod Position Indication: | | Group # | 2 | 2 |
| Predict impact and mitigate: Loss of power to the RPIS | | K/A # | 014.A2.02 | |
| Proposed Question: | | Importance Rating | 3.1 | 3.6 |

The following sequence of events occurs:

1. The MCC LOSS OF CONTROL POWER annunciator comes in on MB8.
2. The RO reports DRPI indication has lost power on MB4.
3. Upon investigation, MCC 32-2C is found to be de-energized, and cannot be reenergized for at least 12 hours.

What is the status of DRPI "Rod Supervision" indication on the Plant Process Computer; and how can DRPI be restored prior to restoring MCC 32-2C?

a) Rod Supervision has also lost indication. Select 32-1C at the Transfer Switch Box in the Aux Building MCC/Rod Control Area.

b) Rod Supervision has also lost indication. Select 32-1M at the Transfer Switch Box in the Aux Building MCC/Rod Control Area.

c) Rod Supervision is still providing DRPI indication. Select 32-1C at the Transfer Switch Box in the Aux Building MCC/Rod Control Area.

d) Rod Supervision is still providing DRPI indication. Select 32-1M at the Transfer Switch Box in the Aux Building MCC/Rod Control Area.

Proposed Answer: B

Explanation (Optional): The power supply for DRPI is selected at 3RDI-TRS1 in MCC Rod Control Area, 45' 6" elevation. The only individual rod position sensors are the DRPI coils, which supply both the DRPI LEDs on MB4 and Rod Supervision. Since DRPI has lost power, DRPI and Rod Supervision no longer display rod height ("C" and "D" wrong). The two available power supplies are 32-2C and 32-1M ("B" correct, and "C" wrong). "C" and "D" are plausible, since Rod Supervision is a separate indication of DRPI. "A" is plausible, since 32-1C is another non-emergency MCC, and power was lost to 32-2C.

Technical Reference(s): OP3302B (Rev 5-5), Section 4.1 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-05298 Describe the function and location of the following Rod Position Indication System components: A. Control Board Display Unit B. Bank Demand Step Counters C. DRPI Power Transfer Switch | (As available) |

Question Source: Bank 68722

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.7

Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 59 | Tier # | 2 | 2 |
| K/A Statement: Non-nuclear Instrumentation: | Group # | 2 | 2 |
| Operational implications of: Separation of | K/A # | 016.K5.01 | |
| control and protection circuits | Importance Rating | 2.7 | 2.8 |

Proposed Question:

The Master Pressurizer Pressure controller develops a ground in its control circuitry.

What the effect, if any, on the protection system?

a) No effect, since protection and control circuits use separate detectors, power supplies, and circuitry.

b) No effect, since the control circuit is electrically isolated from the protection circuit.

c) The associated protection system bistable trips.

d) The associated protection system alarms actuate, but the bistable does NOT trip.

Proposed Answer: B

Explanation (Optional): "B" is correct, and "A", "C", and "D" wrong, since control signals going to the controller are electrically isolated from the protection circuits, to prevent electrical faults in control circuits from affecting safety circuits. "A" is plausible, since this relates to circuits used to shutdown the plant when the crew is required to evacuate the control room due to a fire. "C" is plausible, since the circuits use the same input signals. "D" is plausible, since alarm circuits upstream of the trip bistables are not electrically isolated from control circuits.

Technical Reference(s): Process Sheet 12 (Rev N) (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05243 Discuss the difference between "process control" and "process protection". (As available)

Question Source: Bank 68324

Question History: Millstone 3 2001 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 # 60 | Tier # | 2 | 2 |
| K/A Statement: Containment Iodine Removal: | Group # | 2 | 2 |
| Bus power supplies to: Fans | K/A # | 027.K2.01 | |
| Proposed Question: | Importance Rating | 3.1 | 3.4 |

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

1. Chemistry reports CTMT Iodine levels are elevated.
2. The US directs the BOP operator to start the “B” Train of Containment Air Filtration.
3. The BOP reports the “B” CAF Fan (3HVU-FN3B) does not have power on VP1.

The crew dispatches a PEO to check the power supply to the fan.

To which MCC is the PEO dispatched?

a) MCC 32-1M

b) MCC 32-2C

c) MCC 32-3T

d) MCC 32-5H

Proposed Answer: A

Explanation (Optional): "A" is correct, since the power supply to 3HVU-FN3B is MCC 32-1M. "B" is wrong, but plausible, since 32-2C supplies power to the “A” CAF Fan. "C" is wrong, but plausible, since 32-3T supplies loads in the Turbine Building. "D" is wrong, but plausible, since 32-5H supplies “B” Train loads in the Intake Structure.

Technical Reference(s): OP 3313D-001 (Rev 0-0), page 2 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03320 Describe the function and location of the following major 480 volt ac system components… 480 volt MCC's (As available)

Question Source: New

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.7

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 61 | Tier # | 2 | 2 |
| K/A Statement: Steam Generator: | Group # | 2 | 2 |
| Design feature/interlock which provides | K/A # | 035.K4.02 | |
| for S/G level indication | Importance Rating | 3.2 | 3.5 |

Proposed Question:

A Main Feedwater transient occurs, resulting in a reactor trip, and current conditions are as follows:

- RCS Tave: 557°F
- "A" SG Narrow Range Level: 80%
- "B" SG Wide Range Level: 80%
- "C" SG Narrow Range Level: 8%
- "D" SG Wide Range Level: 8%

What is the actual status of the Steam Generators?

a) "A" SG may actually be full. "C" SG may actually be empty.

b) "A" SG may actually be full. "D" SG may actually be empty.

c) "B" SG may actually be full. "C" SG may actually be empty.

d) "B" SG may actually be full. "D" SG may actually be empty.

Proposed Answer: D

Explanation (Optional): The NR lower tap penetrates the 453 inches (about 38 feet) above the top of the tubesheet, which is also above the top of the U-Tubes, indicating the tubes are covered when on the Narrow Range Scale ("A" and "C" wrong); while the lower WR tap penetrates the downcomer just 21 inches above the top of the tubesheet, and with instrument inaccuracies, 12% Wide Range level may indicate the SG is actually dry ("B" and "D" wrong). The upper taps for both the WR and NR detectors are located just above the outlet of the swirl vane separators, 581 inches above the top of the tubesheet. SG Wide Range level is calibrated for COLD conditions (100°F). It will read significantly lower due to less dense water at normal operating temperatures. For example, 50% NR is equivalent to 86% WR level (at 212°F) but with the ruptured SG at the SG safety valve setpoint of 1200 psig, 50% NR is equivalent to 65% WR level. Hash marks on the SG WR level indicators on MB 5 provide operators with a visual queue that SG WR level will indicate about 79% when the top level tap is reached (100% actual level) ("B" wrong). Narrow Range level instruments are calibrated for hot conditions, and indicate accurately at 557°F ("D" correct). "A", "B", and "C" are plausible, since a Wide and Narrow Range Channel share common Upper Level tap.

| | | |
|---|---|---|
| Technical Reference(s): | E-3 (Rev 24-0), step 4 (WR vs. NR Level) | (Attach if not previously provided) |
| | FR-H.5 (Rev 8-0), step 4.RNO (Dry SG) | |
| | SGS035C (Rev 1-2), page 18 | |
| | Steam Generator Tech Manual Drawings | |

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-05656 Describe the relationship between Wide and Narrow Range Level Indications in regards to both the top of the Steam Generator Tube Bundle and the Steam Generator Tube Sheet. | (As available) |

| | |
|---|---|
| Question Source: | New |
| Question History: | |
| 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 # 62 | Tier # | 2 | 2 |
| K/A Statement: Steam Dump /Turbine Bypass Control | Group # | 2 | 2 |
| Physical connections and/or cause-effect relationship | K/A # | 041.K1.6 | |
| with: Condenser | Importance Rating | 2.6 | 2.9 |

Proposed Question:

With the plant initially at 100% power, a load reject occurs.

Which valve is specifically designed to aid the Main Condenser in handling the increased energy input during this load reject; and what signal caused this valve to automatically open?

a) The Main Turbine Exhaust Hood Spray Valve (3CNM-TV38), which auto-opens when the Steam Dump Valves arm.

b) The Main Turbine Exhaust Hood Spray Valve (3CNM-TV38), which auto-opens on Condenser high temperature.

c) The De-superheating Spray Valve (3CNM-PV99), which auto-opens when the Steam Dump Valves arm.

d) The De-superheating Spray Valve (3CNM-PV99), which auto-opens on Condenser high temperature.

Proposed Answer: C

Explanation (Optional): The plant is designed to handle a 50% load rejection. 40% is handled by the Main Condenser via the Steam Dumps, and 10% is handled by the Rod Control. In order for the Main Condenser to handle the steam dumped into it from the steam dump system, the De-Superheating Spray valve auto-opens when the steam dumps arm ("C" correct and "D" wrong) to direct condensate pump discharge (cold water) through nozzles in the condenser to cool the steam. This prevents rapid temperature and pressure increases in the condenser during load rejections. The Exhaust Hood Spray Valve opens on exhaust hood high temperature ("D" plausible) to protect against exhaust hood high temperature during low power operation (A" and "B" wrong). "A" and "B" are plausible, since the exhaust hood spray valve is part of the Condensate System, has an AUTO-OPEN feature, and protects against high temperature.

Technical Reference(s): P&ID 126B (Rev 35) (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-04232 Describe the operation of the following Main Condensate and Makeup Control systems components controls and interlocks... Main turbine exhaust hood spray temperature control valve (3CNM-TV38)... De-superheating spray pressure control valve (3CNM-PV99)... Main condensate system "short recycle" valve (3CNM-FV48)... Low pressure feedwater heater string bypass valve (3CNM-MOV88)... | (As available) |

Question Source: Bank 69693

Question History:

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 # 63 | Tier # | 2 | 2 |
| K/A Statement: Condensate: Physical connections | Group # | 2 | 2 |
| and/or cause-effect relationship with: MFW | K/A # | 056.K1.03 | |
| Proposed Question: | Importance Rating | 2.6 | 2.6 |

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

1. One of the running Main Condensate pumps trips.
2. The BOP operator attempts to start the standby Condensate Pump, but it does NOT start.
3. The BOP operator reports Main Feed Pump suction and discharge pressures are decreasing.

What effect will this have on the Main Feedwater System?

a) The Motor Driven Main Feed pump will auto-start on low feed pump DISCHARGE header pressure. This will restore feed header pressure to normal.

b) A Condensate Demin high differential pressure annunciator will be received at MB6. Operators will promptly open the Condensate Demin Bypass Valve at MB6, restoring feed header pressure to normal.

c) All running Main Feed pumps will trip after a time delay on low feed pump SUCTION pressure. This will result in a LO-LO SG Level reactor trip.

d) A Low Feedwater Pump Suction Pressure annunciator will be received on MB5. Operators will rapidly lower load to 50% using the Load Limit pot at the EHC insert, preventing a reactor trip.

Proposed Answer: C

Explanation (Optional): Each condensate pump is a 50% capacity pump, so two are needed for operation above approximately 50% power ("A" and "B" wrong). "A" is plausible, since the motor driven main feed pump has an AUTO-START feature on low feed pump discharge header pressure. "B" is plausible, since insufficient condensate supply will result in a demin high DP condition, and the Annunciator Response Procedure directs the operators to bypass the demineralizers, increasing suction head to the Main Feedwater pumps. All 3 Main Feed pumps have a trip on low feed pump suction pressure after a time delay. With only 1 condensate pump running, insufficient feed pump suction pressure will lower discharge pressure, and feed pump speed control will speed up the turbine driven main feed pumps, lowering suction pressure even more. The MDMFP may start on low discharge pressure, but this will only lower the suction pressure even more. The feed pumps will trip on low suction pressure, resulting in a reactor trip ("C" correct). "D" is wrong, since rapidly lowering turbine load with the load limit pot will arm steam dumps, which will maintain steam demand even with turbine load lowering. "D" is plausible, since the rapid downpower AOP allows using the load limit pot to rapidly lower load, and 50% is the capacity of one Condensate Pump.

| | | |
|---|---|---|
| Technical Reference(s): | LSK7-5A (Rev 7), 7-5B (Rev 6), 6-1.1A (Rev 9), and 6-1.1B (Rev 10) | (Attach if not previously provided) |
| | OP 3319C (Rev 11-7), Att. 1 | |
| | FSAR Table 10.4-3 (Rev 16-1) | |

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-04235 Given a failure, partial or complete, of the Main Condensate and Makeup Control systems, determine the effects on the systems and on interrelated systems. | (As available) |

| | |
|---|---|
| Question Source: | Bank 73617 |
| Question History: | Millstone 3 2000 NRC Exam |
| Question Cognitive Level: | Comprehension or Analysis |
| 10 CFR Part 55 Content: | 55.41.5 / 43.5 |
| Comments: | |

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 64 | Tier # | 2 | 2 |
| K/A Statement: Fire Protection: | Group # | 2 | 2 |
| Knowledge of the effect of a malfunction of fire, smoke, | K/A # | 086.K6.04 | |
| and heat detectors on Fire Protection | Importance Rating | 2.6 | 2.9 |

Proposed Question:

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

1. A Heat Detector at the GSU Transformer shorts out.
2. The Control Room receives a GSU transformer FIRE alarm.

Does deluge spray initiate; and is the remainder of the Fire Detection Zone still considered "functional" per the Technical Requirements Manual (TRM)?

a) Deluge water spray DOES initiate on the transformer. The remainder of the Fire Detection zone is NOT functional.

b) Deluge water spray DOES initiate on the transformer. The remainder of the Fire Detection zone IS functional.

c) Deluge water spray DOES NOT initiate on the transformer. The remainder of the Fire Detection zone is NOT functional.

d) Deluge water spray DOES NOT initiate on the transformer. The remainder of the Fire Detection zone IS functional.

Proposed Answer: A

Explanation (Optional): A single heat detector in alarm will actuate deluge spray ("C" and "D" wrong). Failure of single heat detector causes the entire zone to become non-functional ("A" correct, "B" wrong). "C" and "D" are plausible, since CO2 actuation requires 2 cross-zoned detectors to alarm to cause an automatic actuation. Also, there are manually actuated fire spray systems in the plant. "B" is plausible, since a failure of many types of detectors in the plant does NOT make the remainder of the associated detectors become inoperable.

Technical Reference(s): OP 3341A (Rev 13-9), Section 1.2 (Attach if not previously provided)
OP 3341D (Rev 15-10), Precaution 3.3
TRM 3.3.3.7 (LBDCR 07-M3-018)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04604 Given a failure, partial or complete, of the Fire Protection, Detection, and Control System, determine the effects on the system and on inter-related systems. (As available)

Question Source: Bank 87713

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.7

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 65 | Tier # | 2 | 2 |
| K/A Statement: AMSAC: | Group # | 2 | 2 |
| Monitor automatic operation of AMSAC | K/A # | AMSAC.A3.01 | |
| Proposed Question: | Importance Rating | Site Priority | Site Priority |

AMSAC has just actuated, and the crew is monitoring the Main Boards to verify it has properly operated.

Which of the following is a **direct** output signal from the AMSAC actuation?

a) Reactor trip signal.

b) Start signal to all 3 AFW Pumps.

c) Actuation signal to Safety Injection (SIS).

d) Actuation signal to Feedwater Isolation (FWI).

Proposed Answer: B

Explanation (Optional): AMSAC Actuation trips the Main Turbine, starts all 3 AFW Pumps ("B" correct), and isolates the Blowdown and Blowdown Sample lines. "A" is wrong since Reactor Trip is a direct result of Turbine Trip above P-9, and not as a result of AMSAC. "C" is wrong since AMSAC does not provide an output to the AFW Flow Control Valves. "D" is wrong because FWI would result from a Reactor Trip with RCS temperature lowering, and not directly from AMSAC. "A" is plausible, since AMSAC is designed to respond to an ATWS condition. "C" is plausible, since SIS almost always actuates during an ATWS from high power, when the local trip breakers are opened with many secondary relief valves open. "D" is plausible, since FWI is normally actuated on a reactor trip signal, and the reactor has failed to trip.

Technical Reference(s): OP 3350 (Rev 6-5), Att. 3 (Attach if not previously provided)
Functional Dwg 15 (Rev L)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04086 Describe operation of AMSAC circuitry including the following… Outputs (As available)

Question Source: Bank 76105

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.7

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 66 | 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:

With the plant at 100% power, a PEO is being briefed on locally closing a Motor Operated Valve (MOV). The brief includes the following information:

- The valve is a Safety-Related MOV that at this point, is still OPERABLE.
- The MOV has an AUTO-OPEN function.
- The SM has given permission to operate the MOV locally.
- This is a non-emergency situation.
- The PEO will operate the valve in the usual manner by locally depressing the de-clutch lever on the MOV, and then rotating the handwheel in the "closed" direction.

In accordance with OP-AA-100, *Conduct of Operations*, will the crew remove power to the MOV prior to the PEO operating the valve; and after the valve is locally closed, is it still considered OPERABLE?

a) The crew will de-energize the MOV. The valve is declared INOPERABLE until it is again operated electrically.

b) The crew will de-energize the MOV. After local operation, the crew will restore power to the valve, restoring the valve to OPERABLE.

c) The crew will keep the MOV energized. The valve is declared INOPERABLE until it is again operated electrically.

d) The crew will keep the MOV energized. After local operation, the valve is considered OPERABLE.

Proposed Answer: A

Explanation (Optional): The usual way to close an MOV locally is to de-energize the MOV ("C" and "D" wrong), depress the de-clutch lever, and then rotate the handwheel in the "closed" direction. The MOV is declared inoperable until the valve is operated electrically ("A" correct, "B" wrong). "C" and "D" are plausible, since the de-clutch lever will physically allow local operation with power still supplied to the valve motor. "B" is plausible, since the valve still has power.

Technical Reference(s): OP-AA-100 (Rev 25-0), Att. 6, section 2.5 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05081 Discuss the requirements for operating MOVs by hand. (As available)

Question Source: New

Question History:

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 control room switches, | K/A # | GEN.2.1.31 | |
| controls, and indications and determine they | Importance Rating | 4.6 | 4.3 |
| correctly reflect the desired plant lineup | | | |

Proposed Question:

After a mid-cycle reactor trip, a plant startup is in progress per OP 3203, *Plant Startup*, and current conditions are as follows:

- The plant is stable at 12% power.
- The oncoming BOP operator observes the following switch/indicator positions on MB5:

| MB5 Switch/Indication | Position |
|---|---|
| • FW PUMPS P4 TRIP BYPASS Switch: | NORMAL |
| • 3MSS-N07, Steam Dump "MODE SEL" Switch: | STM PRESS |
| • Atm Relief Bypass 3MSS*MOV74A Lockout Switch (MB5R): | LOCKOUT |
| • Feed Isolation Valve 3FWS*MOV35A Position Indication: | GREEN |

Which switch position should the BOP operator report as "NOT expected" for current plant conditions?

a) The FW PUMPS P4 TRIP BYPASS Switch should be in BYPASS.

b) The Steam Dump "MODE SEL" Switch should be in TAVE Mode.

c) The Atm Relief Bypass Valve Lockout Switch should be in NORMAL.

d) The Feed Isolation Valve position indicator should indicate RED.

Proposed Answer: A

Explanation (Optional): With the plant at 12% power, the "FW PUMPS P4 TRIP BYPASS" selector switch should be in BYPASS ("A" correct), since it is not placed in "NORMAL" until power is above 25% power. This is a two position "NORMAL/BYPASS" selector switch, located on MB5, and is used to enable or bypass the Reactor Trip signal which trips the MFW Pumps. The Steam Dump "MODE SEL" Switch should be in the Steam Pressure Mode, since it is not placed in Tave Mode until power is above 15% ("B" is wrong, but plausible). The Atm Relief Bypass Valve Cutout Switch should be in LOCKOUT, since these BTP 9.5-1 Fire Safety cut out switches are normally in bypassed to prevent spurious operation in the event of a "hot short". These switches are switched to "Operate" prior to operating the valves, but the condenser steam dumps are in operation ("C" wrong, but plausible). The Feed Isolation Valve position indicator should indicate GREEN, since these valves are bypassed by the Feed Reg Bypass Valves, and are utilized to isolate the Main Feedwater Regulating Valves while feeding with the bypass valves. They are not opened until the crew shifts to the Main Feed Reg Valves at 25% power ("D" wrong, but plausible).

Technical Reference(s): OP 3204 (Rev 19-0), step 4.1.15 (Attach if not previously provided)
OP 3203 (Rev 20-4), steps 4.3.57.f, 58.b, and 64
GA-26 (Rev 1-0), step 6

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03384 Describe the major action categories contained within OP 3203. (As available)

Question Source: Bank 86763

Question History: Millstone 3 2011 NRC Exam

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.4, 41.7, and 41.10

Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 68 | Tier # | 3 | 3 |
| K/A Statement: Generic: Knowledge of RO duties in the control room during fuel handling, such as responding to alarms, communications, systems operated in the control room, and supporting instrumentation | Group # | 1 | 1 |
| | K/A # | GEN.2.1.44 | |
| | Importance Rating | 3.9 | 3.8 |

Proposed Question:

Initial Conditions:

- The plant is in MODE 6.
- Core Reload operations are in progress.

The following sequence of events occurs:

1. The SHUTDOWN MARGIN MONITOR CHANNEL 1 Annunciator is received on MB4C.
2. The RO reports both Source Range channels indicate unexplained flux increase.
3. Core Alterations are suspended.

What additional action is the US required to direct the RO to take?

a) Initiate Control Building Isolation (CBI).

b) Stabilize RCS temperature.

c) Commence Immediate Boration.

d) Stop the Containment Purge System.

Proposed Answer: C

Explanation (Optional): "C" is correct, since a loss of shutdown margin is occurring, requiring entry into AOP 3566, and the major action taken in AOP 3566 is immediate boration. "A", "B", and "D" are wrong, since none of these actions are directed in either the ARP or by AOP 3566. "A", "B", and "D" are plausible, since each of these actions are directed in EOPs/AOPS (EOP 3502, 3503, and AOP 3572) designed for use during lower modes, but their entry conditions are not currently met.

Technical Reference(s): OP 3210B (Rev 10-3), Step 4.2.4 (Attach if not previously provided)
OP 3353.MB4C (Rev 6-12), 2-2, step 6

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03960 Identify plant conditions that require entry into AOP 3566, Immediate Boration (As available)

Question Source: New

Question History:

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 # | 2 | 2 |
| Knowledge of the process for making | K/A # | GEN.2.2.6 | |
| changes to procedures | Importance Rating | 3.0 | 3.6 |

Proposed Question:

In which case is an operator allowed to submit a procedure change request WITHOUT a requirement for a Condition Report to be submitted?

a) The change is evaluated as Level 4, "not adverse to quality"

b) The change is needed to allow critical path work to continue

c) The change is classified as a "Field Change"

d) The change is being tracked as part of the biennial review process

Proposed Answer: A

Explanation (Optional): Prior to 2013, all procedure changes utilized the CR process. Current direction has the initiator determine the change classification. If the procedure change corrects a condition adverse to quality (Level 1, 2, or 3), a CR is required ("A" correct, "B", "C", and "D" wrong). This applies to Field changes and changes based on biennial reviews. For Level 4 requests, an email is required to be sent to mailbox "MP Procedure Changes", "B", "C", and "D" are plausible, since these types of changes are addressed by the procedure change process.

Technical Reference(s): MP-05-DC-SAP01 (Rev 8-6), section 1.4 (Attach if not previously provided)
MP-05-DC-SAP01 (Rev 8-6), step 2.1.3.d
MP-05-DC-SAP01 (Rev 8-6), step 2.2.16
MP-05-DC-SAP01 (Rev 8-6), Step 2.4.5.b

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-06771 Outline the process for modifying a document (As available)

Question Source: New

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

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: | Group # | 2 | 2 |
| Knowledge of conditions and limits in the | K/A # | GEN.2.2.38 | |
| facility license | Importance Rating | 3.6 | 4.5 |

Proposed Question:

With the plant initially stable at 100% power, a significant transient occurs, and the board operators report the following parameters:

- Tave: 2.0°F above program
- Pressurizer level: 6% above program level
- Pressurizer pressure: 2270 psia
- All SG NR levels: 46%

In accordance with the precautions of OP 3204, *At Power Operation*, which parameter is currently outside of the band assumed by safety analysis?

a) Tave

b) Pzr Level

c) Pzr Pressure

d) SG NR Level

Proposed Answer: B

Explanation (Optional): The operators are to maintain the following system parameters to ensure plant conditions remain within safety analysis calculations:
Tave within 2.5°F of program ("A" wrong)
Pressurizer level within + or - 5% of program ("B" correct)
Pressurizer pressure between 2225 and 2280 psia ("C" wrong)
Steam generator water level (Narrow Range) between 45 and 55% ("D" wrong)
"A", "C", and "D" are plausible, since each of these parameters contain required bands in OP 3204.

Technical Reference(s): OP 3204 (Rev 19-0), Section 3.1.3 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05444 Describe the major administrative & procedural precautions and limitations placed on the operation of the Reactor Coolant System… (As available)

Question Source: Modified Bank 83948 (Parent question attached)

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.5 and 41.10

Comments:

Original Bank Question (prior to modification) is on the following page.

Original Bank Question 83948 (Prior to modification):

With the plant initially stable at 100% power, a significant transient occurs, and the board operators report the following parameters and trends:

- Tave is 2.0°F above program temperature and stable.
- Pressurizer level is 3% above program level and stable.
- Pressurizer pressure is 2270 psia and slowly decreasing.
- All SG NR levels are 40% and slowly increasing.

In accordance with the precautions of OP 3204, *At Power Operation*, which parameter is currently outside of the band assumed by safety analysis?

a) Tave

b) Pzr Level

c) Pzr Pressure

d) SG NR Level

Original Answer: D

Considered Modified since two of the parameters have been changed, changing the correct answer.

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 71 | Tier # | 3 | 3 |
| K/A Statement: Generic: Ability to use radiation | Group # | 3 | 3 |
| monitoring systems, such as fixed monitors, portable | K/A # | GEN.2.3.5 | |
| survey instruments, personnel monitoring equipment, etc. | Importance Rating | 2.9 | 2.9 |

Proposed Question:

An operator is preparing to perform a manual frisk when exiting the Turbine Drive Auxiliary Feedwater Pump Room, and initial conditions are as follows:

- The Range on the portable frisker is set to "x1".
- Background counts on the frisker meter indicates 160 cps.

The highest reading obtained on the frisker meter is 240 cps while frisking the operator's left heel.

In accordance with the Radiation Protection Manual, was this a valid frisk? If so, is the operator considered "contaminated"?

a) This IS a valid frisk. The operator IS contaminated.

b) This IS a valid frisk. The operator IS NOT contaminated.

c) This IS NOT a valid frisk, since the frisker is set to the wrong scale.

d) This IS NOT a valid frisk, since background counts are too high.

Proposed Answer: B

Explanation (Optional): To perform a frisk, the frisker is to be set on the "x1" scale ("C" wrong), with background counts less than 200 counts ("D" wrong). "C" is plausible, since there are several selectable scales on the frisker. "D" is plausible, since background counts are close to the limit and the highest reading while frisking is above the background limit. The operator is NOT contaminated, since counts have increased by 80 counts, and to be considered "contaminated," the counts must increase by 100 counts or more ("A" wrong, "B" correct). "A" is plausible, since counts have increased, and the highest reading is above 100 counts (but hasn't increased by 100 counts).

Technical Reference(s): RPM 5.2.2 (Rev 16-0), 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 History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.11

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 72 | Tier # | 3 | 3 |
| K/A Statement: Generic: | Group # | 3 | 3 |
| Ability to control radiation releases | K/A # | GEN.2.3.11 | |
| Proposed Question: | Importance Rating | 3.8 | 4.3 |

The plant is initially at 100% power with Control Room Area ACU (3HVC*ACU1A) running, when the following sequence of events occurs:

1. The OUTSIDE ATMOSPH RADIATION HIGH annunciator is received on MB2.
2. The RO verifies 3HVC*RE16A and B are in HI ALARM at the RIC.
3. The crew enters AOP 3573, *Radiation Monitor Alarm Response*.
4. The US directs the BOP operator to verify proper operation of the CBI system at VP1.

Which system alignment is "proper" for this event?

a) Control Room Kitchen Area Exhaust Valve 3HVC*AOV20 is OPEN

b) Control Room Air Inlet Valve 3HVC*AOV25 is CLOSED

c) Control Room Area ACU 3HVC*ACU1A is OFF

d) Control Building Filter Fan 3HVC*FN1B is OFF

Proposed Answer: D

Explanation (Optional): A CBI Signal is generated at the Alarm setpoint for 3HVC*RE16A/RE16B, and causes the Control Building Purge and Kitchen exhaust path valves to close ("A" wrong), the Control Building Filter bypass dampers to close, and the Lead "A" Control Building Filter Fan to automatically start. The "B" Train Fan will start only if the "A" Train Fan fails to start ("D" correct). The CBI signal also sends an open signal to the normally open outside air inlet valves to ensure outside makeup air is brought in to pressurize the envelope via the filter ("B" wrong). The operating ACU maintains Control Room temperature and humidity ("C" wrong) while the Control Room is maintained at a slight positive pressure to control the rad release by minimizing ingress of contaminants into the Control Room to protect control room personnel. "A" and "B" are plausible, since each of these components are impacted by a CBI. "C" is plausible, since some normal ventilation equipment (Kitchen Exhaust path and Control Room Purge path) realigns on a CBI.

Technical Reference(s): OP 3353.MB2B, 1-7 (Rev 0-0) (Attach if not previously provided)
AOP 3573 (Rev 18-3), Att. A, page 5 of 12
OP 3314F (Rev 23-2), Section 4.13.2
P&ID 151A (Rev 33)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04763 Describe operation of HVC/HVK systems under the following … High radiation detected by HVC*RE16A or B… (As available)

Question Source: New

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.7, 41.8, 41.10, and 41.11

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 73 | Tier # | 3 | 3 |
| K/A Statement: Generic: | Group # | 4 | 4 |
| Knowledge of EOP layout, symbols, and icons | K/A # | GEN.2.4.19 | |
| Proposed Question: | Importance Rating | 3.4 | 4.1 |

Safety Injection has actuated, and the crew is progressing through the EOP network.

What are the general rules for step completion while in the EOP network?

a) The crew is allowed to proceed to the next step before completing the current step. If the steps must be completed before proceeding, a CAUTION prior to step 1 of the EOP will explicitly state the requirements for that EOP.

b) The crew is allowed to proceed to the next step before completing the current step. If a step must be completed before proceeding, either the logic of the step, a WHEN/THEN statement, or a CAUTION will prevent proceeding.

c) The crew is required to complete the current step before proceeding to the next step. If a step need not be fully completed before proceeding to the next step, a NOTE prior to step 1 of the EOP will explicitly state the allowance to proceed for that EOP.

d) The crew is required to complete the current step before proceeding to the next step. If a step need not be fully completed before proceeding to the next step, either the logic of the step or a NOTE will state the allowance.

Proposed Answer: B

Explanation (Optional): Unless otherwise specified, a step need not be fully completed before proceeding to the next step ("C" and "D" wrong). Once a step is begun, the SM/US may determine it desirable and acceptable to continue the procedure actions even though the current task is not yet complete; however, completing the task in a timely manner is still required. If a particular step or portion of the procedure must be completed prior to proceeding, one of the following methods are used to alert the Operator of this situation: A "CAUTION" is provided explicitly stating this requirement, an RNO is provided with a WHEN, THEN logic statement which prohibits proceeding to the next step until the condition is satisfied, or the logic of the step prevents the Operator from proceeding until a specific condition is satisfied ("A" wrong and "B" correct). "A", "C", and "D" are plausible, since these rules are close to GOP requirements.

Technical Reference(s): OP 3272 (Rev 8-12), Section 1.3 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04449 Describe when actions of a step need not be fully completed prior to proceeding to the next step within the same procedure or transitioning to another procedure. (As available)

Question Source: Bank 70163

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.10

Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 74 | Tier # | 3 | 3 |
| K/A Statement: Generic: Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, NRC, or transmission system operator | Group # | 4 | 4 |
| | K/A # | GEN.2.4.30 | |
| | Importance Rating | 2.7 | 4.1 |

Proposed Question:

The crew is preparing to conduct a planned load change.

In accordance with OP-AP-300, *Reactivity Management*, what is the minimum load change above which the crew is required to notify Reactor Engineering?

a) 1%

b) 5%

c) 10%

d) 15%

Proposed Answer: B

Explanation (Optional): "B" is correct, and "A", "C", and "D" wrong, since the crew is responsible to notify Reactor Engineering of all planned reactivity changes > 5%. "A", "C", and "D" are plausible, since each of these are power changes that could be planned for plant repairs, etc.

Technical Reference(s): OP-AP-300 (Rev 16-0), Section 3.3.3 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-06343 Understand Reactivity Management principles as outlined in OP-AP-300, Reactivity Management. (As available)

Question Source: Bank 67787

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

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 |
| Ability to diagnose and recognize trends | K/A # | GEN.2.4.47 | |
| utilizing appropriate reference material | Importance Rating | 4.2 | 4.2 |

Proposed Question:

With the plant initially at 50% power with rod control in manual, the following sequence of events occurs:

1. A plant transient occurs.
2. The RO reports primary plant parameters to the crew.
3. The STA compares the parameters against the expected parameter values listed in SP 31002, *Plant Calorimetric*, Attachment 9.

The crew determines major parameters have stabilized relative to their initial values as follows:

- Reactor Power (based on calorimetric): Higher than prior to the transient.
- Tave: Returned to its original value.
- MWe: Lower than prior to the transient.

What event could have caused this transient?

a) A dilution is occurring.

b) A rod has dropped.

c) Extraction steam has been lost to a feed heater.

d) A turbine control valve has failed fully open.

Proposed Answer: C

Explanation (Optional): "C" is correct, since MWe changing opposite of reactor power with Tave constant is indicative of a change in plant efficiency. Due to loss of efficiency, $T_{cold}$ will go down and $T_{hot}$ will go up, but Tave will be fairly stable. "A" is wrong, since with a dilution, MWe would not be decreasing. "A" is plausible, since reactor power is increasing. "B" is wrong, since with a dropped rod, Reactor Power would be decreasing. "B" is plausible, since MWe had decreased. "D" is wrong, since with increased steam demand, Tave would be decreasing. "D" is plausible, since reactor power would go up.

| | | |
|---|---|---|
| Technical Reference(s): | NRC IN 96.41 Comanche Peak 1996 | (Attach if not previously provided) |

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-03349 For given plant conditions, qualitatively state the effect of any RCS, secondary plant or reactivity induced transient… on the following parameters (RCP trip, turbine trip, dropped rod, etc.): reactor power, rod position, RCS loop average temperatures… | (As available) |
| Question Source: | Bank 65340 | |
| Question History: | | |
| Question Cognitive Level: | Comprehension or Analysis | |
| 10 CFR Part 55 Content: | 55.41.1, 41.5, and 41.14 | |
| Comments: | | |

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 76 | Tier # | | 1 |
| K/A Statement: RCP Malfunctions: | Group # | | 1 |
| Ability to explain and apply system limits | K/A # | APE.015/17.GEN.2.1.32 | |
| and precautions | Importance Rating | | 4.0 |

Proposed Question:

The plant is at 20% power, preparing to place the main turbine in service, when the following sequence of events occurs:

1. The "A" RCP # 1 seal leakoff flow increases from 2.3 gpm to 7.2 gpm over 3 minutes.
2. The STA reports both Seal Water inlet temperatures are reading 113°F, and slowly increasing.

What action is required to be directed by the US?

a) Trip the Reactor, stop the "A" RCP, and go to E-0, *Reactor Trip or Safety Injection*.

b) Enter AOP 3554, *RCP Trip or Stopping a RCP at Power*, remove the RCP from service and isolate the number 1 seal within 5 minutes.

c) Enter OP 3206, *Plant Shutdown*, and commence an orderly plant shutdown and remove the "A" RCP from service within 8 hours.

d) Per the RCP Seal ARP, notify the Duty Officer and request Engineering Department evaluate continued pump operation.

Proposed Answer: B

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions and select a procedure based on decision points in the ARP based on the specific event. The RCP seal leakoff limit before a trip is required is 8 gpm, due to concern of hot RCS water flowing up the RCP shaft into the seal package. A backup check is seal inlet temperature increasing, since some flow is also exiting the number two seal. Table 1 directs actions of step 6 to be taken, which goes to AOP 3554 to perform an immediate RCP shutdown ("B" correct). Power is below P-8, therefore trip is not required ("A" wrong). , "A" is plausible, since this action would be correct if power were above P-8. "C" is plausible; since an orderly plant shutdown would be performed if seal inlet temperature was stable. "D" is wrong, but plausible since these actions would be correct if seal leakoff flow was above the alarm setpoint but ≤ 6 gpm.

Technical Reference(s): OP 3353.MB3B (Rev 6-21), 2-10, steps 4, 5, and 6 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07533 Given a set of plant conditions, determine the required actions to be taken per AOP 3554. (As available)

Question Source: Bank 64317

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 # 77 | Tier # | | 1 |
| K/A Statement: Loss of RHR System: | Group # | | 1 |
| Ability to recognize system parameters that are entry- | K/A # | APE.025.GEN.2.2.42 | |
| level conditions for Technical Specifications | Importance Rating | | 4.6 |

Proposed Question:

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

1. During testing of the "B" RHR Pump, vibration is noted to be above normal levels.
2. The System Engineer determines vibration is within limits, and the pump is OPERABLE.
3. The System Engineer recommends tagging the pump out for bearing inspection/repair at the next available opportunity.
4. Maintenance estimates the work will take 80 hours.
5. Management is deciding whether to shut down the plant to perform repairs, or to wait for the upcoming scheduled shutdown for the refueling outage to perform the work.

If a plant shutdown is commenced, what is the first plant MODE in which the pump can be removed from service WITHOUT having to enter an LCO ACTION for the RHR Pump?

a) MODE 3.

b) MODE 4.

c) MODE 5.

d) MODE 6.

Proposed Answer: B

Explanation (Optional): Question is considered SRO level since it requires the applicant to apply four applicable Tech Spec LCOs in lower operational modes. The four LCO's that apply are: LCO 3.4.1.2 (RCS Loops) which requires only RCS loops, until two trains of RHR are required to be OPERABLE in MODE 5 ("D" wrong); LCO 3.5.2 (ECCS), which requires two trains of ECCS in MODES 1, 2, and 3; LCO 3.5.3, which requires only one train in MODE 4 (not provided as a reference), meaning RHR can be removed from service once MODE 4 is reached ("C" correct, "A" and "B" wrong); and LCO 3.9.8.1, which requires one RHR loop in MODE 6, but question asks for first MODE where pump can be removed from service ("D" wrong, but plausible). "A" and "B" are plausible, since for each of these MODES, at least one of the LCOs does not require an RHR pump.

Technical Reference(s): Tech Spec LCO 3.4.1.2 (Amend 230) (Attach if not previously provided)
Tech Spec LCO 3.5.2 (Amend 103)
Tech Spec LCO 3.5.3 (Amend 157)
Tech Spec LCO 3.9.8.1 (Amend 230)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05460 Given a plant condition or equipment malfunction, use provided reference material to... Evaluate Technical Specification applicability… (As available)

Question Source: Bank #64247

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.2

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 78 | Tier # | | 1 |
| K/A Statement: Pressurizer Pressure Control Malfunction: | Group # | | 1 |
| Determine/interpret RCP injection flow. | K/A # | APE.027.AA2.14 | |
| Proposed Question: | Importance Rating | | 2.9 |

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

1. The Pressurizer Master Pressure Controller malfunctions, and actual RCS pressure starts to decrease.
2. The RO takes manual control of the Master Pressure Controller, and stabilizes RCS pressure.
3. The RO reports current plant parameters are stable at the following values:
   - RCS Pressure: 2200 psia
   - "A" RCP Seal Injection Flow: 10.3 gpm
   - "B" RCP Seal Injection Flow: 9.8 gpm
   - "C" RCP Seal Injection Flow: 10.2 gpm
   - "D" RCP Seal Injection Flow: 10.2 gpm

What ACTION, if any, is required to be taken per the RCS operational leakage LCO due to RCS CONTROLLED LEAKAGE?

a) No ACTION is required to be taken, since controlled leakage is within its limit.

b) No ACTION is required to be taken, since the Controlled Leakage LCO does not apply at this RCS pressure.

c) Reduce leakage to within limits within 4 hours or be in HOT STANDBY within the next 6 hours.

d) Be in HOT STANDBY within 6 hours and COLD SHUTDOWN within the following 30 hours.

Proposed Answer: B

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions and apply surveillance requirements in these specific plant conditions. Seal injection is normally between 9 and 10 gpm/pump. Lowering actual RCS pressure will increase seal injection flow. The combined flows of the four RCPs is 40.5 gpm, which exceeds the LCO limit of 40 gpm ("A" wrong, but plausible). But, the basis of the limit is to ensure that during a LOCA, the SI flow will not be less than assumed in the safety analyses, and that controlled leakage is determined under a set of reference conditions, specifically one Charging Pump in operation and RCS pressure at 2250 psia +/- 20 psia. Since the cause of the increased injection flowrate is a drop in pressure caused by the Pzr pressure control malfunction, the LCO Action does not apply ("B" correct, "C" and "D" wrong). "C" and "D" are plausible, since "C" is the action if controlled leakage was violated, and "D" is the action required if pressure boundary leakage was violated.

| | | |
|---|---|---|
| Technical Reference(s): | Tech Spec Bases for 4.4.6.2.e (LBDCR No. 07-MP3-032) | (Attach if not previously provided) |
| | Tech Spec Surveillance Req 4.4.6.2.1.c (Amend 238) | |
| | Surveillance 3601F.3-001 (Rev 4-2), page 2 of 2 | |

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-05343 Given a plant condition or equipment malfunction… evaluate Technical Specification applicability and determine required actions.. | (As available) |

Question Source: New

Question History:

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 # 79 | Tier # | | 1 |
| K/A Statement: Loss of Vital AC Inst. Bus | Group # | | 1 |
| Determine/interpret Instrument Bus alarms for | K/A # | 057.AA2.06 | |
| the inverter and alternate source | Importance Rating | | 3.7 |

Proposed Question:

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

1. An Inverter 3 Trouble Annunciator is received on MB8.
2. A PEO is dispatched to Inverter 3, and reports the following local alarm status:
   - The "Out of Sync Light" is ON
   - The "Bypass Source Supplying Load" Light is ON
   - The "Inverter Supplying Load" Light is OFF

**Using the attached copy of Technical Specification LCOs 3.8.2.1 and 3.8.3.1**, is an LCO ACTION in effect that will require a plant shutdown? If so, how long does the crew have from the initiation of the event to restore the normal electrical lineup before having to apply the requirement to "be in HOT STANDBY within the next 6 hours"?

a) Yes. The crew has 2 hours before they have to be in HOT STANDBY within the next 6 hours.

b) Yes. The crew has 8 hours before they have to be in HOT STANDBY within the next 6 hours.

c) Yes. The crew has 24 hours before they have to be in HOT STANDBY within the next 6 hours.

d) No. A plant shutdown is NOT required in the current electrical alignment.

Proposed Answer: C

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions, and apply required Tech Spec actions with specific input from the initial conditions affecting the required action time. An assessment of the alarms shows power is being supplied to the VIAC from the alternate AC source as indicated by the Bypass Source Supplying Load Light ON. The Battery and Charger are still OPERABLE, per surveillance requirements of 4.8.2.1, not provided as a reference ("D" plausible), but VIAC 3 is not operable, since it is required to be energized from its Inverter, connected to the DC Bus. If not, the crew has 2 hours to energize the VIAC per ACTION 3.8.3.1.b (1). Since the VIAC is energized from the alternate source ("D" plausible), this action is met ("A" wrong, but plausible), so the crew has 24 hours to energize the VIAC from its inverter per ACTION 3.8.3.1.b (2) ("C" correct, "D" wrong). "A" is also plausible, since this is the time allowed per ACTION 3.8.3.1.c if the DC bus is not energized, and the time allowed to restore a battery bank or charger per 3.8.2.1. "B" is plausible since this is the time allowed if an emergency bus (VIAC 3 is a "vital" bus) is not OPERABLE per 3.8.3.1.a.

| | | |
|---|---|---|
| Technical Reference(s): | Tech Spec LCO 3.8.2.1 (Amend. 64) | (Attach if not previously provided) |
| | Tech Spec LCO 3.8.3.1 (Amend. 220) | |
| | OP 3345B (Rev 11-2), section 4.18 | |
| | EE-1BA (Rev 29) | |

Proposed references to be provided to applicants during examination: **LCOs 3.8.2.1 and 3.8.3.1**

Learning Objective: MC-03951 Given a plant condition requiring the use of AOP-3563, identify applicable technical specification action requirements (As available)

Question Source: New

Question History:

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 # 80 | Tier # | | 1 |
| K/A Statement: Loss of Nuclear Svc Water: | Group # | | 1 |
| Ability to determine operability and/or | K/A # | APE.062.GEN.2.2.37 | |
| availability of safety related equipment | Importance Rating | | 4.6 |

Proposed Question:

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

1. The Outside Rounds PEO reports a significant motor oil leak exists on the "A" (lead) Service Water Pump.
2. The crew starts the "C" SWP Pump.
3. The crew stops the "A" SWP Pump and places it in Pull-To-Lock.

How, if at all, does the loss of the "A" Service Water Pump affect the OPERABILITY of the "A" Emergency Diesel Generator, and why?

a) The "A" EDG IS still OPERABLE, since there is still an OPERABLE Service Water Pump available on the "A" Train of Service Water.

b) The "A" EDG IS still OPERABLE, since loss of a Service Water Pump is covered by the SWP LCO, which has a more restrictive ACTION time than the EDG LCO.

c) The "A" EDG is NOT OPERABLE because both Service Water pumps are required on the affected Train to maintain OPERABILITY of the EDG.

d) The "A" EDG is NOT OPERABLE because the lead Service Water pump is required on the affected Train to maintain OPERABILITY of the EDG.

Proposed Answer: A

Explanation (Optional): Question is considered SRO level since it requires the applicant to apply Tech Spec Basis knowledge to analyze operability. The EDG requires an operable SWP "loop". The EDG is operable since only one redundant SWP pump in its train is required to consider the loop operable per Tech Specs ("A" is correct, and "C" and "D" wrong). "C" and "D" are plausible, since the lead Service Water Pump was lost, and it receives the first start signal on an LOP. Also, there are TRM actions with a loss of one SWP Pump, but this is not related to SWP or EDG OPERABILITY. "B" is wrong, since if SWP is lost to a train, its EDG is INOPERABLE, since its LCO time is more restrictive than the SWP LCO. "B" is plausible, since unless the second ACTION time is more restrictive, Tech Spec LCOs are generally not cascaded.

Technical Reference(s): Tech Spec LCO 3.7.4 (Amend. 206) (Attach if not previously provided)
Tech Spec Basis for LCO 3.7.4 (LBDCR 3-22-02)
Tech Spec LCO 3.8.1.1 (Amend. 229)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05720 (SRO, STA) Given a plant condition or equipment malfunction (related to Service Water), use provided reference material to.... Evaluate Technical Specification applicability and determine required actions (As available)

Question Source: Bank #69353

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.2

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 81 | Tier # | | 1 |
| K/A Statement: Generator Voltage and Electric | Group # | | 1 |
| Grid Disturbances: Determine/interpret | K/A # | APE.077.AA2.04 | |
| VARS outside the capability curve | Importance Rating | | 4.0 |

Proposed Question:

Initial Conditions:

- A load increase is in progress per OP 3204, *At Power Operation.*
- Reactor power is 40% and increasing normally.

An electrical disturbance occurs, and the following sequence of events occurs:

1. The GENERATOR OVER EXCITATION (MB7C, 5-5) Annunciator is received.
2. The BOP operator reports VARS are reading 925 VARS Out.
3. Reactor Power is steady at 40%.
4. The GEN CORE MONITOR LEVEL HI (MB7C, 4-5) Annunciator is received.
5. A PEO is dispatched to the Core Monitor to press and hold the FILTER pushbutton for 15 seconds, and report the results to the Control Room.
6. The PEO reports the following at the Core Monitor:
   - The trace had rapidly declined from normal to the alarm condition.
   - The trace returned to normal when "Filter" was depressed.
   - The trace returned to the alarm condition when the Filter pushbutton was released.

Per the associated Annunciator Response Procedures, what actions are required to be taken by the US?

a) Direct the BOP to lower Main Generator voltage; and notify I&C of a Core Monitor malfunction.

b) Direct the BOP to lower Turbine Load; and notify I&C of a Core Monitor malfunction.

c) Direct the BOP to trip the Main Turbine; and enter AOP 3550, *Turbine/Generator Trip.*

d) Direct the RO to trip the Reactor; and enter E-0, *Reactor Trip or Safety Injection.*

Proposed Answer: C

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions, make decisions based on specific procedure decision points, and select the appropriate procedure based on the event in progress. Operating outside the capability curve leads to over-heating, which caused the core monitor alarm. Since the Core Monitor trace decreased rapidly and responded to the filter being placed in service, an actual overheating event is occurring. "A" and "B" are wrong, since the ARP requires a reactor trip above P-9 (51%) ("D" wrong, but plausible), or a turbine trip and entry into AOP 3550 if less than P-9 ("C" correct). "A" and "B" are plausible, since if the trace had decreased gradually, or had not responded to the filter being placed in service, the US would be required to notify I&C of a core monitor malfunction; and the over excitation ARP directs the crew to lower MVARs by reducing main generator voltage.

Technical Reference(s): OP 3353.MB7C (Rev. 4-4), 5-5, step 1 (Attach if not previously provided)
OP 3353.MB7C (Rev. 4-4), 4-5, Note 3 and step 4

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04685 Describe operation of Main Generator exciter and regulator system under… Generator overload operations… (As available)

Question Source: New

Question History:

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: Loss of Source Range NI: | Group # | | 2 |
| Determine/interpret maximum allowable | K/A # | APE.032.AA2.07 | |
| channel disagreement | Importance Rating | | 3.4 |

Proposed Question:

The crew is preparing to start up the reactor per OP 3202, *Reactor Startup*; and the following sequence of events occurs:

1. The crew closes the Reactor Trip Breakers.
2. The RO reports Source Range NIS Channels indicate as follows:
   - N31: 10 cps
   - N32: 40 cps
3. The SM determines this exceeds the maximum allowable channel disagreement, and determines, based on the previous day's rounds readings that Channel N32 has drifted high.

Does Tech Spec LCO 3.3.1 "Reactor Trip System Instrumentation" need to be entered; and does the FSAR credit the Source Ranges for protection against a positive reactivity addition event during the reactor startup?

a) LCO 3.3.1 ACTION DOES NOT need to be entered, and the FSAR does NOT credit the Source Ranges, since both Tech Spec Bases and the FSAR credit the Power Range Low Setpoint Trip for primary protection against a positive reactivity event during a reactor startup.

b) LCO 3.3.1 ACTION DOES NOT need to be entered, since Tech Spec Bases credits the Power Range Low Setpoint Trip. But the FSAR credits the Source Ranges as primary protection against a positive reactivity event during a reactor startup.

c) LCO 3.3.1 ACTION NEEDS to be entered, since Tech Specs require Source Ranges during a reactor startup. But the FSAR credits the Power Range Low Setpoint Trip rather than the Source Ranges as primary protection against a positive reactivity event during a reactor startup.

d) LCO 3.3.1 ACTION NEEDS to be entered, and the FSAR DOES credit the Source Ranges as primary protection against a positive reactivity event during a reactor startup.

Proposed Answer: C

Explanation (Optional): Question is considered SRO level since it requires detailed knowledge of FSAR assumptions and associated administrative requirements. Tech Spec 3.3-1 only requires the Source Ranges in MODE 3 after the reactor trip breakers are closed with power below the P-6 setpoint of $10^{-10}$ Amps in the intermediate range. The conditions in the stem indicate this is true, and LCO3.3-1 requires 2 Source Range channels, so LCO 3.3-1 needs to be entered ("A" and "B" wrong). "A" and "B" are plausible, since the requirements for Source Ranges is only a small window during the reactor startup, and the FSAR credits the Power Ranges during this point in the Startup. The FSAR does not credit the Source Ranges, since they are not seismically qualified ("C" correct, "D" wrong). So, operators are required to verify RCS Tave is greater than 551°F (minimum temperature for criticality) with the Power Range Startup Surveillance current prior to closing the trip breakers on a reactor startup. "D" is plausible, since LCO 3.3-1 requires Source Ranges to be operable when closing the trip breakers.

| | | |
|---|---|---|
| Technical Reference(s): | Tech Spec 3.3.1(Amend. 229), page 3/4 3-2 | (Attach if not previously provided) |
| | Tech Spec 3.3.1(Amend. 217), pages 3/4 3-5 | |
| | Tech Spec Bases Page B 2-5 (LBDCR No. 07-MP3-017) | |
| | FSAR 15.4.1.2.4 (Rev. 26.1) | |
| | FSAR 9.4.7.3.3 (Rev. 26.1) | |
| | OP 3302A (Rev. 15.7), Prerequisite 2.1.6 | |

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04900 List automatic Control & Protection System actions anticipated as a result of reactivity & power distribution anomalies (As available)

Question Source: New

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.1 and 43.2

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 83 | Tier # | | 1 |
| K/A Statement: Accidental Gaseous Radwaste Rel: | Group # | | 2 |
| Knowledge of abnormal conditions procedures | K/A # | APE.060.GEN.2.4.28 | |
| Proposed Question: | Importance Rating | | 4.2 |

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

1. A RADIATION ALERT annunciator comes in on MB2.
2. The RO reports that the Turbine Building Stack Rad Monitor 3HVR10B has trended up to the ALERT setpoint.

What procedure is the US required use to mitigate the event, and what action will that procedure direct?

a) The US will use AOP 3573, *Radiation Monitor Alarm Response*, which will direct the crew to manually start one train of SLCRS.

b) The US will use AOP 3573, *Radiation Monitor Alarm Response*, which will direct the crew to manually start one train of Auxiliary Building Filtration for general area lower levels.

c) The US will use OP 3353.MB2B, 2-8, *Radiation Alert*, which will direct the crew to manually start one train of SLCRS.

d) The US will use OP 3353. MB2B, 2-8, *Radiation Alert*, which will direct the crew to manually start one train of Auxiliary Building Filtration for general area lower levels.

Proposed Answer: A

Explanation (Optional): Question is considered SRO level since it requires the applicant to interpret radiation readings as they pertain to selection of the appropriate Abnormal Operating Procedure. "C" and "D" are wrong, since OP3353.MB2B, 2-8 will direct the crew to AOP 3573 prior to taking actions with ventilation. "C" and "D" are plausible, since OP 3353.MB2B, 2-8 is applicable in this event, and will direct some actions. "A" is correct, and "B" is wrong, since the crew is directed to start a SLCRS fan, not the Aux Building Filters. There are other building ventilation systems that discharge out the Turbine Building Stack besides the Aux Building. "B" is plausible, since Aux Building Filters are started for numerous Rad Monitor alarms, and the Aux Building does discharge through the Turbine Building Stack.

Technical Reference(s): AOP 3573 (Rev. 18-3), Att. A, page 7 of 12 (Attach if not previously provided)
OP 3353.MB2B 2-8, (Rev. 0-1)

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 #80930

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.4 and 43.5

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 84 | Tier # | | 1 |
| K/A Statement: Steam Generator Over-pressure: | Group # | | 2 |
| Determine/interpret adherence to appropriate | K/A # | W/E13.EA2.2 | |
| procedures | Importance Rating | | 3.4 |

Proposed Question:

Initial Conditions:

- The crew has entered ES-0.1, *Reactor Trip Response*.
- The MSIVs are CLOSED.
- RCS Tave is 557°F.

The following sequence of events occurs:

1. The crew enters FR-H.2, *Response to Steam Generator Overpressure*, due to an overpressure condition in "B" SG.
2. The crew is unable to dump steam from the "B" SG.

What action is the US required to direct?

a) Return to ES-0.1, since the crew was unable to align a steam release path from the "B" SG.

b) Increase blowdown flow from "B" SG to decrease its pressure by expanding its steam bubble.

c) Feed the "B" SG to decrease its pressure by cooling it down.

d) Dump steam from the other SGs to decrease "B" SG pressure by cooling it down.

Proposed Answer: D

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions and select a procedure section based on specific Functional Restoration Procedure decision points impacted by the event in progress. "A" is wrong, but plausible, since the crew is directed to return to the procedure and step in effect if the crew is successful at dumping steam from the affected SG. If unsuccessful, the crew is directed to isolate AFW to the affected SG ("C" wrong), and dump steam from the unaffected SGs to reduce RCS hot leg temperature, which will cooldown and depressurize the affected SG ("D" correct and "B" wrong). "B" is plausible, since this is an action taken in FR-H.3 with a SG high level condition, and would also lower pressure if high level were the cause of the overpressure condition. "C" is plausible, since feeding the affected SG would cool the SG but this would also raise SG level, which is not desired.

Technical Reference(s): FR-H.2 (Rev. 9-0), step 7.a.RNO (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07481 Given a set of plant conditions, determine the required actions to be taken per FR-H.2. (As available)

Question Source: Bank 73186

Question History: Millstone 3 2001 NRC Exam

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.10 and 43.5

Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 85 | Tier # | | 1 |
| K/A Statement: High Containment Radiation | Group # | | 2 |
| Ability to diagnose and recognize trends | K/A # | W/E16.GEN.2.4.47 | |
| utilizing reference material | Importance Rating | | 4.2 |

Proposed Question:

With the plant initially at 100% power with Containment High-Range monitor 3RMS-RE04A out of service, the following sequence of events occurs:

| Time | Event |
|---|---|
| 0 Minutes: | A locked rotor occurs on the "A" RCP, resulting in a reactor trip. |
| 5 Minutes: | While in ES-0.1, *Reactor Trip Response*, the STA reports Fuel Drop Monitors 3RMS- RE 41 and 42 are reading 0.5 R/hr and trending up. |
| 10 Minutes: | A Yellow Path is received on CTMT Radiation. |
| 120 Minutes: | 3RMS- RE 41/42 are reading 150 R/hr and continuing to trend up. |
| 120 Minutes: | 3RMS- RE 05A is reading 150 R/hr and trending up. |
| 145 Minutes: | 3RMS- RE 05A and 3RMS- RE 41/42 all read 175 R/hr and stable. |
| 149 Minutes: | RMT1 reports the Core Damage Estimate is NOT yet complete. |
| 150 Minutes: | A fault occurs on the "C" Steam Generator inside Containment, and the "C" SG rapidly depressurizes. |
| 151 Minutes: | 3RMS-RE-05A rapidly increases to 1000 R/hr. |
| 151 Minutes: | 3RMS-RE 41 and 42 readings have remained stable at 175 R/hr. |

**Using the Millstone 3 EAL Tables**, what is the highest classification required for this event?

a) General Emergency – Alpha

b) Site Area Emergency – Charlie 2

c) Alert – Charlie 1

d) Unusual Event – Delta 1

Proposed Answer: C

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions related to radiation readings and make an emergency classification, which is a duty reserved for a SRO licensed individual. The Alert classification is first met at 10 minutes for "In-plant Radiation" (RA2), Radiation reading >5R/hr in Areas Requiring Access for Safe Shutdown (CTMT), since the Yellow path for CTMT Radiation is 10 R/hr, and for Loss of the Clad Barrier (FCB3) with sustained valid RE-04A/05A reading >5R/hr without RCS release inside CTMT. At 121 minutes, the classification remains Alert, C-1, even though CTMT radiation exceeds the Table 1 "2 to 4" hour limit of 125 R/hr, since this only applies with an RCS leak inside CTMT. "C" is correct, and "A", "B", and D" wrong, since at 151 minutes, the classification does not escalate, since the CTMT loss threshold is still not exceeded. "A" is plausible, since RE05A has rapidly increased above the RG1 "In-Plant Radiation" General Emergency threshold, but this is not valid, since the steam break inside CTMT is causing Temperature-Induced Current (TIC) on RE05A, and its readings are not to be considered valid until the effects of TIC have dissipated. Also, radiation impacts all three barriers are the barrier failure reference table. "B" is plausible, since this would be correct if the applicant uses the TIC-affected reading of RE05A to assess the CNB5 CTMT loss threshold, making two barriers lost, or, if the applicant views the RCS barrier as potentially lost due to uncontrolled pressure decrease (due to the steam break) and increasing containment radiation monitors (RCB3) ,which are elevated, but the rad monitor indication was stable during the steam break . "D" is plausible, since a steam break inside CTMT is not classifiable if Rads were lower, and if only the CTMT barrier is lost, Unusual Event would be the correct classification.

Technical Reference(s): MP-26-EPI-FAP06-003 (Rev. 8-0) EAL Tables (Attach if not previously provided)

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

Learning Objective: EP-00171 Given a plant condition and associated alarms and/or indications, classify an emergency event to include NRC classification and state posture code (As available)

Question Source: New

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.4 and 43.5

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 86 | Tier # | | 2 |
| K/A Statement: Component Cooling Water: | Group # | | 1 |
| Predict impact and mitigate: Excessive exit temp- | K/A # | 008.A2.09 | |
| erature from the letdown cooler, including resins | Importance Rating | | 2.8 |

Proposed Question:

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

1. The RPCCW to Letdown temperature controller (3CHS-TK130) fails.
2. The associated RPCCW Temperature Control Valve (3CCP*TV172) strokes fully closed.
3. The RO reports letdown line temperature (3CHS*TI 130) indicates 135°F.

What procedure is the US required to enter; and what action will the US direct per this procedure to mitigate this event?

a) OP 3353.MB3A, 4-6, *Letdown Relief Vv Temp Hi.* The US will direct the RO to simultaneously remove Charging and Letdown from service.

b) OP 3353.MB3A, 5-4, *Regen HX Out Temp Hi.* The US will direct the RO to simultaneously remove Charging and Letdown from service.

c) OP 3353.MB3A, 5-5, *Letdown HX Out Temp Hi.* The US will direct the RO to ensure 3CHS*TCV129, "L/D DIVERT" has bypassed the CHS demineralizers by placing its control switch in the "VCT" position.

d) OP 3353.MB3A, 5-5, *Letdown HX Out Temp Hi.* The US will direct the RO to simultaneously remove Charging and Letdown from service. The US will direct the RO to place Charging Flow Controller 3CHS-FK121in MANUAL, and raise Charging flow.

Proposed Answer: C

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions and select a specific annunciator response procedure based on the event in progress. The failed RPCCW controller has isolated RPCCW cooling to the Letdown Heat Exchanger. The high temperature alarm is received downstream of this heat exchanger, bringing in the Letdown Heat Exchanger Outlet high temperature alarm. The associated Annunciator Response Procedure will direct the crew to select "VCT" to bypass the CHS demineralizers ("C" correct) to prevent damaging the resins, take manual control of the letdown temperature controller, and remove charging and letdown from service if temperature cannot be reduced below 134°F ("A" and "B" plausible). "D" is wrong, since OP 3353.MB3A, 5-5 does not direct this action. "D" is plausible, since this action will increase cooling in the Regen Heat Exchanger, and is directed in the Regen HX Out Temp Hi procedure. "A" and "B" are wrong, since these alarms will not be received since they sense temperature upstream of the failed RPCCW valve. "A" and "B" are plausible, since they are high temperature alarms associated with the letdown line, and the action described is an action from the correct Annunciator Response Procedure.

| | | |
|---|---|---|
| Technical Reference(s): | OP 3353.MB3A (Rev. 2-13), 4-6 | (Attach if not previously provided) |
| | OP 3353.MB3A (Rev. 2-13), 5-4 | |
| | OP 3353.MB3A (Rev. 2-13), 5-5 | |
| | P&ID 104A (Rev. 54) and 121B (Rev. 20) | |

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-04156 Given a… equipment malfunction (with the RPCCW System)… Determine entry conditions to applicable plant procedures… | (As available) |

Question Source: New

Question History:

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: Reactor Protection: | Group # | | 1 |
| Predict impact and mitigate: Erratic power | K/A # | 012.A2.04 | |
| supply operation | Importance Rating | | 3.2 |

Proposed Question:

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

1. The SSPS A TROUBLE annunciator comes in and clears on MB4C.
2. The BOP operator reports VIAC 3 voltage is erratically spiking down on MB8.
3. The US starts looking at AOP 3564, *Loss of One Protective System Channel*, in case VIAC 3 completely deenergizes, or is required to be deenergized manually.
4. The BOP operator reports VIAC 3 voltage is continuing to erratically spike down.

What is the current status of power to the "A" Train Reactor Protection; and if VIAC 3 completely fails, what AOP will the US use to determine which specific RPS Bistables are required to be tripped?

a) Power to Train "A" RPS circuits is being maintained, since its 48 Volt and 15 Volt power supplies receive redundant, auctioneered high inputs from VIAC 1 and VIAC 3. If VIAC 3 loses power, the US will direct the appropriate RPS Bistables to be tripped per AOP 3564, *Loss of One Protective System Channel.*

b) Power to Train "A" RPS circuits is being maintained, since its 48 Volt and 15 Volt power supplies receive redundant, auctioneered high inputs from VIAC 1 and VIAC 3. If VIAC 3 loses power, the US will direct the appropriate RPS Bistables to be tripped per AOP 3571, *Instrument Failure Response.*

c) Power to Train "A" RPS 48 Volt circuits is being maintained, since it is supplied from VIAC 1, but the 15 Volt circuits are experiencing voltage drops, since they are supplied from VIAC 3. If VIAC 3 loses power, the US will direct the appropriate RPS Bistables to be tripped per AOP 3564, *Loss of One Protective System Channel.*

d) Power to Train "A" RPS 48 Volt circuits is being maintained, since it is supplied from VIAC 1, but the 15 Volt circuits are experiencing voltage drops, since they are supplied from VIAC 3. If VIAC 3 loses power, the US will direct the appropriate RPS Bistables to be tripped per AOP 3571, *Instrument Failure Response.*

Proposed Answer: B

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions and select a specific Abnormal Operating Procedure based on based on the event in progress. It also requires the applicant to know the content of procedures to select a required course of action. The "A" Train of RPS receives electrical power from 120 VAC from two sources; VIAC 1 and VIAC 3. The slave relays receive power from VIAC 1 only ("C" and "D" plausible), and both provide input via an auctioneered high circuit to the 48 V and 15 V power supplies ("C" and "D" wrong). "A" is wrong, and "B" correct, since AOP 3564 directs the crew to AOP 3571 to address tripping of Bistables. "A" is plausible, since the crew will enter AOP 3564 on loss of VIAC.

| | | |
|---|---|---|
| Technical Reference(s): | EE-1BF (Rev. 32) | (Attach if not previously provided) |
| | SSPS Power Distribution Dwg | |
| | AOP 3564 (Rev. 10-0), step 10. RNO | |
| | AOP 3571 (Rev. 9-7), Att. A, page 6 | |

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: | New |
| Question History: | |
| 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 # 88 | Tier # | | 2 |
| K/A Statement: Main and Reheat Steam: Predict | Group # | | 1 |
| impact and mitigate: Steam dump malfunction | K/A # | 039.A2.04 | |
| Proposed Question: | Importance Rating | | 3.7 |

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

1. The MAIN STEAM RELIEF VV NOT CLOSED Annunciator is received on MB5.
2. The BOP operator reports that Atmospheric Relief Valve 3MSS*PV20D has spuriously opened.
3. The BOP operator reports that the cause of the failure is Steam Generator Pressure Transmitter 3MSS*PT20D has failed high.
4. The crew enters AOP 3571, *Instrument Failure Response*.
5. The RO reports Calorimetric 4 minute average is 3725 MWth.
6. The US directs the BOP operator to manually CLOSE 3MSS*PV20D.

What action is the US required to direct as described in OP 3204, *At Power Operation* to mitigate the consequences of this event; and will AOP 3571 require the crew to trip bistables?

a) "Reduce" power to $\leq$ 100% power. The crew will be required to trip bistables associated with the failed instrument within 6 hours.

b) "Reduce" power to $\leq$ 100% power. There are NO Tech Spec bistables associated with the failed instrument.

c) "Immediately reduce" power to $\leq$ 100% power. The crew will be required to trip bistables associated with the failed instrument within 6 hours.

d) "Immediately reduce" power to $\leq$ 100% power. There are NO Tech Spec bistables associated with the failed instrument.

Proposed Answer: D

Explanation (Optional): Question is considered SRO level since it requires the applicant to determine administrative requirements required to comply with the maximum power level limit in the Millstone 3 license. This question also requires the applicant to have detailed knowledge of which instruments have bistables associated with Tech Spec LCO's 3.3-1 and 3.3-2. AOP 3571 directs the crew to manually close the failed-open relief valve, and notifies the crew that there are no Technical Specifications or bistables associated with the failed instrument ("A" and "C" wrong). "A" and "C" are plausible, since a failed steam generator pressure detector requires entry into AOP 3571 and requires the tripping of Bistables. OP 3204 actions need to be taken to address the overpower event caused by the malfunctioning steam relief valve. "D" is correct, since with power above 102% (3723 MWth), the crew is required to "immediately" reduce power to less than or equal to 100%, and notify RE. "D" is wrong, but plausible, since this would be correct if power had exceeded 100.2% (3,657 MWth), but not 100.5%.

Technical Reference(s): AOP 3571 (Rev. 9-7), Att. I (Attach if not previously provided)
OP 3204 (Rev. 19-0), section 1.2, page 3 of 78
OP 3204 (Rev. 19-0), section 4.3.1.a - d

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 85279 (Parent question attached)

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.1, 43.2 and 43.5

Comments:

Original Bank Question 85279 (prior to modification):

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

1. The MAIN STEAM RELIEF VV NOT CLOSED Annunciator is received on MB5.
2. The BOP operator reports that Atmospheric Relief Valve 3MSS*PV20D has spuriously opened.
3. The BOP operator reports that the cause of the failure is Steam Generator Pressure Transmitter 3MSS*PT20D has failed high.
4. The crew enters AOP 3571, *Instrument Failure Response*.
5. The RO reports Calorimetric 4 minute average is 3680 MWth.
6. The US directs the BOP operator to manually CLOSE 3MSS*PV20D.

What other actions is the US required to direct per OP 3204, *At Power Operation* to mitigate the consequences of this event; and will AOP 3571 require the crew to trip bistables?

a) Promptly reduce power to ≤ 100% power, and notify Reactor Engineering. The crew will be required to trip bistables associated with the failed instrument within 6 hours.

b) Promptly reduce power to ≤ 100% power, and notify Reactor Engineering. There are no Tech Spec bistables associated with the failed instrument.

c) Monitor power, ensuring it returns to ≤ 100% power within 15 to 20 minutes. The crew will be required to trip bistables associated with the failed instrument within 6 hours.

d) Monitor power, ensuring it returns to ≤ 100% power within 15 to 20 minutes. There are no Tech Spec bistables associated with the failed instrument.

Correct Answer was B

Considered "Modified" since new power level changed the correct answer.

| | | | | |
|---|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 89 | Tier # | | 2 |
| K/A Statement: Service Water: Predict impact | Group # | | 1 |
| and mitigate: Service water header pressure | K/A # | 076.A2.02 | |
| Proposed Question: | Importance Rating | | 3.1 |

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

1. The SERVICE WTR PUMP DIS PRES LO (MB1C, 4-3) annunciator is received.
2. The US enters the associated Annunciator Response Procedure (ARP).
3. The RO reports "A" Train Service Water Supply Pressure (3SWP-PI26A) has dropped to 15 psig and stabilized.
4. The RO reports both "A" Train Service Water Pumps are running.
5. The RO reports Service Water Trains "A" and "B" TPCCW Supply Valves 3SWP*MOV71A and B have automatically closed.
6. A PEO reports large amounts of water spraying in the "A" Train Service Water Cubicle.
7. The US directs the RO to place both "A" Train Service Water Pumps in Pull-To-Lock.

What required procedural flowpath is required to be taken by the US?

a) Take action per the ARP, without tripping the reactor, and then go to AOP 3560, *Loss of Service Water*. Then go to AOP 3561, *Loss of Reactor Plant Component Cooling Water* to continue mitigating the event.

b) Take action per the ARP, without tripping the reactor, and then go to AOP 3560, *Loss of Service Water*. Remain in AOP 3560 to continue mitigating the event.

c) Per the ARP, trip the reactor and go to E-0, *Reactor Trip or Safety Injection*. Then enter AOP 3560, *Loss of Service Water* in parallel with E-0. Then enter AOP 3561, *Loss of Reactor Plant Component Cooling Water* in parallel with E-0 to continue mitigating the event.

d) Per the ARP, trip the reactor and go to E-0, *Reactor Trip or Safety Injection*. Then enter AOP 3560, *Loss of Service Water* in parallel with E-0. Remain in E-0 and AOP 3560 to continue mitigating the the event.

Proposed Answer: A

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions and select Abnormal Operating Procedures based on decision points in the ARP for the specific event. Service Water System low pressure automatically starts the second pump in the affected train, and closes the SWP supply path to TPCCW. The SWP Low Pressure ARP directs the crew to start the second SWP Pump in the unaffected train, and place the affected train's pumps in Pull-To-Lock. "C" and "D" are wrong, since the ARP does not direct entry into E-0. "C" and "D" are plausible, since AOP 3560, step 1 directs the crew to trip the reactor and enter E-0 if both trains of Service Water are lost. Also, per the Millstone 3 EOP User's Guide, parallel use of EOPS and AOPs are allowed, and desired in events where they both apply. "A" is correct, and "B" wrong, since AOP 3560 will direct the crew to open AOV71B to restore cooling to TPCCW (to prevent a plant runback on high stator cooling temperature), and then transitions to AOP 3561, since RPCCW has no cooling on the affected train, and will restore cooling to the RCPs. "B" is plausible, since AOP 3560 takes further actions for a loss of service water if initial actions to restore flow in both trains are successful.

Technical Reference(s): OP 3353.MB1C (Rev. 6-3), 4-3 (Attach if not previously provided)

AOP 3560 (Rev. 8-1), steps 1 and 2

P&ID 133A (Rev. 44), B (Rev. 86), and D (Rev. 44)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07541 Given a set of plant conditions, determine the required actions to be taken per AOP 3560 (As available)

Question Source: New

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.5 and 43.5

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 90 | Tier # | | 2 |
| K/A Statement: Containment: | Group # | | 1 |
| Ability to perform specific system and integrated | K/A # | 103.2.1.23 | |
| plant procedures during all modes of operation | Importance Rating | | 4.4 |

Proposed Question:

A plant heatup is in progress per OP 3201, *Plant Heatup*, and the crew is preparing to enter MODE 4.

As part of preparations for ensuring the RCS Leak Detection Systems are OPERABLE inside Containment, the crew takes the following actions:

1. The crew places 3DAS-P10 (Containment Unidentified Leakage Sump Pump) in Automatic.
2. The crew ensures 3CMS-RE22 (Containment Atmosphere Particulate Monitor) is in service.

What other actions will be taken per OP 3312B, *Containment Atmosphere and Leak Monitoring System*, and OP 3335B, *Reactor Plant Aerated Drains*, to ensure the RCS Leak Detection Systems are OPERABLE inside Containment?

a) Ensure at least one CAR Fan is running; and place 3DAS-P2A and P2B (Containment Drains Sump Pumps) in Automatic.

b) Ensure at least one CAR Fan is running; and ensure 3CMS-RE22 (Containment Atmosphere Gaseous Monitor) is in service.

c) Ensure at least one CRDM Fan is running; and place 3DAS-P2A and P2B (Containment Drains Sump Pumps) in Automatic.

d) Ensure at least one CRDM Fan is running; and ensure 3CMS-RE22 (Containment Atmosphere Gaseous Monitor) is in service.

Proposed Answer: A

Explanation (Optional): Question is considered SRO level since it requires the applicant to apply Tech Spec Basis knowledge to determine operability. OP 3312B requires at least 1 CAR fan to be operating ("C" and "D" wrong) to ensure a representative sample is reaching the Containment Radiation Monitor. "C" and "D" are plausible, since one CRDM fan is required whenever the CRDMs are energized, or when RCS temperature is above 350°F, to provide vessel head and CRDM cooling. Tech Spec LCO 3.4.6.1 requires the Containment Atmosphere Particulate Monitor ("B" wrong, but plausible). "A" is correct, since OP 3335A places 3DAS-P10 and 3DAS-P2A and B in Auto, since either can be credited to meet LCO 3.4.6.1.

Technical Reference(s): OP3312B (Rev. 7-2), Prerequisite 2.1.2
OP 3335B (Rev. 14-1), sections 4.1.2 and 4.1.6
OP 3302A (Rev. 15-7), Precaution 3.1
Tech Spec LCO 3.4.6.1 (Amend 244) and Basis (LBDCR No. 07-M3-032 and 11-M3-004)
(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04249 Describe the major administrative or procedural precautions and limitations placed on the operation of the Containment structure and components and the Containment leakage monitoring system... (As available)

Question Source: New

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.43.2 and 45.5

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 91 | Tier # | | 2 |
| K/A Statement: Hydrogen Recombiner and | Group # | | 2 |
| Purge Control: Knowledge of conditions | K/A # | 017.GEN.2.2.38 | |
| and limits in the facility license | Importance Rating | | 4.5 |

Proposed Question:

A plant heatup is in progress, and RCS temperature is currently at 250°F and heating up normally.

In accordance with the FSAR, which Containment Purge System (HVU) and Containment Vacuum System (CVV) flowpath(s), if any, is/are required to be isolated; and which flowpath(s), if any, is/are allowed to be aligned to Containment in this operational MODE?

a) The HVU path, the CVV Air Ejector path, and the CVV Vacuum Pump path are required to be isolated from Containment.

b) The HVU path and the CVV Air Ejector path are required to be isolated, but the CVV Vacuum Pump path is allowed to be aligned to Containment.

c) The HVU path is required to be isolated, but the CVV Air Ejector path and the CVV Vacuum Pump path are allowed to be aligned to Containment.

d) The HVU path, the CVV Air Ejector path, and the CVV Vacuum Pump path are allowed to be aligned to Containment.

Proposed Answer: B

Explanation (Optional): Question is considered SRO level since it requires the applicant to apply Tech Spec Basis knowledge in lower operational modes. The Containment Purge System is used to purge Containment when shutdown. The Containment Vacuum System is used to draw initial vacuum in Containment on a heatup through the air ejector, and to maintain Containment vacuum with the plant operating, with the vacuum pumps. The Containment Vacuum System is also used to purge Containment during accident conditions if high Containment hydrogen concentrations exist. This method has replaced the use of Hydrogen Recombiners, which have been abandoned in place at Millstone 3. Based on RCS temperature, the plant is in MODE 4. The Containment Air Ejector path is used to perform initial containment drawdown, after which it is required to be isolated with its isolation valves locked closed to isolate Containment in the event of a LOCA ("C" wrong), while Containment Vacuum Pumps are used to maintain Containment pressure within its limits ( "A" wrong). The Containment Vacuum Pump path utilizes a Safety Grade portion of piping at the Containment penetration area that is isolated by a Containment Isolation Phase A signal and is designed for Containment pressure maintenance during normal operation. The Containment Purge System is to be started from the Control Room only during Cold Shutdown (MODE 5), and is required to be locked closed during plant operation since this path has not been demonstrated to be isolable on a LOCA or stem break ("B" correct, "D" wrong). "A", "C", and "D" are plausible, since the plant is in a lower MODE, and all three paths have Containment Isolation Valves.

Technical Reference(s): FSAR Section 9.4.7.3.3 (Rev. 26.1) (Attach if not previously provided)

FSAR Section 9.5.10.3 (Rev. 24.1)

Tech Spec Bases for 3/4.6.1.7 (NRC Letter A15710)

Tech Spec Bases for 3/4.6.5.1 (LBDCR 05-M3-028)

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 History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.1

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 92 | Tier # | | 2 |
| K/A Statement: Spent Fuel Pool Cooling: | Group # | | 2 |
| Ability to explain and apply system limits | K/A # | 033.GEN.2.1.32 | |
| and precautions | Importance Rating | | 4.0 |

Proposed Question:

Initial Conditions:

- The plant is at 100% power.
- A Spent Fuel Rod is being moved to a new location in the Spent Fuel Pool.
- All precautions and limits of OP 3305, *Fuel Pool Cooling and Purification*, have been verified to be met.

A transient occurs in the Spent Fuel Pool, and Fuel Pool parameters stabilize at the following:

- Fuel Pool temperature: 152°F
- Fuel Pool level: 36%

What limit(s) has/have been exceeded, what consequence exists, and what procedure is the US required to enter?

a) Fuel Pool temperature has exceeded the FSAR Fuel Pool long-term design temperature limit, but is still within the maximum peak temperature limit. The US will enter OP 3353.MB1A, 4-4, *Fuel Pool Temp Hi.*

b) Fuel Pool temperature has exceeded both the FSAR long-term design temperature limit and the maximum peak temperature limit. The US will enter OP 3353.MB1A, 4-4, *Fuel Pool Temp Hi.*

c) A Fuel Pool level is too low, and may not filter out the required 99% of the iodine that would be released if the fuel assembly is dropped. The US will enter OP 3353.MB1A, 3-4, *Fuel Pool Level Lo.*

d) A Fuel Pool level is too low, and may not maintain the dose rate at the surface of the Spent Fuel Pool less than the required 2.5 mrem per hour. The US will enter OP 3353.MB1A, 3-4, *Fuel Pool Level Lo.*

Proposed Answer: A

Explanation (Optional): Question is considered SRO level since it requires the applicant to have detailed knowledge of FSAR design information, and Tech Spec bases; as well as determine entry conditions for annunciator response procedures. "A" is correct, since Fuel Pool temperature has exceeded the long-term design limit of 150°F listed in FSAR 9.1.3.1, but not the maximum peak temperature limit of 200°F ("B" wrong). "B" is plausible, since temperature has exceeded the entry requirement for OP 3353.MB1A, 4-4 of 125°F, and the long term temperature limit. "C" and "D" are wrong, since fuel pool level is above the low-level entry condition for OP 3353.MB1A, 3-4 of 35%. "C" and "D" are plausible, since level is at the low end of the normal range, and the consequences listed are bases for minimum fuel pool level above the fuel in the storage racks, and the minimum level above the fuel rod being moved.

| | | |
|---|---|---|
| Technical Reference(s): | OP 3210B (Rev. 10-3), Precaution 3.14 | (Attach if not previously provided) |
| | OP 3305 (Rev. 21-7), Section 1.2, Precaution 3.1, and Att. 1 | |
| | Tech Spec Bases for 3 / 4.9.11 (LBDCR No. 06-M3-026) | |
| | FSAR 9.1.3.1 (Rev. 22-3), item 14 | |
| | OP 3353.MB1A (Rev. 3-2), 3-4 | |
| | OP 3353.MB1A (Rev. 3-2), 4-4 | |

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-056542 Describe the major Administrative or Procedural Precautions and Limitations placed on the operation of the Spent Fuel Pool Cooling System and the basis for each. | (As available) |

| | |
|---|---|
| Question Source: | New |
| Question History: | |
| Question Cognitive Level: | Comprehension or Analysis |
| 10 CFR Part 55 Content: | 55.43.1, 43.2, 43.5, and 43.7 |
| Comments: | |

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 93 | Tier # | | 2 |
| K/A Statement: Liquid Radwaste: | Group # | | 2 |
| Ability to apply Technical Specifications for a system | K/A # | 068.GEN.2.2.40 | |
| Proposed Question: | Importance Rating | | 4.7 |

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. It is discovered that liquid waste radiation monitor 3LWS-RE70 is no longer functioning.
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) A temporary monitor must be used with its alarm setpoint set more conservatively than the LWS70 setpoint to allow the operator sufficient time to manually stop the discharge in the event an alarm condition occurs.

b) Best efforts must be made to repair the instrument; and, at least two independent samples, independent release calculations, and independent discharge valve lineups must be performed prior to initiating the discharge.

c) Best efforts must be made to repair the instrument; the "A" LLWDT must be recirculated an additional 15 minutes, and independent discharge valve lineups must be performed prior to initiating discharge.

d) Samples must be taken every 15 minutes while the discharge is in progress, to verify the effluent is within Technical Specifications 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): | MP-22-REC-BAP01 (REMODCM) (Rev. 27-0), V.C.1, page 134<br>MP-22-REC-BAP01 (Rev 27-0), Table V.C.-1, pages 135 & 136 | (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 2009 NRC Exam |
| Question Cognitive Level: | Comprehension or Analysis |
| 10 CFR Part 55 Content: | 55.43.2, 43.4, and 43.5 |
| Comments: | |

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 94 | Tier # | | 3 |
| K/A Statement: Generic: | Group # | | 1 |
| Ability to perform specific system and integrated | K/A # | GEN.2.1.23 | |
| plant procedures during all modes of operation | Importance Rating | | 4.4 |

Proposed Question:

The Plant is in MODE 3 with a cooldown in progress in accordance with OP 3208, *Plant Cooldown*.

Due to a Tech Spec ACTION requirement, the crew is attempting to cooldown at the maximum rate allowed by the plant cooldown goal.

The following data has been logged over the last hour:

| TIME | RCS TEMP | RCS PRESS |
|---|---|---|
| 1500 | 550.0°F | 2075 psia |
| 1515 | 531.5°F | 1700 psia |
| 1530 | 513.0°F | 1500 psia |
| 1545 | 493.5°F | 1350 psia |
| 1600 | 474.0°F | 1125 psia |

What action, if any, is required to be taken with the cooldown at Time 1600?

a) Increase the cooldown rate, since it is below the plant cooldown goal.

b) Maintain current cooldown rate, since it is at the plant cooldown goal.

c) Decrease the cooldown rate, since it exceeds the plant cooldown goal, but not the Tech Spec limit.

d) Stop the cooldown, since it exceeds both the plant cooldown goal and the Tech Spec limit.

Proposed Answer: C

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions and to have detailed knowledge of Tech Spec Surveillance procedures to select a required course of action based on administrative limits and Tech Spec limits, based on a cooldown rate that is required to be checked both over the last hour and over the last 15 minutes, and limits that change based on RCS temperature. The administrative limit is 70 +/- 5°F in any one-hour period, or 1.25°F per minute (18.75°F in 15 minutes). The Tech Spec limit is 80°F/hr, or 1.33°F per minute (20°F in 15 minutes). Cooldown over the last hour was 76°F, and ΔT for current 15 minutes is 19.5°F in 15 minutes, or 1.30 °F/min. Based on plant conditions the Tech Spec limit is NOT being exceeded ("D" wrong), but the cooldown rate should be decreased to approx. 1.25°F/min to comply with the Admin limit ("C" correct, "A" and "B" wrong).

Technical Reference(s): SP 3601G (Rev. 9-0), step 4.2.3.d & e (Attach if not previously provided)
Form 3601G.2-001 (Rev. 5-4), pages 2 - 4
OP 3208 (Rev. 22-4), step 4.2.9.e

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07503 Given a set of plant conditions, determine the required actions to be taken per OP 3208. (As available)

Question Source: Bank 78941

Question History:

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 # 95 | Tier # | | 3 |
| K/A Statement: Generic | Group # | | 2 |
| Knowledge of | K/A # | GEN.2.1.35 | |
| fuel handling responsibilities of SROs | Importance Rating | | 3.9 |

Proposed Question:

Current Conditions:

- The plant is in MODE 6.
- Westinghouse Source Range Channel N31 is out of service for surveillance testing.
- Both Gammametrics Channels are OPERABLE.
- Both Fuel Building Exhaust Filter Trains are available.
- The "A" Train Fuel Bldg Filter is running, and the "B" Train is not running.
- The Fuel Building roll-up door is being intermittently opened under administrative control.
- Five hours ago, RHR flow was suspended for one hour to improve fuel pool visibility.
- RHR flow is currently 2500 gpm.

The refueling team has established communications with the control room, and has requested permission from the Refueling SRO to move the next fuel bundle from the fuel building to the core.

What condition requires the Refueling SRO to prevent recommencing fuel movement?

a) SR Channel N31 is required to be OPERABLE.

b) Both Fuel Building Filters are required to be running.

c) The Fuel Building roll-up door is required to be closed.

d) Residual Heat Removal System flow must be increased.

Proposed Answer: D

Explanation (Optional): Question is considered SRO level since it requires the applicant to know administrative requirements associated with refueling activities. "A" is wrong, since Gammametrics detectors can suffice for Source Range Counts. "A" is plausible, since the normal method of monitoring counts during refueling is Westinghouse SR NIS. "B" and "C" are wrong, but plausible, since one train of Fuel Bldg filters is run during refueling, and the Fuel Bldg rollup door is allowed to be open under administrative control. Tech Spec 3.9.12, which limited fuel building boundary breaches in MODE 6 under administrative control, and contained Fuel Building Filter requirements, has been deleted. "D" is correct, since RHR flow is allowed to be suspended for a maximum of one hour out of the previous 8 hours (this has been exceeded). Otherwise, the required RHR operating range is between 2,800 gpm and 4,000 gpm. "A", "B", and "C" are plausible, since each of these conditions are less than optimal.

Technical Reference(s): OP 3210B (Rev. 10-3), Prerequisites, especially 2.1.12 and 18; OP 3210B (Rev. 10-3), Precautions, especially 3.9 and 3.10 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-06495 Describe the Stop Work requirements with regards to fuel movement in accordance with EN 31007, Refueling Operations. (As available)

Question Source: Bank 78793

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.2, 43.4, 43.5, 43.6, and 43.7

Comments:

| | | | |
|---|---|---|---|
| Examination Outline Cross-reference: | Level | RO | SRO |
| Question # 96 | Tier # | | 3 |
| K/A Statement: Generic: | Group # | | 2 |
| Ability to determine operability and/or | K/A # | GEN.2.2.37 | |
| availability of safety related equipment | Importance Rating | | 4.6 |

Proposed Question:

Initial Conditions:

- The plant is in MODE 0.
- An "A" Train Electrical Outage is in progress.
- The "B" Spent Fuel Pool Cooling (SFC) Pump is in operation.
- An Electrician, carrying a beeper, is available to establish temporary power to the "A" SFC Pump.
- The "B" and "C" RPCCW Pumps are available.
- The "B" and "D" Service Water Pumps are available.

The "B" SFC Pump trips.

Is the "A" SFC Pump allowed to be credited for Shutdown Risk (SDR) Calculations; and can it be considered available for use in EOP 3505A, *Loss of Spent Fuel Pool Cooling*?

| | Credit for SDR | Available for use in EOP 3505A |
|---|---|---|
| a) | Yes | Yes |
| b) | Yes | No |
| c) | No | Yes |
| d) | No | No |

Proposed Answer: C

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions and determine equipment status based on both Shutdown Risk administrative requirements and on specific content of a 3500 series EOP. The "B" SFC Pump is available for EOP 3505A, since it does have its administrative requirements (electrician, 2 CCP pumps, and 2 SWP pumps) met ("B" and "D" wrong), but it is not credited for SDR, since it does not have its normal power supply available ("A" wrong, "C" correct). "A" is plausible, since the "A" SFC Pump does have its admin requirements met to use backup power. "B" and "D" are plausible, since normal power is not available, and there are several admin requirements needed to credit the pump.

| | | |
|---|---|---|
| Technical Reference(s): | OU-M3-201 (Rev.6-0), Att. 2, Page 4 | (Attach if not previously provided) |
| | EOP 3505A (Rev. 10-0), Att E | |

Proposed references to be provided to applicants during examination: None

| | | |
|---|---|---|
| Learning Objective: | MC-07622 Given a specific set of plant conditions, complete a shut down safety assessment check list using OU-M3-201, Shutdown Safety Assessment Checklist | (As available) |

| | |
|---|---|
| Question Source: | New |
| Question History: | |
| Question Cognitive Level: | Comprehension or Analysis |
| 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 the process used to track | K/A # | GEN.2.2.43 | |
| inoperable alarms | Importance Rating | | 3.3 |

Proposed Question:

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

1. The RO reports one annunciator fails to illuminate during the daily main board annunciator test.
2. I&C determines the annunciator is disabled, and a blue dot is placed on the annunciator window.

What administrative classification is required to be assigned to this annunciator; and what responsibility is specifically assigned to the Shift Manager in response to the disabled annunciator?

a) This is classified as an Operator Burden. The SM is responsible for determining the Reactivity Management Level classification, if required.

b) This is classified as an Operator Burden. The SM is responsible for ensuring the annunciator is identified as a contributor to the Ops Aggregate Impact.

c) This is classified as a Control Room Deficiency. The SM is responsible for determining the Reactivity Management Level classification, if required.

d) This is classified as a Control Room Deficiency. The SM is responsible for ensuring the annunciator is identified as a contributor to the Ops Aggregate Impact.

Proposed Answer: D

Explanation (Optional): Question is considered SRO level since it requires the applicant to know administrative processes specifically assigned to an SRO licensed individual for a disabled annunciator. A disabled annunciator is to be classified as a "Control Room Deficiency" and would only be considered an "Operator Burden" if it was to be established that Operators would be required to take significant compensatory actions during normal operations ("A" and "B" wrong, but plausible). The classification of this event is significant since it determines the point value to be assessed against the Ops Aggregate Impact (Operator Burden = 2 points, and Control Room Deficiency = 1 point). "C" is wrong, but plausible, since the Reactivity Management Level determination is the responsibility of the Reactivity Management Team. "D" is correct, since the SM responsibility is to ensure the annunciator is identified as a contributor to the Ops Aggregate Impact.

Technical Reference(s):
OP-AA-100 (Rev. 25-0), Att 6, Item 7
OP-AA-1700 (Rev. 6-0), Sections 5.2.1, 5.3.3, 5.3.5
OP 3353 (Rev. 8-3), Section 4.3
OPSTAT Database Instructions (4/1/09), Item 2, Note 3
(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-01956 Demonstrate compliance with Conduct of Operations, OP-AA-100 (As available)

Question Source: New

Question History:

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.43.3 and 43.5

Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 98 | Tier # | | 3 |
| K/A Statement: Generic: Ability to use radiation | Group # | | 3 |
| monitoring systems, such as fixed monitors, portable | K/A # | GEN.2.3.5 | |
| survey instruments, personnel monitoring equipment, etc. | Importance Rating | | 2.9 |

Proposed Question:

A small-break LOCA occurs, and Initial Conditions are as follows:

- An ALERT-Charlie 1 has been declared at Millstone 3.
- The CR-DSEO is preparing the Incident Report Form.
- The CR-DSEO is currently determining if the "Radiological Release in progress due to event" box is required to be checked on the IRF form.

The CR-DSEO gathers the following information from the Radiation Monitor Computer:

1. Gaseous Waste Effluent Monitor 3GWS-RE48 shows an increasing trend, but is NOT in ALERT.
2. ESF Bldg Normal Vent Exhaust Monitor 3HVQ-RE49 is in ALERT, but is NOT in ALARM.
3. RPCCW Radiation Monitor 3CCP-RE31 is in ALARM.
4. Containment Atmosphere Monitor 3CMS-RE22 is in ALARM.

In accordance with MP-26-EPI-FAP06, Classification and PARs, which one of these Radiation Monitors requires the CR-DSEO to select the "Radiological release in progress due to event" Box?

a) 3GWS-RE48 increasing trend.

b) 3HVQ-RE49 in ALERT

c) 3CCP-RE31 in ALARM

d) 3CMS-RE22 in ALARM

Proposed Answer: B

Explanation (Optional): Question is considered SRO level since it requires the applicant to interpret radiation readings as they pertain to making an appropriate reporting decision for a specific duty of an SRO licensed individual. The Radiation Monitor input to checking the block "Radiological release in progress due to event" is a gaseous effluent radiation monitor ("A" plausible) in ALERT ("B" correct, "A" wrong) or ALARM ("C" and "D" plausible). "C" and "D" are wrong, since these are not gaseous effluent monitors. "A", "C", and "D" are plausible, since RE48 is only in ALERT.

Technical Reference(s): MP-26-EPI-FAP06 (Rev. 8-0), Section 2.1.8 (Attach if not previously provided)
MP-26-EPI-FAP06 (Rev. 8-0), Att. 6

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-02534 The Shift Manager and Unit Supervisor will perform all administrative actions necessary to protect the public in accordance with emergency plan procedures. (As available)

Question Source: New

Question History:

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 fire protection procedures | K/A # | GEN.2.4.25 | |
| Proposed Question: | Importance Rating | | 3.7 |

With the plant initially at 100% power with the Fire Protection $CO_2$ System in its normal lineup, the following sequence of events occurs:

1. It is discovered that the pressure switch has failed that supplies the electrical auto-close signal to Electro-Thermal Link (ETL) fire damper (3HVR*DMPF142) between the East and West MCC/Rod Control Area.
2. The crew is preparing to lockout $CO_2$ to the East and West MCC/Rod Control Areas per OP 3341C *Carbon Dioxide Fire Protection System* to allow repairs.

What action is required with the East and West MCC/Rod Control Area Lockout Ball Valves to lock out $CO_2$ to the areas; and using **TRM 3.7.12.3, attached to this exam**, what fire watch requirement exists?

a) The normally closed Lockout Ball Valve needs to be locked. An hourly fire watch patrol is required for the East and West MCC/Rod Control Areas.

b) The normally closed Lockout Ball Valve needs to be locked. A continuous fire watch is required for the East and West MCC/Rod Control Areas.

c) The normally open Lockout Ball Valve needs to be closed and locked. An hourly fire watch patrol is required for the East and West MCC/Rod Control Areas.

d) The normally open Lockout Ball Valve needs to be closed and locked. A continuous fire watch is required for the East and West MCC/Rod Control Areas.

Proposed Answer: A

Explanation (Optional): Question is considered SRO level since it requires the applicant to apply Tech Spec/TRM actions based on specific plant conditions, as well as administration of fire protection program requirements. The US will direct the PEO to lock the normally closed lockout ball valves, since the MCC/RCA areas are manually actuated CO2 discharge areas ("C" and "D" wrong). "C" and "D" are plausible, since these areas were originally designed for automatic actuation, and are capable of being aligned for automatic actuation. Also, several areas are currently aligned for automatic operation. "A" is correct, and "B" wrong, since an hourly patrol is required for an inoperable CO2 area as long as its fire dampers are operable, and the fire damper will still close, even without the voltage signal, due to high temperature during a fire. "B" is plausible, since a continuous fire watch is required if the damper is inoperable, and there is a problem with its auto-close signal.

Technical Reference(s): OP 3341C (Rev. 16-9), Section 4.23 (Attach if not previously provided)
TRM 3.7.12.3 (LBDCR 07-MP3-018)

Proposed references to be provided to applicants during examination: **TRM 3.7.12.3**

| | | |
|---|---|---|
| Learning Objective: | MC-04587 Given a plant condition or equipment malfunction, use provided reference material to:<br>A. Determine entry conditions to applicable plant procedures<br>B. Evaluate Technical Specification applicability and determine required actions... | (As available) |

Question Source: Bank 85282
Question History: Millstone 3 2009 NRC Exam
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.43.1, 43.2, and 43.5
Comments:

| Examination Outline Cross-reference: | Level | RO | SRO |
|---|---|---|---|
| Question # 100 | Tier # | | 3 |
| K/A Statement: Generic: Knowledge of RO tasks performed outside the control room during an emergency, and resultant operational effects | Group # | | 4 |
| | K/A # | GEN.2.4.34 | |
| | Importance Rating | | 4.1 |

Proposed Question:

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

1. The crew enters EOP 3503, *Shutdown Outside Control Room.*
2. The extra Licensed Operator trips the Reactor Coolant Pumps at the Switchgear.
3. The crew is preparing to cooldown the RCS using EOP 3504, *Cooldown Outside Control Room.*
4. A PEO reports only the "A" CRDM cooling fan is available.

With the RCPs OFF and only 1 CRDM fan running, what action is the US required to direct?

a) The crew is required to go to ES-0.3, *Natural Circulation Cooldown With Steam Void in Vessel (with RVLMS),* and conduct the cooldown with subcooling GREATER THAN 132°F.

b) The crew is required to go to ES-0.3, *Natural Circulation Cooldown With Steam Void in Vessel (with RVLMS),* and conduct the cooldown at LESS THAN 50°F/hr.

c) The crew will remain in EOP 3504, align a reactor vessel head vent letdown path, and conduct the cooldown with subcooling GREATER THAN 132°F.

d) The crew will remain in EOP 3504, align a reactor vessel head vent letdown path, and conduct the cooldown at LESS THAN 50°F/hr.

Proposed Answer: D

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions and know the content of a 3500 series EOP to select a required course of action for the specific event. The extra licensed operator tripped the RCPs per EOP 3503, step 14. This action requires the crew to cooldown the plant at 50°F per hour, rather than the normal cooldown rate limit, to avoid allowing a steam bubble to form in the reactor vessel head. "A" and "B" are wrong, since ES-0.3 is used during natural circulation conditions when there is an urgency to reach Cold Shutdown conditions, and a bubble is intentionally allowed to grow in the head during the cooldown. "A" and "B" are plausible, since a natural circulation cooldown is in progress, and head cooling is limited without a second CRDM Cooling Fan. "D" is correct, since with one CRDM cooling fan available, the US will direct the crew to align the head vent path at the Aux Shutdown Panel to help cool the vessel head. "C" is wrong, but plausible, since the 132°F subcooling is only a requirement if the head vent path cannot be aligned during a cooldown in ES-0.2, *Natural Circulation Cooldown.*

Technical Reference(s): EOP 3503 (Rev. 15-3), step 14 (Attach if not previously provided)
EOP 3504 (Rev. 8-6), steps 4 and 6

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07511 Given a set of plant conditions, determine the required actions to be taken per EOP 3504. (As available)

Question Source: New

Question History:

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.5

Comments: