45 Day Submittal
"DRAFT"

ES-701 | SRO Written Examination Cover Sheet | Form ES-701-8

U.S. Nuclear Regulatory Commission

SRO Written Examination

Applicant Information	
Name:	
Date: **8/25/06**	Region: **I**
Facility/Unit: **Calvert Cliffs**	Reactor Type: **Combustion Engineering**
Start Time:	Stop Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. The passing grade requires a final grade of at least 80.00 percent. Examination papers will be picked up 4 hours after the examination begins.

Applicant Certification

All work done on this examination is my own. I have neither given nor received aid.

_____
Operator's Signature

Results	
Test Value	_____ Points
Applicant's Score	_____ Points
Applicant's Grade	_____ Percent

Bank Question: 76 Answer: D

1 Pt(s) Unit 1 was operating at 100% power when the 12A RCP seals began to degrade. Given the following events and conditions:

Time	0200	0205	0210	0215
Parameter				
Middle seal pressure (psig)	1430	1325	75	75
Upper seal pressure (psig)	785	50	50	50
Lower seal temperature (°F)	117	92	150	225
CBO temperature (°F)	110	115	125	205

Which one of the following statements correctly describes the (1) required time to trip the reactor, and (2) the diagnosis of the problem?

A. **(1) 0205**
(2) The middle RCP seal has failed

B. **(1) 0205**
(2) The upper RCP seal has failed

C. **(1) 0210**
(2) The upper and middle RCP seals have failed

D. **(1) 0215**
(2) The upper and middle RCP seals have failed

Distracter Analysis:

A. **Incorrect**: The reactor should not be tripped for one failed RCP seal. The upper seal has failed, not the middle seal.
Plausible: If the applicant does not recall the criteria for tripping the reactor for failed RCP seals.

B. **Incorrect**: The reactor should not be tripped for one failed RCP seal.
Plausible: If the applicant does not recall the criteria for tripping the reactor for failed RCP seals.

C. **Incorrect**: If the applicant does not recall the criteria for tripping the reactor for failed RCP seals.
Plausible: If 2 seals have failed, operators are directed to perform a controlled shutdown.

D. **Correct**: RCP seal bleedoff temperature exceeds 200°F. This value requires tripping the reactor per 1C06-ALM E-051

Level: SRO Exam

KA: SYS 003G2.4.6 (3.1/4.0)

Lesson Plan Objective: LOI-064B1-0 12.0 – Given a set of plant conditions, determine when conditions would require a manual reactor coolant pump trip. Also 9.0, 10.0 and 11.0

Source: New

Level of knowledge: comprehension

References:
1. 1C06-ALM E-51
2. LOI-064B1-0 slides 34, 40, 44, 47-49, 52, 56

003 Reactor Coolant Pump 2.4.6 Knowledge [of] symptom based EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13) 3.1/4.0

Bank Question: 77 Answer: C

1 Pt(s)

Unit 1 was operating at 100% power when a large-break LOCA occurred. Given the following events and conditions:

- Operators implemented EOP-5 (*Loss of Coolant Accident*) and had reached step AF (*Commence Shutdown Cooling*)
- Pressurizer level is 0 inches
- Core spray pumps are secured
- CET temperature = 275 °F

Which one of the following statements correctly describes the (1) mitigation strategy required to proceed to cold shutdown, and (2) the reason why 3000 gpm flow must be maintained through the core at this point?

A. (1) Initiate shutdown cooling using OI-3B (*Shutdown Cooling*). Implement AOP-3B (*Abnormal Shutdown Cooling Conditions*) to address any problems.
(2) To ensure sufficient cooling capacity to remove decay heat and minimize effects of a boron dilution event.

B. (1) Initiate shutdown cooling using OI-3B (*Shutdown Cooling*). Implement AOP-3B (*Abnormal Shutdown Cooling Conditions*) to address any problems.
(2) To prevent precipitation of boric acid in the reactor vessel following a break that is too large to allow the RCS to refill.

C. (1) Initiate alternate shutdown cooling by aligning the LPSI pump to take suction from the containment sump and inject into the RCS with part of the flow passing through the shutdown cooling heat exchangers.
(2) To ensure sufficient cooling capacity to remove decay heat and minimize effects of a boron dilution event.

D. (1) Initiate alternate shutdown cooling by aligning the LPSI pump to take suction from the containment sump and inject into the RCS with part of the flow passing through the shutdown cooling heat exchangers.
(2) To prevent precipitation of boric acid in the reactor vessel following a break that is too large to allow the RCS to refill.

Distracter Analysis:

A. **Incorrect**: For large-break LOCAs (with pressurizer level less than 100 inches) normal shutdown cooling cannot be initiated.
Plausible: If the LOCA was a small break LOCA, normal shutdown cooling would be directed. Partially correct – the bases for establishing 3000 gpm through the core is correct.

B. **Incorrect**: For large-break LOCAs (with pressurizer level less than 100 inches) normal shutdown cooling cannot be initiated.
Plausible: If the LOCA was a small break LOCA, normal shutdown cooling would be directed. The basis listed is the correct basis for the core flush (step AE) – which is the EOP step that immediately precedes step AF.

C. **Correct**: Right action – right basis

D. **Incorrect**: The basis for establishing the 3000 gpm flow through the core is incorrect.
Plausible: Partially correct – alternate shutdown cooling must be established rather than normal shutdown cooling. The basis listed is the correct basis for the core flush (step AE) – which is the EOP step that immediately precedes step AF.

Level: SRO Exam

KA: SYS 005G2.4.6 (3.1/4.0)

Lesson Plan Objective: 1.2.2 – "Recall the focus of operator response to various sizes of LOCAs". Note: although there is no specific lesson plan objective for this step in EOP-5, this question requires knowledge of the major action steps for EOP-5 and the bases for these steps. This has historically been required SRO-level knowledge. Note also that there is no lesson plan for AOP-3B, Loss of Shutdown Cooling. The K/A tests the knowledge of EOP (not AOP) mitigation strategies – so it was determined that we should test the choice of mitigation strategy #6 in the EOP-5 lessons plan.

Source: New

Level of knowledge: comprehension

References:
1. EOP-5 pages 83-84
2. EOP-5 Bases Document pages 81, 83

005 Residual Heat Removal 2.4.6 Knowledge symptom based EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13) 3.1/4.0

Bank Question: 78 Answer: D

1 Pt(s)

Unit 1 had completed a refueling outage and was in the process of heating up in preparing for a plant startup when RWT was refilled. Given the following events and conditions:

- RCS Tave = 195 °F
- RCS pressure = 150 psia
- RWT level = 453 inches on 1-LIA-4142 at 1C08
- The operators added 2300 gals to the RWT
- After the fill, RWT level = 456 inches

Which one of the following statements correctly describes (1) the status of the RWT, and (2) the required actions to continue the plant startup?

References Provided: RWT Tank Curve

A. (1) The RWT level increase is accounted for by the fill and Tech Specs are satisfied.
(2) Continue RCS heat up.

B. (1) The RWT level increase is NOT accounted for but Tech Specs are satisfied.
(2) Continue the RCS heatup and locate the leak on the RWT.

C. (1) The RWT level increase is accounted for by the fill but Tech Specs are NOT satisfied.
(2) Stop the heat up and restore RWT level.

D. (1) The RWT level increase is NOT accounted for by the fill and Tech Specs are NOT satisfied.
(2) Stop the heat up, restore RWT level and locate the leak in the RWT.

Distracter Analysis: Tech Spec surveillance 3.5.4.3 requires the RWT volume to be > 4000,000 gallons in modes 1-4. The plant is in mode 5. Tech Spec 3.0.4 precludes entering mode 4 until all mode 4 Tech Spec LCOs are satisfied. If the heatup continues, the plant will enter mode 4 when RCS Tave = 200 °F. Tech Spec LCO 3.5.4 is a one-hour LCO.

A. **Incorrect**: The RWT level increase is NOT accounted for and Tech Specs are NOT satisfied. Continuing the heat up will violate Tech Spec 3.5.4 Condition B – which has a 1 hour completion time.

Plausible: If the applicant fails to compute the level change correctly, does not recall the surveillance requirement for RWT level, or neglects the application of Tech Spec 3.0.4.

B. **Incorrect**: Tech Spec 3.5.4 condition B is exceeded. Cannot continue the heat up.
Plausible: Partially correct – the leakage is not accounted for. Applicants may misinterpret the Tech Specs because the LCO is not explicit. In order to determine that Tech Specs are not satisfied, the applicant must recognize that a 7-day surveillance on RWT level cannot be satisfied and must be satisfied prior to entry into mode 4.

C. **Incorrect**: The RWT level increase is not accounted for
Plausible: If the applicant fails to properly interpret the RWT tank curve – the rest of the information is correct.

D. **Correct**:

Level: SRO Exam

KA: SYS 006A2.03 (3.3/3.7)

Lesson Plan Objective: LOI 052-1 Objective 1.7 Recognize the following Tech Spec LCOs and bases or TRM and given a set of plant conditions apply LCO or TNC to determine the action or surveillance(s) required: …c. Refueling Water Sources – TS 3.5.4

LO 1.2 Recognize the minimum RWT level per OI-3A or 3B, to satisfy volume requirements of TS 3.5.4.

Source: Mod Q20465

Level of knowledge: analysis

References:
1. LOI-052-1 slide 20
2. Tech Spec 3.5.4
3. Tech Spec definition Table 1.1-1
4. Tech Spec 3.0.4
5. RWT Tank Curve
6. OI-03A page 8

006 Emergency Core Cooling A2 Ability to (a) predict the impacts of the following malfunctions or operations on the ECCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 45.5) A2.03 System leakage 3.3 3.7

Bank Question: 79 Answer: A

1 Pt(s) Unit 1 was being heated up per OP-1 (*Plant Startup from Cold Shutdown*). Given the following events and conditions:

- Tave = 518°F
- PZR pressure = 1760 psia and slowly rising
- All PZR heaters are energized
- PZR pressure control is in automatic with a setpoint of 2250 psia
- A main steam line rupture occurs in the turbine building
- 11 S/G = 650 psia
- 12 S/G = 750 psid
- The operators enter EOP-0 (Standard Post Trip Actions) and reach step E (*Verify Core and RCS Heat Removal Function is Satisfied*) which reads:

"E.1 Verify TURB BYP valves OR the ADVs operate to maintain the following:
- *S/G pressures between 850 and 920 PSIA*
- *Tcold between 525 and 535 °F"*

Which one of the following statements correctly describes (1) the ESFAS actuation(s) that would have occurred and (2) the reason why step "E" is implemented?

A. (1) SGIS will actuate to isolate the steam rupture - only
(2) Stabilize Tcold to reduce the effects of a large in-surge of cold water into the pressurizer

B. (1) SGIS will actuate to isolate the steam rupture - only
(2) To prevent pressurizer refill and RCS re-pressurization

C. (1) SGIS will actuate to isolate the steam rupture and AFAS block will actuate
(2) Stabilize Tcold to reduce the effects of a large in-surge of cold water into the pressurizer

D. **(1) SGIS will actuate to isolate the steam rupture and AFAS block will actuate**
(2) To prevent pressurizer refill and RCS re-pressurization

Distracter Analysis:

A. Correct:

B. **Incorrect**: The reason that operators are directed to stabilize Tcold is to reduce the effects of a large in-surge of relatively cold water into the pressurizer. This in-surge can have the immediate effect of compressing the pressurizer bubble, raising RCS pressure well above the saturation temperature of the pressurizer volume. If pressurizer level is subsequently lowered, the absence of saturated conditions will yield a rapid pressure reduction. If a relatively small cooldown has occurred, temperature may be capable of being stabilized near the lowest temperature.
Plausible: This is the basis for another step in EOP-04 ESDE

C. **Incorrect**: AFAS will not actuate – requires > 115 psid to actuate
Plausible: Partially correct – SGIS will actuate and the basis for this step is correct.

D. **Incorrect**: AFAS will not actuate – requires > 115 psid to actuate. The reason that operators are directed to stabilize Tcold is to reduce the effects of a large in-surge of relatively cold water into the pressurizer.
Plausible: Partially correct – SGIS will actuate. This is the basis for another step in EOP-04 ESDE

Level: SRO Exam

KA: SYS 013A2.02 (4.3/4.5)

Lesson Plan Objective: LOI 201-0-9 Objective 1.15 – Identify the operator actions during EOP-0 when an SGIS has terminated the cooldown

Source: Mod Q40987

Level of knowledge: comprehension

References:
1. LOI-201-0-9
2. EOP-0 page 14
3. EOP-0 Bases Document pages 23-24

013 Engineered Safety Features Actuation A2 Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations; (CFR: 41.5 / 43.5 / 45.3 / 45.13) A2.02 Excess steam demand 4.3 4.5

Bank Question: 80 Answer: D

1 Pt(s) Unit 2 had just completed a startup following a refueling outage. Given the following events and conditions:

- Reactor power = 7%
- The operators were in the process transitioning to the 21 SGFP per OI-12A (*Feedwater System*) step 6.15 (*Shifting Steam Supplies on a Loaded SGFP*)
- The 22 SGFP had not been started
- DFWCS is in manual mode
- As the operators shifted the steam supply from Unit 1 auxiliary steam to Unit 2 main steam, the following occurred:
  - SGFP speed decreased from 3300 rpm to 1200 rpm
  - 21 and 22 S/G levels dropped to –40 inches
  - The operators maximized AFW flow into the S/Gs
  - The operators implemented AOP-3G (*Malfunction of Main Feedwater System*)

Which one of the following statements correctly describes the required operator actions to (1) restore S/G water levels and (2) trip the reactor?

A. **(1) Immediately shift back to the Unit 1 auxiliary steam supply and promptly restore SG water levels. Withdraw control rods to maintain Tave > 515 °F.**
(2) Trip the reactor if Tave < 515°F.

B. **(1) Immediately shift back to the Unit 1 auxiliary steam supply and promptly restore SG water levels.**
(2) Trip the reactor if S/G level < 50 inches.

C. **(1) Reduce power and bypass condensate demineralizers to maintain SGFP suction pressure > 250 psig and Tcold on program. Allow S/G levels to slowly recover. Withdraw control rods to maintain Tave > 515 °F.**
(2) Trip the reactor if Tave < 515°F.

D. **(1) Reduce power and bypass condensate demineralizers to maintain SGFP suction pressure > 250 psig and Tcold on program. Allow S/G levels to slowly recover.**
(2) Trip the reactor if S/G level < 50 inches.

Distracter Analysis: In 1995, Unit 2 experienced an overfeeding event (LER 95-02) in which the events closely paralleled this question.

Operators shifted back to the auxiliary steam supply and overfed/overcooled the RCS. They withdrew control rods to raise Tave and got a reactor trip on "loss of load" because they exceeded 12% power. This is an SRO-level question because a dedicated SRO is stationed during feed pump startup to direct the CROs in operating the feedwater system because of the overfeeding/overcooling event.

A. **Incorrect**: Shifting back to the auxiliary steam supply will overspeed the SGFP and overfeed the S/G. Withdrawing control rods will raise reactor power and can cause a plant trip. MTC is very low at BOL and the effects of withdrawing control rods will be to raise power substantially while raising Tave relatively slowly.
Plausible: If the applicants are not familiar with the 1995 LER for S/G overfeed. These are the actions that they took during the event that exacerbated the problem. .

B. **Incorrect**: Shifting back to the auxiliary steam supply will overspeed the SGFP and overfeed the S/G. AOP-3G step V.B.2 and 3 require operators to open various condensate valves to maximize SGFP suction pressure and adjust reactor power to maintain Tcold on program and raise SGFP suction pressure > 250 psig.
Plausible: Partially correct – AOP-3G requires tripping the reactor if SG level < 50 inches

C. **Incorrect**: Withdrawing control rods will raise reactor power and can cause a plant trip. MTC is very low at BOL.
Plausible: 515°F is the minimum temperature for critical operations.

D. **Correct**: This is the correct sequence of actions required by AOP-3G.

Level: SRO Exam

KA: SYS 061A2.01 (2.5/2.6*)

Lesson Plan Objective: LOI-045E-1-1 Obj 7.0 Given conditions and a mode of DFWCS (Auto/Manual) identify the proper response of DFWCS.

Source: New

Level of knowledge: comprehension

References:
1. LOI-045A-1-1 slides 48, 74-77, 79-80, 85
2. AOP-3G pages 7-8, 16

061 Auxiliary/Emergency Feedwater A2 Ability to (a) predict the impacts of the following malfunctions or operations on the AFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) A2.01 Startup of MFW pump during AFW operation 2.5 2.6*

Bank Question: 81 Answer: D

1 Pt(s)

Unit 1 was operating at 100% power when the off-going shift realized that Tech Spec SR 3.4.9.2 for pressurizer water level had not been completed prior to the time it was due. Given the following events and conditions:

- SR 3.4.9.1 was due to be completed no later than 0200 8/25/06
- The overdue surveillance was first identified during shift change at 0630 on 8/25/06

Assuming the surveillance will be satisfactory when performed, which one of the following statements correctly describes the latest time that this surveillance can be completed without having to enter Tech Spec 3.4.9 LCO action condition "A"?

References Provided: Tech Spec 3.4.9

A. 0800 on 8/25/06

B. 1230 on 8/25/06

C. 0200 on 8/8/26/06

D. 0630 on 8/8/26/06

Distracter Analysis: SR 3.03 allows up to 24 hours for this surveillance to be completed before having to enter the applicable LCO. The 24-hour clock starts when the overdue SR is first discovered, not when it is due.

A. **Incorrect**: LCO 3.4.9 must be entered no later than 24 hours after the problem is discovered. This time extension is allowed per SR 3.0.3
Plausible: If the applicant thinks that the surveillance is due no later than the completion time for the condition. This time is 6 hours from the time the surveillance was missed. 6 hours is the required completion time for action condition "A".

B. **Incorrect**: LCO 3.4.9 must be entered no later than 24 hours after the problem is discovered. This time extension is allowed per SR 3.0.3
Plausible: This time is 6 hours form the time it was discovered. If the applicant is unaware of the 24 hour time extension for overdue surveillances.

C. **Incorrect**: LCO 3.4.9 must be entered no later than 24 hours after the problem is discovered. This time extension is allowed per SR 3.0.3
Plausible: This time is 24 hours from the time that the SR was missed.

D. **Correct**: *0630 8/25 + 24 hours = 0630 8/26.*

Level: SRO Exam

KA: SYS 011G2.2.22 (3.4/4.1)

Lesson Plan Objective: 20875 Recognize the relationship between LCOs, applicability, actions and surveillances.

Source: New

Level of knowledge: memory

References:
1. Tech Spec SR 3.0.3
2. Tech Spec 3.4.9

011 Pressurizer Level Control 2.2.22 Knowledge of limiting conditions for operations and safety limits. (CFR: 43.2 / 45.2) 3.4/4.1

Bank Question: 82 Answer: D

1 Pt(s) Unit 2 was reducing power in preparation for an outage. Given the following events and conditions:

- Linear Range NI Channel A had previously failed and was in "bypass"
- Linear range NI channel B had just failed high
- Linear range NI channels C and D were reading 16%
- Alarm 2C05 (*Loss of Load Channel Trip Bypass*) has annunciated

Which one of the following statements correctly describes (1) when the turbine can be tripped without causing a reactor trip, and (2) required action (if any) to comply with Tech Specs?

A. **(1) When NI channel "C" or "D" is less than 14%**
(2) Place NI channel B in trip within 1 hour prior to tripping the turbine

B. **(1) When NI channel "C" or "D" is less than 14%**
(2) Continue the shutdown and reduce power < 15%

C. **(1) When NI channels "C" and "D" are both less than 14%**
(2) **Place NI channel B in trip within 1 hour prior to tripping the turbine**

D. **(1) When NI channels "C" and "D" are both less than 14%**
(2) Continue the shutdown and reduce power < 15%

Distracter Analysis: The "at Power" reactor trip is only required in mode 1 (>15% RTP). Once in mode 2, there are no tech spec actions that are required.

A. **Incorrect**: Coincidence is 3 or 4 linear range NIs for unblocking the at power reactor trip. With NI channel B failed high, both channels C and D are required to bypass this trip.
Plausible: If the applicant does not recognize that the at-power turbine trip/reactor trip is not required in mode 2 and thinks that the coincidence logic is less than 3 of 4 channels. Placing channel B in trip within 1 hour is required by Tech Spec 3.3.1 if the reactor remains in mode 1.

B. **Incorrect**: Coincidence is 3 or 4 linear range NIs for unblocking the at power reactor trip. With NI channel B failed high, both channels C and D are required to bypass this trip.

Plausible: Partially correct – reducing power to enter mode 2 will comply with Tech Specs.

C. **Incorrect**: There is no requirement to place NI channel B in trip before reducing power < 14%.
Plausible: Partially correct – NI channels C and D are required to be < 14% in order to make up the 3 of 4 NI channels to auto-bypass the at power turbine trip /reactor trip.

D. **Correct**:

Level: SRO Exam

KA: SYS 035A2.02 (4.2/4.4)

Lesson Plan Objective: 17972 Given a reactor power level, determine whether the loss of load trip is enabled [SOER-83-8] (A3.06) task 8

Source: Mod Q20165

Level of knowledge: comprehension

References:
1. Tech Spec 3.3.1
2. LOI 58-A1-01 slides 37-40
3. SD-058 page 17, Figure 15-8

035 Steam Generator A2 Ability to (a) predict the impacts of the following malfunctions or operations on the SGS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5) A2.02 Reactor trip/turbine trip 4.2 4.4

Bank Question: 83 Answer: A

1 Pt(s) Unit 1 was operating at 100% when a fish kill occurred and fouled the traveling screens. Given the following events and conditions:

- D/P on the 16A and 16B screens rises rapidly to 60 inches psid
- The water level behind the traveling screens is 0 feet
- Condenser vacuum is holding steady at 26 inches Hg

Which one of the following statements correctly describes (1) the immediate danger if the problem is not addressed and (2) the required actions in AOP-7L (*Loss of Intake Structure*) to mitigate the situation?

A. (1) The traveling screens will fail at 60 inches d/p
(2) Trip the 16 CW pump.

B. (1) The 16 CW pump will lose suction 0 feet
(2) Immediately lower the 1-SW-109/110 sluice gates on the 15/16CW pump inlet bays

C. (1) The traveling screens will fail at 60 inches d/p
(2) Trip the 16 CW pump and immediately lower the 1-SW-109/110 sluice gates on the 15/16CW pump inlet bays

D. (1) The 13 SW and 16 CW pumps will lose suction 0 feet
(2) Trip the 13 SW and 16 CW pumps

Distracter Analysis:

A. **Correct**:

B. **Incorrect**: The 16 CW pump is not in danger of losing suction until water level lowers to –4 feet. Tripping the 16 CW pump is required by AOP-7L in order to save the traveling screens from structural failure at >60" d/p and injection of trash into the condensers.
Plausible: If the applicant does not recognize that lowering the sluice gates will have no effect on the 16 CW pump suction and will isolate inlet water sources for the 13 SW pump. Lowering sluice gates is not an action required by AOP-7L.

C. **Incorrect**: The 16 CW pump is not in danger of losing suction until –4 feet. Lowering the sluice gates will have no effect on the 16 CW pump suction and will isolate inlet water sources for the 13 SW pump.
Plausible: Partially correct – tripping the 16 CW pump is the correct action.

D. **Incorrect**: The 13 SW and 16 CW pumps will not lose suction until water level drops to –4 ft. Tripping the 13 SW is not a required action per AOP-7L for this condition.
Plausible: Partially correct – if the danger were a loss of suction, tripping the pumps would be appropriate.

Level: SRO Exam

KA: SYS 075A2.01 (3.0*/3.2)

Lesson Plan Objective: 23430 Recognize the actions required for excessive traveling screen D/P

Source: Mod Q20040

Level of knowledge: memory

References:
1. AOP-7L page 26
2. LOI-042-1-1 slides - 86, 90, 92, 97SD-012 pages 1-2, 5-6

075 Circulating Water A2 Ability to (a) predict the impacts of the following malfunctions or operations on the circulating water system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) A2.01 Loss of intake structure 3.0* 3.2

Bank Question: 84 Answer: A

1 Pt(s) Unit 2 was operating at 100% when the operators noted that VCT level was dropping. Given the following events and conditions:

- AOP-2A (*Excessive Reactor Coolant Leakage*) has been implemented
- Acoustic monitors ERV-402 and RV-200 indicate 0.1
- Quench tank pressure and temperature were rising slowly
- PORV block valves 402-MOV and 404-MOV were shut
- The 21 charging pump is running
- Pressurizer level = 216 inches - holding steady
- Pressurizer pressure = 2250 psia - holding steady
- Letdown flow = 32 gpm
- Acoustic monitor indication and quench tank parameters remain the same

Which one of the following statements correctly describes (1) the direction to be given to the RO and CRO, and (2) the reason for this mitigation strategy?

A. (1) Place the Unit in cold shutdown per OP-3, OP-4 and OP-5
(2) An orderly plant shutdown is preferable to avoid stress on plant systems and components from high power

B. (1) Isolate letdown by closing 2-CV-515/516 and observe pressurizer level
(2) To reduce inventory loss and attempt additional leak isolation

C. (1) Raise RCS pressure to 2350 psia and observe acoustic monitors
(2) To reseat the leaking relief valve and stop the leak

D. (1) Trip the reactor and implement EOP-0
(2) The leak is greater than allowable limits for a normal shutdown

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Distracter Analysis: K/A Match Analysis – while the K/A states "EOP mitigation strategies", the K/A catalogue does not differentiate between AOPS and EOPs. There are no K/A that test AOPs. A search of the term "AOP" in the K/A catalogue discovers nothing. This question tests the applicant's knowledge of when to trip the reactor (an EOP mitigation strategy) or when to commence a normal shutdown. The answer is to conduct a normal shutdown.

A. **Correct**:

B. **Incorrect**: Although leak isolation is directed by AOP-2A, the closure of the PORV block valve has failed to isolate the leak. The only other possible source of the leak is a pressurizer relief valve which is unisolable. Leak isolation has been effectively attempted and was unsuccessful
Plausible: This is the next step in AOP-2A. If the applicant does not understand the sequence of closing the PORV black valve and observing acoustic monitors and quench tank parameters.

C. **Incorrect**: Raising pressure is not in accordance with plant procedures.
Plausible: This could be considered a "special test" and may be an engineering solution but cannot be attempted by the shift crew. It is not directed by AOP-2A

D. **Incorrect**: Tripping the reactor is not required until the leak rate is is greater than the capacity of 2 charging pumps
Plausible: If the applicant is not aware of the requirements or intent of AOP-2A.

Level: SRO Exam

KA: APE 000008G2.4.6 (3.1/4.0)

Lesson Plan Objective: 19071 - Given plant conditions indicating an RCS leak, the licensee candidate shall quantify leakage then direct and/or implement the applicable actions to mitigate the event in progress.

Source: Mod Q20550

Level of knowledge: comprehension

References:
1. AOP-2A 7, 10-13
2. SOP-2A basis document pages 8, 15, 18
3. SD-064D pages 22-23

000008 Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open) 2.4.6
Knowledge symptom based EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13) 3.1/4.0

Bank Question: 85 Answer: A

1 Pt(s) Unit 1 was operating at 100% power when loss of offsite power and a small break LOCA occurred. Given the following events and conditions:

- Containment pressure peaked at 5 psig
- The 1B DG failed to start
- The 11 containment air cooler (CAC) was running in slow speed
- The 12 CAC was running in fast speed
- The 11 SRW pump failed to start and the 11 SRW header was idled

Which one of the following statements correctly describes (1) the expected CAC fan speed and the reason for this speed under these conditions, and (2) the actions required for CAC alignment?

A. (1) The 11 CAC is operating as expected. The air coolers are required to operate in slow speed to reduce D/G loading and prevent overloading the fan motor.
(2) Start the 13 SRW pump on the 11 SRW header and shift the 12 CAC to slow speed.

B. (1) The 11 CAC is operating as expected. The air coolers are required to operate in slow speed to prevent overheating the 1A DG SRW system.
(2) Start the 13 SRW pump on the 11 SRW header and shift the 12 CAC to slow speed.

C. (1) The 12 CAC is running as expected. The air cooler is required to run in fast speed to remove the design bases accident heat loads from containment.
(2) Shift the 11 CAC to fast speed and start the 13 SRW pump on the 11 SRW header.

D. (1) The 12 CAC is running as expected. The air cooler is required to run in fast speed to remove the design bases accident heat loads from containment.
(2) Do NOT reestablish flow in the 11 SRW header to prevent severe water hammer in the CACs.

Distracter Analysis:

A. **Correct**: CAC Fans should operate in slow speed following a SIAS. The original design for shift to slow speed was to prevent motor overload in a steam-water environment. However, the design bases

now included limiting the D/G loading during a SIAS. The 12 CAC should be shifted to slow speed. Reestablishing flow through the 12 SRW header is required as long as

B. **Incorrect**: The reason for shifting the fan coolers to slow speed during a SIAS is to limit D/G loading and prevent fan motor overload
Plausible: The reason for throttling the inlet valves to the containment air coolers during a SIAS is because analysis has shown that higher cooling water flows to the CACs may result in SRW inlet temperature to the DG coolers of 105°F.

C. **Incorrect**: The containment fan coolers should be running in slow speed after a SIAS.
Plausible: Running in fast speed would remove more heat from containment. If the applicant thinks that this is correct with the 13 and 14 CACs out of service due to the 1B DG failure to start. Also step G.1.a has operators start all CACs in hugh speed if SIAS has not actuated.

D. **Incorrect**: Both 11 and 12 CACs should run in slow speed during a SIAS.
Plausible: There is a precaution that SRW flow to the CACs should not be reestablished unless containment pressure has remained < 10 psig to avoid severe water hammer to the CAC. However, containment pressure has remained less than 25 psig so the caution does not apply. Note that EOP-5 leaves the CACs running even if SRW flow is not supplied to prevent local H2 accumulation.

Level: SRO Exam

KA: EPE 000009G2.4.6 (3.1/4.0)

Lesson Plan Objective: 18209 Recall the bases for shifting CACs to slow speed during a pressurization event (Steam Line Break or LOCA) in containment

Source: Mod Q20400

Level of knowledge: memory

References:
1. LOI-052-3-2 slides 35, 38
2. EOP-5 pages 16, 18
3. EOP-5 Bases Document pages 32-34

000009 Small Break LOCA / EA2 Ability to determine or interpret the following as they apply to a small break LOCA: (CFR 43.5 / 45.13) EA2.19 Containment air cooler run indication 2.7 3.1

Bank Question: 86 Answer: C

1 Pt(s) Unit 2 experienced a small break LOCA. Given the following events and conditions:

- The operators completed EOP-0 (*Post Trip Immediate Actions*) and transitioned to EOP-5 (*Loss of Coolant Accident*)
- Subcooling margin = -5°F
- There is indication of a void in the reactor vessel head

Which one of the following statements correctly describes the reactor vessel level monitoring system (RVLMS) indication under these conditions?

A. RVLMS is accurate for both vessel level and level trending information when RCPs are operating

B. RVLMS is accurate only for vessel level information when RCPs are operating

C. RVLMS is accurate for both vessel level and level trending information when RCPs are NOT operating

D. RVLMS is accurate for both vessel level and level trending information whether or not RCPs are operating

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Distracter Analysis: K/A Match Analysis: The EPG (CEN-152) contains this general precaution. CCNP Has determined that this precaution need not be repeated in EOP-5 because the operators are well trained in this area. This questions tests the effectiveness of that training. Although there is no explicit precaution in EOP-5, the fact that it exists in CEN-152 and was eliminated from EOP-5 makes this a good area for testing. This meets the spirit of the K/A because it would be a precaution if CCNP had not deviated from CEN-152. I was not able to locate where this knowledge was covered in the training program – but it is important.

A. **Incorrect**: RVLMS is only accurate for vessel level indication when RCPs are NOT running.
Plausible: Partially correct - RVLMS can be used to trend vessel level accurately when RCPs are operating

B. **Incorrect**: RVLMS is only accurate for vessel level indication when RCPs are NOT running.
Plausible: If the applicant reverses the precaution (level accuracy vs. trending accuracy) for RVLMS.

C. **Correct**:

D. **Incorrect**: RVLMS is only accurate for vessel level indication when RCPs are NOT running.
Plausible: If the training program has not emphasized this precaution in CEN-152.

Level: SRO Exam

KA: EPE 000011G2.1.32 (3.4/3.8)

Lesson Plan Objective: none – Unable to locate learning objective for this knowledge

Source: New – unable to locate any questions to test mastery

Level of knowledge: memory

References:
1. EOP-5 Bases Document page 17

000011 Large Break LOCA / 3 2.1.32 Ability to explain and apply all system limits and precautions. (CFR: 41.10 / 43.2 / 45.12) 3.4/3.8

Bank Question: 87 Answer: B

1 Pt(s) Which one of the following statements correctly describes the systems/components in the plant-specific accident analysis that have been specifically credited to prevent exceeding the 2500 psia plant pressure safety limit in Tech Spec 2.1 (*Safety Limits*)?

A. PZR PORVs, PZR safety valves, and the PZR high pressure Rx trip,

B. S/G safety valves, PZR safety valves, and the PZR high pressure Rx trip

C. PZR PORVs, PZR spray valves and PZR safety valves

D. PZR PORVs, S/G safety valves and PZR safety valves

Distracter Analysis: K/A Match Analysis: The K/A tests knowledge of safety limits. At the SRO level, this knowledge includes the bases for these limits, which delineates the systems and components credited in the accident analysis.

A. **Incorrect**: PZR PORVs are not credited
Plausible: Partially correct – PZR safety valves and PZR high pressure reactor trip are credited. The PZR PORV will actuate to reduce pressure to prevent the safety valves from being challenged.

B. **Correct**:

C. **Incorrect**: PZR PORVs and spray valves are not credited
Plausible: PZR safety valves are credited – PZR PORVs and spray valves actuate to control pressure but are not credited in the accident analysis

D. **Incorrect**: PZR PORVs are not credited.
Plausible: S/G and PZR safety valves are credited in the accident analysis.

Level: SRO Exam

KA: APE 000027G2.2.22 (3.4/4.1)

Lesson Plan Objective: 20884 - Recall the initial license class memorization requirements for tech specs – All LCO conditions and actions to be taken within 1 hour. *Note that while the power distribution safety limits are covered in detail, there were no similar objectives or questions for the RCS pressure safety limit.*

Source: New

Level of knowledge: memory

References:
1. Tech Spec Bases Document 2.1.2 pages 2.1.2-1 and 2
2. Tech Spec 2.1

000027 Pressurizer Pressure Control System Malfunction / 3 2.2.22 Knowledge of limiting conditions for operations and safety limits. (CFR: 43.2 / 45.2) 3.4/4.1

Bank Question: 88 Answer: D

1 Pt(s) Unit 1 was operating at 100% power when a loss of offsite power occurred. Given the following events and conditions:

- The 1A DG failed to start and energize the 11 4 KV bus
- The 1B DG started but failed to energize the 14 4 KV bus – there is indication of a bus fault on the 14 4KV bus
- The operators implemented EOP-7 (*Station Blackout*) and have reached step "I" (*Attempt to Restore Power to at Least one 4KV Bus*)
- Alarms *SGIS A/B BLOCK PERMITTED* annunciated
- Alarms *PZR PRESS BLOCK A/B PERMITTED* annunciated

Which one of the following statements correctly describes (1) the required actions for SGIS and SIAS (this action will be required later in step "M"), and (2) the preferred order for restoring power to a safety bus?

A. (1) Do NOT block SGIS or SIAS until step "M" has been reached in EOP-7
(2) Order: 1st – 1A or 1B D/Gs, 2nd – OC D/G, 3rd – Offsite Power from SMECo

B. (1) Do NOT block SGIS or SIAS until step "M" has been reached in EOP-7
(2) Order: 1st – 1A D/Gs, 2nd – OC D/G, 3rd – Offsite Power from SMECo

C. (1) Block SGIS and SIAS in advance of reaching step "M"
(2) Order: 1st 1A D/G, 2nd Offsite Power from SMECo, 3rd 0C D/G

D. (1) Block SGIS and SIAS in advance of reaching step "M"
(2) Order: 1st 1A D/G, 2nd 0C D/G, 3rd Offsite Power from SMECo

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Distracter Analysis:

A. **Incorrect**: SGIS and SIAS should be blocked in advance of reaching this step "M". Power should not be restored from the 1B D/G because it has a potential fault on the 14 KV bus.
Plausible: If the applicant is not aware of the rules of usage for EOP steps and does not recognize that the 1B D/G fault precludes restoration of power.

B. **Incorrect**: SGIS and SIAS should be blocked in advance of reaching this step "M".
Plausible: The order for restoration of power is correct

C. **Incorrect**: Power should be restored from the 0C D/G preferentially before restoring from SMECo
Plausible: Partially correct – all other parts of the question are correct

D. **Correct**:

Level: SRO Exam

KA: EPE 000055EA2.03 (3.9/4.7)

Lesson Plan Objective: 19140 – Given a station blackout condition identify in order of priority the power sources available to reenergize at least one 4 KV bus. LOI-201-7 Objective 7 – Recall why SIAS should be blocked when received during a station blackout.

Source: New

Level of knowledge: memory

References:
1. LOI-201-7 slides 7, 39, 55-59
2. EOP-7 pages 18-22, 27

000055 Station Blackout / 6 EA2 Ability to determine or interpret the following as they apply to a Station Blackout: (CFR 43.5 / 45.13) EA2.03 Actions necessary to restore power 3.9 4.7

Bank Question: 89 Answer: A

1 Pt(s) Unit 1 was operating at 100% power when a 120 VAC instrument bus deenergized due to a breaker fault. Given the following events and conditions:

- 1Y01 deenergized when workers inadvertently tripped the supply break on the bus. They immediately reported their error to the control room.
- The operators implemented AOP-7J (*Loss of 120 volt Vital AC or 125 Volt Vital DC Power*)
- Letdown has been isolated
- The operators had reached step V.A.7 which reads:

7. Operate the selected charging pump as necessary to maintain PZR level within 15 inches of programmed level, **NOT** to exceed 225 inches.

Which one of the following statements correctly describes (1) the decision to immediately restore power to 1Y01, and (2) the reason why the expanded control band is provided for pressurizer level?

A. (1) Power can be restored immediately by closing the supply breaker to 1Y01.
(2) To minimize charging pump starts to limit transient on the loop charging nozzles.

B. (1) Power can be restored immediately by closing the supply breaker to 1Y01.
(2) To obtain better control of pressurize pressure with auxiliary spray.

C. (1) Power cannot be restored until after the 1Y01 bus has been thoroughly checked for faults by maintenance and evaluated by engineering.
(2) To minimize charging pump starts to limit transient on the loop charging nozzles.

D. (1) Power cannot be restored until after the 1Y01 bus has been thoroughly checked for faults by maintenance and evaluated by engineering.
(2) To obtain better control of pressurize pressure with auxiliary spray.

Distracter Analysis: K/A match analysis: Caution B.1 in AOP-7J states: "*To prevent common failures, buses should NOT be re-energized until the cause of the power loss has been determined by circuit functional tests performed by the Maintenance Group.*" This question tests the application of this caution and the caution that precedes step V.B.7.

A. **Correct**:

B. **Incorrect**: The reason for allowing an expanded control band for PZR pressure is to minimize thermal cycling of the loop charging nozzles. With letdown isolated, the charging water is not preheated prior to injection into the loop.
Plausible: Auxiliary spray is used to control PZR pressure because the spray valves have lost power – but expanding the PZR level control band does not enhance this effort.

C. **Incorrect**: Power may be restored to the bus immediately because the cause of the loss of power is known (breaker tripped inadvertently) and there is no concern for bus faults.
Plausible: The applicant may think that immediate restoration of power will not allow the controlled restoration of plant systems lost when the bus was deenergized. Partially correct – the reason for an expanded pressurizer level control band is correct.

D. **Incorrect**: Power may be restored to the bus immediately because the cause of the loss of power is known (breaker tripped inadvertently) and there is no concern for bus faults. The reason for allowing an expanded control band for PZR pressure is to minimize thermal cycling of the loop charging nozzles. With letdown isolated, the charging water is not preheated prior to injection into the loop.
Plausible: The applicant may think that immediate restoration of power will not allow the controlled restoration of plant systems lost when the bus was deenergized. Auxiliary spray is used to control PZR pressure because the spray valves have lost power – but expanding the PZR level control band does not enhance this effort.

Level: SRO Exam

KA: APE 000057G2.1.32 (3.4/3.8)

Lesson Plan Objective: 17853 - Given a loss of 120 volt AC bus, implement the necessary actions to mitigate the plant transient and restore power to the affected [sic] plant equipment per AOP-7J.

Source: New

Level of knowledge: comprehension

References:
1. AOP-7J pages 5, 9
2. AOP-7J Bases document pages 5, 8

000057 Loss of Vital Ac Elec. Inst. Bus. / 6 2.1.32 Ability to explain and apply all system limits and precautions. (CFR: 41.10 / 43.2 / 45.12) 3.4/3.8

Bank Question: 90 Answer: C

1 Pt(s) Unit 1 was operating at 100% power when CEA #1 in reg group 5 was noted to be out of alignment by -10 inches. Given the following events and conditions:

- The operators implemented AOP-1B (*CEA Malfunction*)
- CEA #1 appeared to be intermittently sticking and was determined to be "untrippable"
- While AOP-1B rod realignment was in progress, reactor engineering determined that all CEAs in reg group 5 were "untrippable" but moveable.

Which one of the following statements correctly describes the required actions in AOP-1B?

A. Ensure all CEAs in reg group 5 are properly aligned within 1 hour and notify reactor engineering of the problem. Control T_{cold} on program by adjusting turbine power and await further directions.

B. Reduce power below 70% within 1 hour and perform SR 3.1.4.1 (Verify CEA Positions). Notify reactor engineering if any 2 CEAs are misaligned by more that 15 inches from their group and await further directions.

C. Commence a rapid shutdown per OP-3 (*Normal Power Operation*) Appendix B (*Rapid Power Reduction*). Trip the reactor if any 2 CEAs are out of alignment by more than 15 inches from their group.

D. Trip the reactor and enter EOP-0 (*Post Trip Immediate Actions*)

Distracter Analysis: Tech Spec 3.1.4 allows up to 6 hours to be in mode 3 if one or more CEAs are untrippable or two or more CEAs are misaligned by > 15 inches. However, AOP-1B requires a rapid down power if 2 or more CEAs are untrippable and a reactor trip if 2 or more CEAs are misaligned by > 15 inches.

A. **Incorrect**: With 2 CEAs deemed to be untrippable the reactor must be shutdown.
Plausible: If the applicant does not recall the requirement to shutdown the reactor for 2 untrippable CEAs. Tech Spec 3.1.4

allows 6 hours to be in mode 3 but AOP-1B requires an immediate shutdown.

B. **Incorrect**: If 2 or more CEAs are misaligned by > 15 inches, the reactor shall be tripped in accordance with AOP-1B.
Plausible: A reactor shutdown is required per AOP-1B but Tech Spec 3.1.4 allows 6 hours completion time before having to be in mode 3.

C. **Correct**: This is the correct action per AOP-1B.

D. **Incorrect**: A rapid down power is required per AOP-1B. A reactor trip is not required unless 2 or more CEAs are out of alignment by > 15 inches.
Plausible: With all reg group 5 CEAs untrippable; this would seem to be a serious situation requiring a reactor trip.

Level: SRO Exam

KA: APE 000005AA2.03 (3.5/4.4)

Lesson Plan Objective: 19068 – Given CEA status determine the required actions per AOP-1B and Tech Specs.
Also 19066 – Recognize the conditions which would require a reactor trip

Source: New

Level of knowledge: memory

References:
1. AOP-1B page 18
2. Tech Spec 3.1.4 page 3

000005 Inoperable/Stuck Control Rod / 1 AA2. Ability to determine and interpret the following as they apply to the Inoperable / Stuck Control Rod: (CFR: 43.5 / 45.13) AA2.03 Required actions if more than one rod is stuck or inoperable 3.5 4.4

Bank Question: 91 Answer: D

1 Pt(s) Which one of the following statements correctly describes the Tech Spec limiting condition of operations (LCOs) that are applicable to the remote safe shutdown system instrumentation?

A. The remote safe shutdown instrumentation LCOs have been deleted in Tech Specs. Tech Spec 3.3.2 (*RPS Instrumentation – Shutdown)* now provides the necessary LCOs to ensure the remote safe shutdown instrumentation remains operable.

B. The remote safe shutdown instrumentation LCOs have been deleted in Tech Specs. Tech Spec 3.3.10 (*PAM Instrumentation*) now provides the necessary LCOs to ensure the remote safe shutdown instrumentation remains operable.

C. The remote safe shutdown instrumentation LCOs are contained in Tech Spec 3.3.11 (*Remote Safe Shutdown Instrumentation*) and implementing SA-1-102 will NOT address these LCOs.

D. The remote safe shutdown instrumentation LCOs are contained in Tech Spec 3.3.11 (*Remote Safe Shutdown Instrumentation*). However, implementing SA-1-102 will address these LCOs.

Distracter Analysis:

A. **Incorrect**: Tech Spec 3.3.11 provides the LCOs associated with the remote safe shutdown system
Plausible: Tech Spec 3.3.2 applies in modes 3-5. Tech Spec 3.3.11 applies in modes 1-3.

B. **Incorrect**: Tech Spec 3.3.11 provides the LCOs associated with the remote safe shutdown system.
Plausible: Tech Spec 3.3.10 PAM Instrumentation does provide guidance for post accident functions – but not for the remote safe shutdown system

C. **Incorrect**: All Tech Spec 3.3.11 and TRM requirements and LCO will be addressed if SA-1-102 is implemented.
Plausible: If the applicant is not aware of the purpose for creating SA-1-102

D. **Correct**:

Level: SRO Exam

KA: APE 000067G2.2.22 (3.4/4.1)

Lesson Plan Objective: 18795 - Determine contingencies required for removing Appendix R equipment from service.
Also 20876 – Given a mode of operation and a set of equipment conditions, identify applicable Tech Spec Conditions

Source: New

Level of knowledge: memory

References:
1. Tech Spec 3.3.11
2. LOI-202-9A-11 slide 71

000067 Plant Fire On-site / 9 2.2.22 Knowledge of limiting conditions for operations and safety limits. (CFR: 43.2 / 45.2) 3.4/4.1

Bank Question: 92 Answer: C

1 Pt(s) Unit 2 was operating at 100% power when a loss of offsite power occurred. Given the following events and conditions:

- The RCPs tripped and a loss of all RCS flow occurred
- The 2B DG failed to start
- The main steam header from the 21 S/G experienced a double-ended guillotine shear inside containment.
- The S/G blowdown caused an overcooling event in the RCS
- The operators completed EOP-1 (*Immediate Post Trip Actions*) and the SRO reviewed the diagnostic flow chart for transition

Which one of the following statements correctly describes the required procedural transition from EOP-0?

A. Transition into EOP-1 (*Reactor Trip*)

B. Transition into EOP-02 (*Loss of Offsite Power / Loss of Forced Circulation*)

C. Transition into EOP-4 (*Excess Steam Demand Event*)

D. Transition into EOP-8 (*Functional Recovery Procedure*)

Distracter Analysis:

A. **Incorrect**: Transition into EOP-1 is only made for uncomplicated trips
Plausible: If the applicant is not aware of the transition requirements

B. **Incorrect**: The proper transition is EOP-4 – ESDE. The rules of usage for the diagnostic flow chart state "Certain events (i.e. LOCA, SGTR, ESDE or LOAF) do not require offsite power to adequately mitigate the effects of the accident. For this reason, the LOCA, SGTR. ESDE and LOAF Optimal Recovery Procedures are to be implemented even if a Loss of Offsite Power has also occurred.
Plausible: A loss of offsite power / loss of forced circulation has occurred.

C. **Correct**: The proper transition is EOP-4 – ESDE. The rules of usage for the diagnostic flow chart state "Certain events (i.e. LOCA, SGTR, ESDE or LOAF) do not require offsite power to adequately mitigate the effects of the accident. For this reason, the LOCA,

SGTR. ESDE and LOAF Optimal Recovery Procedures are to be implemented even if a Loss of Offsite Power has also occurred.

D. **Incorrect**: Transition to EOP-4 is correct
Plausible: Transition to EOP-8 is required if multiple events are diagnosed. However, this case is an exception to that general rule.

Level: SRO Exam

KA: CE/A11AA2.1 (2.9/3.3)

Lesson Plan Objective: none

Source: New

Level of knowledge: memory

References:
1. EOP-0 diagnostic flow chart pages 18-22
2. EOP-0 Bases Document page 30

CE/A11 RCS Overcooling - PTS / 4 AA2. Ability to determine and interpret the following as they apply to the (RCS Overcooling) (CFR: 43.5 / 45.13) AA2.1 Facility conditions and selection of appropriate procedures during abnormal and emergency operations.
IMPORTANCE RO 2.9 SRO 3.3

Bank Question: 93 Answer: A

1 Pt(s) Unit 1 was operating at 100% power. Given the following events and conditions:

- Letdown flow was at minimum
- Containment normal sump alarm annunciated
- Pressurizer level was at 205 inches and slowly trending lower
- VCT makeup was occurring in manual due to a low level condition
- Tcold was on program
- Condenser off-gas alarm annunciated
- RCS average leak rate was reported by the STA at 100 gpm from the plant computer

Which one of the following statements correctly describes (1) the proper procedure to address the problem, and (2) the criteria for tripping the reactor?

A. **(1) Enter AOP-2A (*Excessive Reactor Coolant Leakage*)**
(2) If pressurizer level cannot be maintained above 101 inches, PZR pressure reaches the TM/LP pre-trip setpoint, or if Tave is less than 537°F

B. **(1) Enter AOP-2A (*Excessive Reactor Coolant Leakage*)**
(2) If pressurizer level cannot be maintained above 200 inches, PZR pressure reaches the TM/LP pre-trip setpoint, or if Tave is less than 537°F

C. **(1) Enter EOP-0 (*Post Trip Immediate Actions*)**
(2) Trip the reactor when the second charging pump starts if pressurizer level continues to lower

D. **(1) Enter EOP-0 (*Post Trip Immediate Actions*)**
(2) Trip the reactor because a SGTR has occurred

Distracter Analysis: RCS average leak rate is a computer-averaged measurement that is very sensitive to transient conditions. This value should be considered inaccurate during plant transients

A. **Correct**:
B. **Incorrect**: The criteria for tripping the reactor when PZR level reaches 200 inches is incorrect – the correct criteria is 101 inches

Plausible: 101 inches is at the top of the pressurizer heaters. It may seem appropriate to trip before this low level is reached. All other portions of the distracter are correct

C. **Incorrect**: Enter AOP-2A not EOP-0 – no immediate Rx trip is required
Plausible: If the applicant suspects that the 2nd charging pump start implies that the leak rate is greater than the makeup capacity. This would not be true unless letdown was isolated.

D. **Incorrect**: Enter AOP-2A not EOP-0– no immediate Rx trip is required
Plausible: If the applicant suspects a SGTR has occurred from the condenser off-gas alarm and the high RCS leak rate.

Level: SRO Exam

KA: CE/A16AA2.1 (2.7/3.5)

Lesson Plan Objective: 19082 - Recognize reactor trip criteria within AOP-2A

Source: Mod Q28669

Level of knowledge: comprehension

References:
1. AOP-2A pages 26-31
2. AOP-2A Bases Document pages 16-17, 20

CE/A16 Excess RCS Leakage / 2 AA2. Ability to determine and interpret the following as they apply to the (Excess RCS Leakage) (CFR: 43.5 / 45.13) AA2.1 Facility conditions and selection of appropriate procedures during abnormal and emergency operations.
IMPORTANCE RO 2.7 SRO 3.5

Bank Question: 94 Answer: B

1 Pt(s) Unit 1 was conducting a reactor startup at $3x10^{-3}$ % power. Given the following events and conditions:

- Channel B wide range (WR) logarithmic (log) instruments was bypassed
- The reactor was critical
- Power was being raised in OP-2 (*Plant Startup from Hot Standby to Minimum Load*)
- Group 4 CEAs were at 100 inches
- Channel A wide range (WR) logarithmic (log) instruments failed

Which one of the following statements correctly describes the action required by Tech Specs?

References Provided: Tech Spec 3.3.1

A. Reinsert regulating group CEAs until reactor power is in mode 3 and repair the WRlog channel "A" instrument prior to recommencing the startup.

B. Halt the startup maintaining CEAs at their current position until the WRlog channel "A" rate of change of power high bistable trip unit has been placed in trip not to exceed 48 hrs.

C. The startup may continue – the WRlog channel "A" rate of change of power high bistable trip unit shall be placed in bypass within 1 hour prior after exceeding 12% RTP.

D. The startup may continue –the WRlog channel "A" rate of change of power high bistable trip unit shall be placed in trip within 1 hour without regard for any power limitations.

Distracter Analysis: A loss of 2 of 4 WRlog channels requires the startup to be terminated under the CCNP Tech Spec 3.0.4. The WRlog NI channels provide SUR protection for RPS. Although action statement "A" allows the startup to continue if the channel is placed in trip, Tech Spec 3.0.4.a precludes entry into mode 1 "*when the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time*". Action B requires restoration of 1 affected channel within 48 hours. Mode 2 is "called" at 90 inches on CEA Regulating Group 4.

A. **Incorrect**: There is no requirement to reinsert regulating group CEAs until mode 3 is reached.
Plausible: If the applicant misreads the requirements of Tech Spec 3.3.1 table 3.3.1 – thinks that because the WRlog NIs cannot meet the channel check requirements of surveillance 3.3.1.1, the function is not satisfied and action G applies – mode 3

B. **Correct**: Tech Spec 3.0.4 is applied and entry into mode 2 is prevented until one of the channels is restored to service.

C. **Incorrect**: The startup may not continue. Channel A must be placed in trip – not bypass – within 1 hour. Channel B is already in bypass – cannot bypass 2 channels concurrently. Also – the note "A" on function 2 does not apply to this case.
Plausible: If the applicant misreads the requirements of Tech Spec 3.3.1 table 3.3.1 and misapplied action statement B and note A on function 2.

D. **Incorrect**: Tech Spec 3.0.4 is applied and entry into mode 2 is prevented until one of the channels is restored to service.
Plausible: If the applicant applies Tech Spec 3.3.1 Table 3.3.1 action statement D – one channel must be placed in **trip** the second channel must be placed in **bypass.** If the applicant does not recognize that Tech Spec 3.0.4 prevents entry into mode 2.

Level: SRO Exam

KA: G2.1.33 and APE 000032AK3.01 (3.2/3.6)

Lesson Plan Objective: 20877 – Given a plant or system condition and the Technical Specifications, be able to apply the appropriate action requirements.

Source: New

Level of knowledge: comprehension

References:
1. Tech Spec 3.3.1
2. Tech Spec 3.0.4
3. SD-78A pages 14-16, 20

000032 Loss of Source Range NI AK3. Knowledge of the reasons for the following responses as they apply to the Loss of Intermediate Range Nuclear Instrumentation: (CFR 41.5,41.10 / 45.6 / 45.13) AK3.01 Termination of startup following loss of intermediate range instrumentation 3.2 3.6

Bank Question: 95 Answer: C

1 Pt(s) Unit 1 was operating at 100% power when a temporary modification (Temp Mod) installation work package was provided by Engineering to the SRO for review and installation approval. Given the following events and conditions:

- The Temp Mod added a portable air conditioner to the 1A DG room for better cooling from May through September. It would be powered from the 11 4KV safety bus. Engineering stated that it was being installed for personnel comfort and was not required for DG room cooling.
- The Temp Mod did not have a 10CFR50.59 screening or evaluation package completed.
- Engineering stated that because the Temp Mod could be manually stopped if an overload condition occurred on the 11 4-KV bus, it did not require a 10CFR50.59 screening. Compensatory actions were sufficient to minimize the risk.

Which one of the following statements correctly describes the SRO's decision?

A. Allow the Temp Mod to be installed and ensure compensatory actions are accounted for as an operator workaround. Temp Mods do not require 10CFR50.59 screening unless they are made permanent.

B. Allow the Temp Mod to be installed because it is a non-safety related system and therefore is not subject to 10CFR50.59 screening. Compensatory actions are sufficient to assure reasonable expectation for continued operability.

C. Reject installation of the Temp Mod and request that Engineering reevaluate the reduction in safety margin for DG loading using the 10CFR50.59 process.

D. Reject installation of the Temp Mod and request that Engineering obtain installation authorization from the GS-NPO for the Temp Mod. This is a type 2 decision in accordance with NO-1-116 (*Operational Decision Making*)

Distracter Analysis:

A. Incorrect: Temp Mods require 10CFR50.59 screening per MD-1-100 unless they meet certain criteria – installed for completion of a

maintenance activity or supporting installation or ESP that will be installed for <90 days in modes 1-3
Plausible: If the applicant is unfamiliar with the process for 10CFR5059 evaluations

B. **Incorrect**: Although the Temp Mod may be non-safety related, the fact that it is powered from the 11 4-KV safety bus makes a 10CFR50.59 screening/evaluation a requirement.
Plausible: If the applicant thinks that compensatory actions can avoid the requirement to conduct 10CFR50.59 screening

C. **Correct**:

D. **Incorrect**: The GS-NPO cannot override the SRO's decision. The GS-NPO is not actively licensed. This is not a type 2 decision because it meets the threshold for the 10CFR50.59 process, and the process is well defined by procedure.
Plausible: The GS-NPO can override or waiver many other lower-level management decisions. Type 2 decisions are defined in NO-1-116 as "decisions in response to conditions that may fall below action thresholds defined in license documents or are not clerrly defined in procedures"

Level: SRO Exam

KA: G2.2.10 (1.9/3.3)

Lesson Plan Objective: none

Source: New

Level of knowledge: comprehension

References:
1. MD-1-100 pages 18, 23
2. NO-1-116 pages 5, 10

G2.2.10 Knowledge of the process for determining if the margin of safety, as defined in the basis of any technical specification is reduced by a proposed change, test or experiment. (CFR: 43.3 / 45.13) IMPORTANCE RO 1.9 SRO 3.3

Bank Question: 96 Answer: C

1 Pt(s) Unit 1 was operating at 100% power when operators noticed that a gage on the main control board was reading erratically. Given the following events and conditions:

- The gage was located in an area where the gage terminals were in close proximity to relay terminals that, if shorted, could cause a reactor trip.
- The FIN-Team requested permission to troubleshoot the gage by measuring the output signal at the gage terminals. This required entering the area behind the main control boards and reaching the instrument gage terminals with a multi-meter to measure the signal.
- The FIN-Team stated that no tagout was necessary and the troubleshooting would only take 10 minutes. The FIN-CRO was absolutely certain that the technicians could land the multi-meter's leads on the gage terminals without touching the nearby relays.
- All near-by circuits operated on low voltage so there was no danger of electrical shock.

Which one of the following statements correctly characterizes the SRO's response to this request?

A. The troubleshooting activity may be authorized at the discretion of the Shift Manager. Troubleshooting does not require a risk assessment per NO-1-117 (*Integrated Risk Management*) unless it removes equipment from operation.

B. The troubleshooting activity may be authorized at the discretion of the Shift Manager. Troubleshooting does not require a risk assessment per NO-1-117 because the activity can be peer-checked and there is no industrial safety risk.

C. The troubleshooting activity may NOT be authorized at the discretion of the Shift Manager. All troubleshooting requires a risk assessment of NO-1-117 prior to actually commencing the work.

D. The troubleshooting activity should NOT be authorized at the discretion of the Shift Manager. Although some troubleshooting activities are specifically excluded in NO-1-117 for risk assessments, it is prudent and conservative to require a risk assessment prior to starting the work.

Distracter Analysis:

A. **Incorrect**: All troubleshooting activity is controlled by NO-1-117. Completion of attachment 2 Risk Assessment is required.
Plausible: This type of troubleshooting appears to be relatively innocuous.

B. **Incorrect**: All troubleshooting activity is controlled by NO-1-117. Completion of attachment 2 Risk Assessment is required.
Plausible: One of the provisions in Attachment 2 is whether or not the activity can be peer-checked. This effects the determination of the risk assessment – but NOT the determination of whether to use a risk assessment.

C. **correct**:

D. **Incorrect**: All troubleshooting activity is controlled by NO-1-117. Completion of attachment 2 Risk Assessment is required.
Plausible: It is indeed prudent to conduct a risk assessment. However, the statement that it is not required is incorrect.

Level: SRO Exam

KA: G2.2.20 (2.2/3.3)

Lesson Plan Objective: none

Source: New

Level of knowledge: memory

References:
1. NO-1-117 pages 5, 38-44

G2.2.20 Knowledge of the process for managing troubleshooting activities. (CFR: 43.5 / 45.13) IMPORTANCE RO 2.2 SRO 3.3

Bank Question: 97 Answer: D

1 Pt(s)

Units 1 and 2 were operating at 100% power with a waste gas release in progress. Given the following events and conditions:

- 0-RI-2191 (*Waste Gas Discharge Radiation Monitor*) alarmed
- 0-WGS-2191-CV (*WG DISCH ISOL*) shut
- 0-RI-2191 activity level decreased below the alarm setpoint
- Meteorological conditions did not change

Which one of the following statements correctly describes the major actions required to restart the release under OI-17B (*Waste Gas System*)?

A. Reset the alarm, obtain approval from Radiation Safety Supervision and restart the release using the existing release permit

B. Terminate the release, reset the alarm, purge the waste gas header, and release the waste gas decay tank

C. Terminate the release, reset the alarm, recalibrate 0-RI-2191, and release the waste gas decay tank

D. Terminate the release, reset the alarm, resample the WGDTs, reissue the release permit and restart the release

---

Distracter Analysis:

A. **Incorrect**: Cannot simply restart the release without issuing a new release permit
Plausible: In many plants, this practice is allowable for the first or second time that the process monitor terminates the release if the meteorological conditions have not changed

B. **Incorrect**: Purging the waste gas header is not required once the activity level on 0-RI-2191 has decreased below the alarm setpoint. It is required to resample the waste gas tanks and issue a new waste gas permit before recommencing the release.
Plausible: Purging the waste gas header is a step in OI-17B. Conditions in the waste gas decay tanks have likely not changed since the last sample,

C. **Incorrect**: Must reissue the release permit. There is no requirement to recalibrate the process monitor
Plausible: If the applicant suspects the process monitor is in error.

D. **Correct**:

Level: SRO Exam

KA: G2.3.8 (2.3/3.2)

Lesson Plan Objective: 27973 – Identify operations that require a gaseous waste discharge permit

Source: New

Level of knowledge: memory

References:
1. OI-17B pages 27-29
2. SD-069 pages 16-17

G2.3.8 Knowledge of the process for performing a planned gaseous radioactive release. (CFR: 43.4 / 45.10) IMPORTANCE RO 2.3 SRO 3.2

Bank Question: 98 Answer: D

1 Pt(s)

Unit 1 was operating at 100% power when a LOCA occurred in the auxiliary building. Given the following events and conditions:

- An ALERT has been declared and you are the Emergency Coordinator
- A worker is reported to be severely injured (arterial bleeding) inside the Aux Building in a area where radiological conditions are as follows:
  - General area radiation levels = 100 rem/hr
  - Contamination levels = not measured

Which one the of the following statements correctly describes: (1) the highest emergency dose limit to be authorized to evacuate the injured person, and (2) the limit for determining if the individual is contaminated prior to evacuation to the local hospital?

A. (1) You are only able to direct workers to receive up to 25 rem
(2) 1000 d/m/100cm^2 beta-gamma or 20 d/m per 100 cm2 alpha

B. **(1) You are only able to direct workers to receive up to 25 rem**
(2) 100 d/m/100cm^2 beta-gamma or any detectable alpha

C. **(1) You are able to direct workers to receive in excess of 25 rem (with no upper limit) but only on a voluntary basis to persons fully informed for the risks**
(2) 100 d/m/100cm^2 beta-gamma or any detectable alpha

D. **(1) You are able to direct workers to receive in excess of 25 rem (with no upper limit) but only on a voluntary basis to persons fully informed for the risks**
(2) 1000 d/m/100cm^2 beta-gamma or 20 d/m per 100 cm2 alpha

Distracter Analysis:

A. **Incorrect**: CCNP has committed to using the new emergency dose limits in EPA-400-R-92-001, which allow no upper limit for personnel who volunteer and are informed of the risks.
Plausible: Partially correct – the contamination level is right. Prior to the change in EPA PAGs, the old limit for saving a life was 25 rem.

B. **Incorrect**: CCNP has committed to using the new emergency dose limits in EPA-400-R-92-001 which allow no upper limit for personnel who volunteer and are informed of the risks. The limit for

contamination is 1000 dpm / 100 cm2 and the limit for alpha contamination is 20 d/p/100 cm2.
Plausible: Prior to the change in EPA PAGs, the old limit for saving a life was 25 rem. The general rule of usage for determining of contamination exists is 100 cpm > background.

C. **Incorrect**: The limit for contamination is 1000 dpm / 100 cm2.
Plausible: The limit for contamination is 1000 dpm / 100 cm2.

D. **Correct**:

Level: SRO Exam

KA: G2.3.4 (2.5/3.1)

Lesson Plan Objective: 19697 – Recall the Rad safety limits for life saving and for plant equipment saving situations.
19677 – Recall the definition of the following terms and administrative controls and limits: …radioactively contaminated area…

Source: New

Level of knowledge: memory

References:
1. EPA-400-R-92-001 page 2-9, 2-10
2. RP-1-100 pages 15, 27-28

G2.3.4 Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized. (CFR: 43.4 / 45.10) IMPORTANCE RO 2.5 SRO 3.1

Bank Question: 99 Answer: D

1 Pt(s) Unit 1 was operating in mode 6 preparing to restart following a refueling outage. Given the following events and conditions:

- The outage commenced on 8/1/06 when the reactor was shutdown at 0001 (midnight). It is now 0200 on 8/25/06.
- Refueling had been completed with 85 new fuel assemblies loaded in the core.
- RCS level is 40 ft, in mid loop, with the reactor vessel head removed
- RCS temperature = 125°F holding steady with SDC in service
- All outage work on the S/Gs had been completed and both S/G had been restored for heatup to mode 4.
- A truck backed into an electrical pole in the switchyard and triggered a loss of all AC power (station blackout) occurred.
- Containment was evacuated.

If no sources of cooling are available for the core, how long before the core will uncover?

References Provided: AOP-3B Attachments 8, 9, 10, 11, 12

A. < 3 hours

B. 3-6 hours

C. 6-9 hours

D. > 9 hours

Distracter Analysis: It is 25 days since the reactor was shutdown. With the new core, attachment 10 delay times must be multiplied times the number of minutes determined in attachment 11. Bullet #5 implies the steam generator nozzle dams had been removed.

A. **Incorrect**: The correct time to core uncovery is 9.8 hrs
Plausible: If the applicant fails to correct for the new core per attachment 10, or enters the wrong attachments (8, 9 or 12).

B. **Incorrect**: The correct time to core uncovery is 9.8 hrs
Plausible: 3.39 x 1.36 x 67 minutes = 309 min = 5.1 hrs – if the applicant uses the wrong attachment – attachment 12 is used when S/G nozzle dams are still installed

C. **Incorrect**: The correct time to core uncovery is 9.8 hrs

Plausible: 3.39 x 127 minutes = 431 minutes = 7.2 hrs – if the applicant misses the note at the top of attachment 10 that requires multiplying by 1.36 for a new core

D. **Correct**: 3.39 x 1.36 127 minutes = 586 minutes = 9.8 hrs

Level: SRO Exam

KA: G2.4.9 (3.3/3.9)

Lesson Plan Objective: Respond to a loss of RCS inventory while SDC is in use. Attempt to correct the abnormal SDC condition.

Source: New

Level of knowledge: comprehension

References:
1. AOP-3B Attachment 10, 11
2. AOP-3B pages 78-79

G2.4.9 Knowledge of low power / shutdown implications in accident (e.g. LOCA or loss of RHR) mitigation strategies. (CFR: 41.10 / 43.5 / 45.13) IMPORTANCE RO 3.3 SRO 3.9

Bank Question: 100 ***Answer: A***

1 Pt(s) Unit 1 was operating at 16% power in the process of conducting a reactor shutdown in OP-4 (*Plant Shutdown from Power Operation to Hot Standby*). Given the following events and conditions:

- A problem with feedwater caused a low water level in the 11 S/G
- The operators elected to manually trip the reactor before reaching the automatic trip setpoint (the next step in OP-4 was to take the turbine offline and shutdown the reactor)
- The main turbine failed to automatically trip
- A SGIS actuation shut both MSIVs

Which one of the following notifications/reports is the FIRST one required in accordance with 10CFR50.72/73 and what person in the NRC is the official recipient of the report?

References Provided: RM-1-101Attachment 2

A. A 4 hour ENS report is made to the NRC Headquarters Operations Officer

B. A 4 hour ENS report is made to the Resident Inspector

C. An 8 hour ENS report is made to the Resident Inspector

D. A 60-day LER is made to the NRC Headquarters Operations Officer

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Distracter Analysis: The reporting procedure is RM-1-101. Attachment 2 to this procedure is essentially a copy of table 1 (Reportable Events) in NUREG-1022 with time reporting requirements added.

A. **Correct**: This event reported IAW 10CFR50.72(b)(2)(iv)(B) – which is a 4-hour ENS report. The report is officially made to the HOO.

B. **Incorrect**: The report is officially made to the HOO, not the resident inspector.
Plausible: The Resident Inspector is listed in RM-1-101 as one of the persons who receives this report.

C. **Incorrect**: This event reported IAW 10CFR50.72(b)(2)(iv)(B) – which is a 4-hour ENS report. The report is officially made to the HOO, not the resident inspector.

Plausible: It is ALSO an 8-hour report under 10CFR50.72(b)(3)(iv)(A) – but this is not the first report

D. **Incorrect**: This event reported IAW 10CFR50.72(b)(2)(iv)(B) – which is a 4-hour ENS report.
Plausible: If you read the right hand column of RM-1-101, it is ALSO a 60-day LER. If the applicant thinks that because it is a reactor shutdown – the trip is considered to be a part of a "planned evolution" or if he/she thinks that the "safety function" was met by the manual trip.

Level: SRO Exam

KA: G2.4.30 (2.2/3.6)

Lesson Plan Objective: 22252 – Determine whether a Reportable Occurrence has occurred.

Source: Mod Q37608

Level of knowledge: comprehension

References:
1. RM-1-101 pages 8, 11, 22-23, 26

G2.4.30 Knowledge of which events related to system operations/status should be reported to outside agencies. (CFR: 43.5 / 45.11) IMPORTANCE RO 2.2 SRO 3.6

RO WRITTEN "DRAFT" 45 DAY SUBMITTAL

U.S. Nuclear Regulatory Commission

Site-Specific RO Written Examination

Applicant Information	
Name:	
Date:	Facility/Unit: **Calvert Cliffs**
Region: **1**	Reactor Type: **CE**
Start Time:	Finish Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. To pass the examination, you must achieve a final grade of at least 80.00 percent. Examination papers will be collected 6 hours after the examination begins.

Applicant Certification

All work done on this examination is my own. I have neither given nor received aid.

_____
Applicant's Signature

Results	
Examination Value	_____ Points
Applicant's Score	_____ Points
Applicant's Grade	_____ Percent

Bank Question: 1 Answer: B

1 Pt(s) Which one of the following statements correctly describes the temperature limit for RCP controlled bleedoff and the reason for this limit?

A. Bleedoff temperature must be maintained less than 250 °F to prevent damage to the thrust bearing.

B. Bleedoff temperature must be maintained less than 250 °F to prevent having to rebuild the seal prior to restarting the pump.

C. Bleedoff temperature must be maintained greater than 180 °F to prevent thermal shock to the seals.

D. Bleedoff temperature must be maintained greater than 180 °F to prevent water hammer in the seal return lines.

Distracter Analysis:

A. **Incorrect**: The concern is not to prevent damage to the RCP thrust bearing – but to the RCP seals.
Plausible: The limit (250 °F) is valid. The distracter (bases) has been used on past exams.

B. **Correct**:

C. **Incorrect**: The temperature and bases are not correct.
Plausible: Preventing thermal shock is a valid concern for other RCS systems. 180°F is the setpoint for the high temperature alarm on the RCP bleedoff line.

D. **Incorrect**: The temperature and bases are not relevant
Plausible: AOP-7C contains a warning that restoration of cooling to a hot RCP seal can cause water hammer – but 180°F is not the setpoint for this caution. 180°F is the high temperature alarm on the RCP bleedoff line.

Level: RO Exam

KA: SYS 003A4.07 (2.6*/2.6)

Lesson Plan Objective: 17349 - Recall the limits for and basis for the limits on bleedoff temperature

Source: Mod Q14386 (Score 81% - 18/21) LOI 2004

Level of knowledge: memory

References:
1. SD-064D pages 3, 19, 38
2. OI-1A page 8

003 Reactor Coolant Pump A4 Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.06 RCP parameters 2.9* 2.9

Bank Question: 2 Answer: C

1 Pt(s) Unit 1 was operating at 100% power when a pipe break occurs in the letdown line inside containment at the containment penetration.

In five seconds, leak flow will be less than 20 gpm because:

A. The excess flow check valve will restrict the flow.

B. The letdown stop valves will close on SIAS.

C. The letdown flow control valves will throttle closed on decreasing pressurizer level.

D. The lowered RCS pressure will reduce the pressure driving head.

Distracter Analysis:

A. **Correct**: The excess flow check valve will close to limit break flow to 10 gpm at < 450 °F into containment. Letdown will not isolate within the first 5 seconds.

B. **Incorrect**: Letdown stop valves will close on a safety injection signal but this will not occur within 5 seconds.
Plausible: This would be an expected response if the applicant forgets the excess letdown check valve will limit break flow.

C. **Incorrect**: The letdown flow control valve will not isolate the leak because the leak is upstream.
Plausible: If the applicant confuses the locations of the letdown flow control valves and the letdown stop valves and if the applicant thinks that the pressure transient will close the letdown flow control valves.

D. **Incorrect**: Pressure will be reduced but not enough to decrease flow.
Plausible: If the applicant forgets that the excess flow check valve will limit flow rate.

Level: RO Exam

KA: SYS 004G2.1.28(3.2/3.3)

Lesson Plan Objective: 17489 - Recall the CVCS functions per the USFAR

Source: MOD Q14531

Level of knowledge: memory

References:
1. SD-041 pages 11, 12
2. Tech Spec 3.3.4 page 5

004 Chemical Volume Control 2.1.28 Knowledge of the purpose and function of major system components and controls. (CFR: 41.7) 3.2/3.3

Bank Question: 3 ***Answer: B***

1 Pt(s)

Unit 1 was in mode 3 (NOP/NOT), making preparations for cooldown. Given the following events and conditions:

- VCT level = 100 inches
- Pressurizer level = 215 inches
- Pressurizer pressure = 2250 psia
- Reactor makeup is in automatic mode set for 700 ppm blended flow
- A 20 gpm leak suddenly developed on a pressurizer code safety valve
  - Assume that a 20 gpm leak corresponds to a steady state energy loss rate of 1600 KW out of the RCS

Assuming no operator action, which one of the following statements correctly describes the systems response?

A. **VCT level decreases to ~90" and then increases and cycles between ~90" and ~104"**
Pressurizer level decreases to ~205" and then increases and cycles between ~205 and ~215"
Pressurizer pressure decreases to ~2220 psia and then increases and stabilizes at ~2250 psia

B. **VCT level decreases to ~90" and then increases and cycles between ~90" and ~104"**
Pressurizer level decreases to ~205" and then increases and stabilizes at ~215"
Pressurizer pressure continues to lower until SIAS actuates

C. **VCT level decreases to ~90" and then increases to ~108"**
Pressurizer level decreases to ~200" and then increases and cycles between ~205 and ~215"
Pressurizer pressure continues to lower until SIAS actuates

D. **VCT level decreases to ~3" and remains constant**
Pressurizer level decreases to ~205" and then increases and stabilizes at ~215"
Pressurizer pressure decreases to ~2220 psia then increases and cycles between ~2220 and ~2225 psia

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Distracter Analysis: The RCS leak rate = 20 gpm.
Minimum letdown flow is limited to 30 gpm. Together, the coolant loss rate is 30 + 20 = 50 gpm out of the RCS of which 30 gpm is returned to the VCT. Variable letdown flow operates between 30 gpm (min) and 126 gpm

(max) on one letdown flow control valve. Charging pump discharge flow rate is 44 gpm / pump.

Proportional heaters = 300 KW and each set of backup heaters = 300 KW. The first set of backup heaters turns on at 2220 psia (decreasing) and turns off at 2225 psia (increasing). There are 4 sets of backup heaters so heaters can make up 300 + 4x300 = 1500 KW. A 1600 KW energy loss from the pressurizer will eventually result in a loss of pressure control.

A. **Incorrect**: Pressurizer pressure will not stabilize on the proportional heaters because they do not input sufficient heat (300 KW) to overcome the leak rate/energy loss rate (1600 KW).
Plausible: The VCT and pressurizer level responses are correct.

B. **Correct**: VCT level decreases to the auto makeup setpoint (90") and then increases to the auto makeup termination point (104"). Pressurizer level decreases until the 1st backup charging pump starts at –10" deviation (205") and continues to run. The variable letdown flow control valve will open up to reestablish letdown and stabilize PZR level at the setpoint (215"). PZR pressure will drop until the backup heaters energize adding 4 x 300 KW = 1200 KW. The pressure will continue to decrease until the low-pressure reactor trip occurs. The PZR heater can only makeup for 1500 KW energy loss from the pressurizer and the total energy loss from the pressurizer is 1600 KW.

C. **Incorrect**: VCT level will not increase to 108". Pressurizer pressure will not stabilize at 2250 psia.
Plausible: Partially correct. The pressurizer pressure response is correct. If the applicant is not familiar with the VCT automatic fill termination function at 104", then this is the correct VCT response – at 108" letdown diverts to the WPS.

D. **Incorrect**: VCT level response will not decrease to the RWST swapover point. Pressurizer pressure will not cycle between 2220 and 2225 psia.
Plausible: Pressurizer level response is correct. Could chose this answer if the applicant does not recognize that the leak rate is within automatic makeup capacity and does not compute pressurizer heater energy input.

Level: RO Exam

KA: SYS 004K1.29 (3.4/4.0)

Lesson Plan Objective: 17500 (EN-1-115) recall how the CVCS responds to the following conditions and evaluate the Transient log when required.

Source: New

Level of knowledge: analysis

References:
1. 1-SD-041 CVCS pages 13, 28, Figs 6-6, 6-7, 6-9
2. 1-SD-064D pages 14-15, Figs 6, 8

004 Chemical Volume Control K1 Knowledge of the physical connections and/or cause-effect relationships between the CVCS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.29 Effect and detection of leaking PORV or relief on PZR level and pressure, including VCT makeup activity in automatic mode 3.4 4.0

Bank Question: 4 Answer: D

1 Pt(s) Unit 1 was operating at 100% power when a design bases earthquake caused a loss of offsite power and a LOCA inside containment. Given the following events and conditions in sequence:

- All emergency diesel generators started and initially energized their respective safety buses
- Bus 17 subsequently deenergized due to a bus fault that has not been cleared
- The 0C diesel would not start
- 10 hours after the LOCA, the CRS directs the RO to shift to hot leg injection:
  - RCS pressure = 19 psia
  - RWT level = 0 inches (the RWT was ruptured by the earthquake)
  - SIAS has been reset

Which one of the following statements correctly describes the correct step for operating the LPSI pump?

A. LPSI pump 11 can be restarted by manually selecting START on the pump hand-switch.

B. LPSI pump 12 can be restarted by manually selecting START on the pump hand-switch.

C. LPSI pump 11 can be restarted by selecting OVERRIDE on the key-operated hand-switch and manually selecting START on the pump hand-switch.

D. LPSI pump 12 can be restarted by selecting OVERRIDE on the key-operated hand-switch manually selecting START on the pump hand-switch.

Distracter Analysis: K/A match justification: The K/A asks knowledge of the power supply for the RHR pumps. The LPSI pumps are the same pumps as the RHR pumps – so if one knows the power supply to the LPSI pumps – one also knows the power supply to the RHR pumps. The pumps are "RHR pumps" when operating in the shutdown cooling mode and "LPSI pumps" when operating in the safety injection (injection of recirc) mode.

Safety Bus 11 is powered from bus 17. With the 0C blackout diesel out of service, bus 11 will not have power because of the LOOP and the inability to feed power to bus 11 without going through bus 17.

A. **Incorrect**: No power to LPSI/RHR pump 11
Plausible: If the applicant does not recognize that bus 17 powers bus 11 and LPSI/RHR pump 11 is powered from bus 11.

B. **Incorrect**: With the RWT < 30 inches, the LPSI/RHR pump will not start due to the RAS signal – must use the key-switch OVERRIDE
Plausible: If the applicant is not aware of the RAS logic. Pump 12 is available.

C. **Incorrect**: No power to RHR pump 11
Plausible: If power were provided, this action would start the pump.

D. **Correct**: The key-switch overrides the RAS logic and starts the 12 RHR pump.

Level: RO Exam

KA: SYS 005K2.01 (3.0/3.2)

Lesson Plan Objective: 38684 Recall the requirements for the preferred and alternate core flush flowpaths following a LOCA from initiation to termination.

Source: Mod Q20529

Level of knowledge: comprehension

References:
1. 1-SD-41 pages 6, 12-1, 37-39, Figure 7-2
2. 1SD-5 Figure 2

005 Residual Heat Removal K2 Knowledge of bus power supplies to the following: (CFR: 41.7) K2.01 RHR pumps 3.0 3.2

Bank Question: 5 Answer: B

1 Pt(s) Unit 1 was operating at 100% power when a loss of offsite power (LOOP) occurred at 0200. Given the following events and conditions:

- Containment spray pump 12 was tagged out of service for maintenance
- SRW pump 13 was electrically aligned to bus 14 and the 12 SRW header
- 0200 LOOP occurred. The following failures occurred at this time:
  - EDG 1B failed to start
  - SRW pump 11 tripped and would not restart
- 0205 – Standby SRW pump 13 is electrically realigned to bus 11, mechanically realigned to supply the 11 SRW header, and started
- 0215 - The 0C diesel was started and bus 14 was reenergized. All available safety related systems powered from bus 14 were started
- 0220 - Containment spray pump 12 was returned to service

What is the earliest time that safety systems have been aligned and made operable to successfully mitigate a large-break LOCA into containment?

A. 0200

B. 0205

C. 0215

D. 0220

Distracter Analysis: Need two full trains - one train of containment spray and one train of containment coolers to mitigate a LOCA

A. **Incorrect**: Only the A train of containment spray is operable.
Plausible: If applicant does not recognize that the loss of the 11 SRW pump causes containment air coolers 11 and 12 to be inoperable and does not recognize the impact of the loss of bus 14 on B train containment cooling systems.

B. **Correct**: The 11 and 12 containment air coolers are now operable with the 13 SRW pump restored on SRW subsystem 11. The 11 CS pump is running so they have 2 full trains of containment cooling

C. **Incorrect**: Not the earliest time.
Plausible: With the 0C diesel supplying loads on the 14 4KV bus, the 13 and 14 containment air coolers can be aligned to cool

containment. Bus 14 reenergized – train B components restored – have 1 train containment spray + 2 trains containment air coolers.

D. **Incorrect**: Not the earliest time.
Plausible: Now have both trains of containment cooling + 2 train of containment spray operating – full capacity.

Level: RO Exam

KA: SYS 006K3.03 (4.2/4.4)

Lesson Plan Objective: CRO-7-1-5-17 / 18206 – Recall the minimum operating combinations of Containment Spray Pumps and / or Containment Air Coolers that ensures design pressure and temperature of containment is not exceeded for the design basis accident LOCA.

Source: Mod Q20397

Level of knowledge: comprehension

References:
1. SD-060A pages 13-16
2. SD-11 pages 10-11, 30 Figures 11-1 and 11-12
3. Tech Spec Bases 3.6.6 pages 3-4

006 Emergency Core Cooling K3 Knowledge of the effect that a loss or malfunction of the ECCS will have on the following: (CFR: 41.7 / 45.6) K3.03 Containment 4.2 4.4

Bank Question: 6 Answer: D

1 Pt(s) Unit 1 was operating at 100% power when a pressurizer PORV spuriously lifted. Given the following events and conditions:

- Quench tank pressure = 25 psig (high pressure alarm)
- Quench tank temperature = 127°F (high temperature alarm)
- Quench tank level = 40 inches (high level alarm)
- The associated pressurizer PORV block valve has been closed

Which one of the following statements correctly describes the proper method for cooling the quench tank?

A. **Slowly vent the quench tank to the waste gas system in 2-psi increments to restore pressure.**
Refill the quench tank from the plant water system to reduce temperature.
Drain the quench tank to the VCT to restore level.

B. **Drain the quench tank to the RCDT to recover level and pressure.**
Refill the quench tank from the plant water system to reduce temperature.
Vent the quench tank into containment to restore pressure.

C. **Fill the quench tank from the demineralized water system to reduce temperature.**
Drain the quench tank to the VCT to recover level.
Vent the quench tank into containment to restore pressure.

D. **Slowly vent the quench tank to the waste gas system in 2-psi increments to restore pressure.**
Drain the quench tank into the RCDT to recover level.
Refill the quench tank from the demineralized water system to reduce temperature.

Distracter Analysis: K/A match analysis: There are no interlocks associated with cooling the quench tank. The quench tank requires an engineered feature that will allow the removal of heat in order to maintain the capability of the quench tank to absorb a PORV discharge. This design feature is the ability to fill and drain the quench tank. The question tests the knowledge of this design feature by requiring the applicant to know what systems are used for draining and refilling. The discussion on venting the quench tank to

reduce pressure is added in order to make the question more operationally valid and discriminatory. This situation occurs if the PORV lifts. The expectation was for the applicant to answer this question based on GFE and systems knowledge – not memorization of the procedure.

There is a caution to limit the venting to 2-psi increments after an energy release to prevent unseating a PORV. The normal venting path is to waste gas. Venting directly into containment is only allowed when waste gas is not available. Quench tank level is above the high level alarm set point (30.5") so it should be reduced before adding more water for bleed and feed – to reduce temperature below the high temp alarm (120°F).

A. **Incorrect**: Should not add more water when level is above the high-level alarm setpoint at 30.5 inches. Should not vent to waste gas unless pressure is < 10 psig. Refill water comes from the demin water system, not the plant water system. Drain the quench tank to the RCDT not the VCT.
Plausible: partially correct – must first vent quench tank before draining and filling.

B. **Incorrect**: OI-1B requires pressure to be reduced below 10 psig before refilling the quench tank from demineralized water. The refill water comes from the demin water system not the plant water system.
Plausible: Partially correct – the tank is drained to the RCDT. If the applicant does not know the precaution for quench tank pressure.

C. **Incorrect**: Cannot refill the quench tank with pressure > 10 psig. Cannot drain to the VCT. Cannot vent into containment if waste gas is available.
Plausible: If the applicant does not know the precaution for quench tank pressure.

D. **Correct**: Per OI-1B section 6.5 – caution.

Level: RO Exam

KA: SYS 007K4.01 (2.6/2.9)

Lesson Plan Objective: none

Source: New

Level of knowledge: comprehension

References:

1. OI-1B pages 6, 16-20
2, SD-064A page 17

007 Pressurizer Relief/Quench Tank K4 Knowledge of PRTS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7) K4.01 Quench tank cooling 2.6 2.9

Bank Question: 7 Answer: D

1 Pt(s)

Unit 1 was shutdown in mode 5 preparing to draw a bubble in the pressurizer in accordance with OP-7. Given the following events and conditions:

- The RCS is in a solid water condition with pressure = 45 psia
- Quench tank level = 29 inches
- Quench tank Oxygen concentration = 4.5%

Which one of the following statements correctly describes the required actions to (1) establish initial conditions in the quench tank, and (2) draw a bubble in the pressurizer per OP-7?

A. **(1) Purge the quench tank with Nitrogen**
(2) Drain the pressurizer to quench tank until pressurizer level is in the indicating range, then energize pressurizer heaters and wait until pressurizer pressure increases.

B. **(1) Raise quench tank level above 30 inches**
(2) Drain the pressurizer to quench tank until pressurizer level is in the indicating range, then energize pressurizer heaters and wait until pressurizer pressure increases.

C. **(1) Raise quench tank level above 30 inches**
(2) Energize pressurizer heaters and drain the pressurizer to the RWT until pressurizer level is lowering with steady or rising pressure.

D. **(1) Purge the quench tank with Nitrogen**
(2) Energize pressurizer heaters and drain the pressurizer to the RWT until pressurizer level is lowering with steady or rising pressure.

Distracter Analysis: Discussed this question with the licensee. The written exam POC stated that there was no lesson plan objective for knowledge of the sequence for drawing a bubble in the pressurizer. He also stated that IF a question had to be written to match the K/A, this as close to an operationally valid as could be prepared. Knowledge of the [O2] limit is ubiquitous and should be common knowledge among applicants. The applicants may not know the normal quench tank level / high alarm setpoint but they should be able to select the correct answer based on the value of [O2].

A. **Incorrect**: Per OP-7, the pressurizer is drained to the RWT – not the quench tank.
Plausible: Partially correct – the quench tank O2 level must be reduced.

B. **Incorrect**: Quench tank level is within the normal range. Per OP-7, the pressurizer is drained to the RWT – not the quench tank.
Plausible: 30.5" is the high-level alarm setpoint for the quench tank. Draining the pressurizer to the quench tank was an old method of drawing a bubble in the pressurizer.

C. **Incorrect**: Quench tank level is within the normal range.
Plausible: Partially correct – the method for drawing a bubble is correct.

D. **Correct**: Oxygen concentration is above the required limit of 4%. Must reduce O2 concentration before increasing H2 concentration in the VCT. The method for drawing a bubble has been changed recently and this now reflects the change to OP-7.

Level: RO Exam

KA: SYS 007K5.02

Lesson Plan Objective: LOI-203-1-9 5.0 – Identify the processes and bases for the notes and cautions contained in OP-1 Section 6.3, Secure SDC, Start RCPs and Enter Mode 4.

Source: New

Level of knowledge: memory

References:
1. OP-7 pages 103-105, 118-125
2. OI-1B page 30

007 Pressurizer Relief/Quench Tank K5 Knowledge of the operational implications of the following concepts as they apply to PRTS: (CFR: 41.5 / 45.7) K5.02 Method of forming a steam bubble in the PZR 3.1 3.4

Bank Question: 8 Answer: B

1 Pt(s) Unit 2 was operating at 100% power when a loss of component cooling water occurred. Given the following events and conditions:

- AOP-7C (*Loss of Component Cooling Water*) was implemented
- The RO was directed to implement Attachment 1 (*Transferring 23 CC Pump 480 volt Disconnects*) to AOP-7C
- The 23 CC pump was aligned to the bus 24B (ZB)
- The RO reached step 3 in Attachment 1 that reads as follows:

1. Place 23 CC PP handswitch in PULL TO LOCK.
2. Verify that 23 CC Pump currently aligned load supply breaker is open.

NOTE
"23 CC PP BKR L/U IMPR" alarm will be received on 2C13.

3. Turn the handswitch, on the disconnect that is shut, to the TRIP position.
4. Turn the handswitch to the PULL OUT position and pull out the handle, placing the disconnect in PULL TO LOCK.

Which one of the following statements correctly describes the location of the disconnects for the 23 CC pump and the interlock requirements for this attachment?

A. The disconnects are located in the switchgear room, 27-foot elevation. The disconnects are interlocked with a key switch.

B. The disconnects are located in the switchgear room, 45-foot elevation. The disconnects are interlocked with a key switch.

C. The disconnects are located in the switchgear room, 27-foot elevation. The disconnects are interlocked through the handswitch on the 23 CC pump being in PTL.

D. The disconnects are located in the switchgear room, 45-foot elevation. The disconnects are interlocked through the handswitch on the 23 CC pump being in PTL.

Distracter Analysis: Note that Attachment 1 does not provide the location of the disconnects to the operator. The operator must know where to go to execute the steps of the attachment.

A. **Incorrect**: The disconnects are located on the 45-foot elevation, not the 27-foot elevation in the switchgear room.
Plausible: Partially correct – the disconnects are interlocked with a keyswitch. The applicant must recall the location of the 24B (ZB) disconnect switch.

B. **Correct**:

C. **Incorrect**: The disconnects are located on the 45-foot elevation, not the 27-foot elevation in the switchgear room. The disconnects are interlocked with a keyswitch, not the handswitch on the pump.
Plausible: Psychometric balance

D. **Incorrect**: The disconnects are interlocked with a keyswitch, not the handswitch on the pump.
Plausible: Partially correct – the location of the disconnects is correct.

Level: RO Exam

KA: SYS 0008G2.1.30 (3.9/3.4)

Lesson Plan Objective: LOI-202-7D-1.SIM 1.0 Given any electrical distribution condition, demonstrate the ability to operate the electrical distribution system in accordance with OIs, Tech Specs and the STPs.

Source: New

Level of knowledge: memory

References:
1. AOP-7C-2 page 8, attachment 1
2. SD-015 pages 8, 54

008 Component Cooling Water 2.1.30 Ability to locate and operate components, including local controls. (CFR: 41.7 / 45.7) 3.9/3.4

Bank Question: 9 Answer: B

1 Pt(s) Unit 1 was in mode 3 when a LOCA occurred inside containment. Given the following events and conditions 30 minutes into the event:

- The operators had just verified RAS occurred
- RCS temperature = 250°F
- RCS pressure = 20 psia
- A total loss of component cooling water flow occurred

Which one of the following statements correctly describes the limits on operating the HPSI and LPSI pumps if the RCS temperature cannot be changed?

A. HPSI pumps can be operated continuously
LPSI pumps can be operated continuously

B. HPSI pumps can be operated for only 2 hours
LPSI pumps can be operated continuously

C. HPSI pumps can be operated continuously
LPSI pumps can be operated for only 2 hours

D. HPSI pumps can be operated for only 2 hours
LPSI pumps can be operated for only 2 hours

Distracter Analysis: HPSI pumps can only be operated continuously if the RCS temperature is < 170°F.

A. **Incorrect**: HPSI pumps cannot be operated continuously
Plausible: Partially correct – LPSI pumps can be operated continuously as long as RCS temperature is < 300°F

B. **Correct**:

C. **Incorrect**: HPSI pumps cannot be operated continuously. LSPI pumps CAN be operated continuously.
Plausible: Psychometric balance

D. **Incorrect**: LPSI pumps can be operated continuously
Plausible: Limits apply if RCS temperature was > 300 °F

Level: RO Exam

KA: SYS 008K1.02 (3.3/3.4)

Lesson Plan Objective: CRO-113-5-5-22 / 18145 Recall the physical connection and/or relationships between the component cooling water system and the safety injection system.

Source: Mod Q20385

Level of knowledge: memory

References:
1. SD-15 pages 1, 6, 28-29

008 Component Cooling Water K1 Knowledge of the physical connections and/or cause-effect relationships between the CCWS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.9) K1.02 Loads cooled by CCWS 3.3 3.4

Bank Question: 10 Answer: B

1 Pt(s) Unit 1 was operating at 90% power when MCC-104R was deenergized due to a fault. Given the following events and conditions:

- A main turbine control valve drifts shut
- RCS pressure rises to 2405 psia

Which one of the following statements correctly describes PORV indications under these conditions?

A. Both ERV-402 and 404 will indicate open

B. Only ERV-402 will indicate open

C. Only ERV-404 will indicate open

D. Neither ERV 402 nor 404 will indicate open

Distracter Analysis: The PORVs open at 2400 psia.

K/A match analysis: The PORV indication power comes from the same source as the PORV opening power – ERV-402 is powered from MCC-114R, ERV-404 is powered from MCC-104R.

A. **Incorrect**: ERV-404 will not open.
Plausible: If the applicant confuses the power supply for the PORV operation and indication.

B. **Correct**: ERV –402 is powered from MCC-114R.

C. **Incorrect**: ERV-404 does not have any power for opening or for indication.
Plausible: If the applicant confuses the power supplies – ERV-404 is powered from MCC-114R

D. **Incorrect**: ERV-404 will not open.
Plausible: If the applicant does not recall the PORV opening setpoint or confuses the power supply for ERV-402.

Level: RO Exam

KA: SYS 010K2.03 (2.8*/3.0*)

Lesson Plan Objective: 17400 Determine the effects on PORV operation upon a loss of vital DC MCC-104(204) or MCC-114(214)

Source: Bank Q14447

Level of knowledge: comprehension

References:
1. SD-064A pages 46, 50

010 Pressurizer Pressure Control K2 Knowledge of bus power supplies to the following: (CFR: 41.7) K2.03 Indicator for PORV position 2.8* 3.0*

Bank Question: 11 Answer: B

1 Pt(s) Unit 1 was operating at 100% power. Given the following events and conditions in sequence:

- Pressurizer pressure = 2250 psia
- HS-100 is selected to channel X
- Pressure transmitter PT-100X failed low
- Pressure transmitter PT-100Y remained operable

Assuming no operator action, which one of the following statements correctly describes the automatic system response?

A. The reactor will trip on thermal margin/low pressure

B. The reactor will trip on high pressure

C. The reactor will trip on high power

D. The reactor will continue to operate at 100% power

Distracter Analysis: If PT-100X fails low, the pressurizer pressure control system will attempt to raise reactor pressure by closing spray valves and energizing backup heaters. Actual pressure will increase until a high-pressure reactor trip occurs at 2385 psia.

A. **Incorrect**: Pressure will increase not decrease.
Plausible: If the applicant reverses the effects of the PT-100X fail and thinks pressure will lower.

B. **Correct**: PORV also open at 2400 – but the high pressure reactor trip setpoint is 2400 psia

C. **Incorrect**: High power (VOTP) will not actuate because pressure is increasing.
Plausible: Increased pressure will cause reactivity to increase raising power – but this effect is very small.

D. **Incorrect**: Pressure will increase until a reactor trip occurs
Plausible: If the applicant thinks that pressure control swaps to PT-100Y without operator action.

Level: RO Exam

KA: SYS 010K3.02 (4.0/4.1)

Lesson Plan Objective: 17966 - Recall the relationship between the High Pressurizer Pressure Trip Function and the operation of the Power Operated Relief Valves (PORVs) 27966 – Given the failure of any RCS pressure, temperature or level instrument, predict the response of the system (heaters, spray, charging and letdown) to that failure.

Source: MOD Q37547 – but the answer in the bank question is wrong – essentially it is distracter A

Level of knowledge: comprehension

References:
1. SD-64D pages 12-16 + Figures 10, 11, 12, 15
2. SD-058 page 17 + Figure 58-12

010 Pressurizer Pressure Control K3 Knowledge of the effect that a loss or malfunction of the PZR PCS will have on the following: (CFR: 41.7 / 45.6) K3.02 RPS 4.0 4.1

Bank Question: 12 Answer: D

1 Pt(s) Unit 1 was operating at 30% power during power ascension to 100%. Given the following events and conditions:

- A turbine trip occurred on high vibration

Which one of the following statements correctly describes the system response and the reason for this response?

A. Reactor power will decrease but the reactor will not trip because the loss-of-load input signal is disabled.

B. The reactor will trip due to a low-pressure signal from the turbine auto stop oil header.

C. The reactor will trip due to a low-pressure signal from the turbine emergency trip system header.

D. The reactor will trip due to voltage input signal from the turbine master trip bus.

Distracter Analysis: K/A match analysis: The loss-of-load input signal is enabled above 15% power.

Unit 1 has recently updated their turbine control system and the input parameter that is sensed to cause the loss-of-load input signal has been changed from low pressure on the turbine auto-stop oil header to the voltage on the turbine master trip bus.

A. **Incorrect**: The reactor will trip because power is > 15%.
Plausible: If the applicant does not recall the 15% loss-of-load enable input to RPS.

B. **Incorrect**: Does not use this signal for the loss of load input signal.
Plausible: This is the correct answer for Unit 2 – the Unit 2 question variant was used with this class on the LOI2004 RPS Exam

C. **Incorrect**: Does not use this signal for the loss of load input signal.
Plausible: A low pressure could be evidence of a loss of load

D. **Correct**: For Unit 1

Level: RO Exam

KA: SYS 012K4.06 (3.2/3.5)

Lesson Plan Objective: 17972 – Given reactor power level, determine whether the loss of load trip is enabled [SOER-83-8]

Source: MOD Q20163

Level of knowledge: memory

References:
1. SD-58 page 17

012 Reactor Protection K4 Knowledge of RPS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7) K4 06 Automatic or manual enable/disable of RPS trips 3.2 3.5

Bank Question: 13 Answer: A

1 Pt(s) Unit 1 was operating at 100% power with maintenance in progress on the AFAS system. Given the following events and conditions:

- AFAS channel "ZE" has been bypassed
- While maintenance was in progress, a loss of 120 Vital AC bus #11 occurred

Which one of the following statements correctly describes the response of the AFAS?

A. Sensor logic is reduced to 1 out of 2 to generate an AFAS

B. Sensor logic is reduced to 2 out of 2 to generate an AFAS

C. AFAS "B" actuation only occurs

D. AFAS "A" and "B" actuations occur

Distracter Analysis: Note there are 2 bank questions that test what happens if 2 AFAS channels are deenergized. I modified the questions to test what happens if one channel is bypassed and the other is deenergized.

A. **Correct**: With the "ZE" sensor channel in bypass, sensor logic is reduced to 2 out of 3 (ZD, ZF and ZG) as the bypass mode takes the ZE channel out of consideration. When power is lost to bus #11, this deenergizes AFAS actuation channel ZA and AFAS sensor channel ZD - that inserts 1 of 3 (2 required) AFAS actuation logic signals. Therefore, with 1 actuation signal "in" (Sensor channel ZD) and 2 channels remaining valid (ZF and ZG), the actuation logic is reduced to 1 out of 2.

B. **Incorrect**: Sensor Subsystems ZF and ZG are still valid – logic is reduced to 1 out of 2
Plausible: If the applicant thinks that a loss of vital AC to sensor channel ZD does not insert one valid actuation signal

C. **Incorrect**: Only one valid signal (ZD) is present
Plausible: This was the correct answer for the bank question – difference is that in the bank question, sensor subsystem ZE was deenergized not bypassed

D. **Incorrect**: Actuation subsystem "A" is powered from bus #11 and is deenergized. Actuation subsystem "B" is not actuated

Plausible: If the applicant does not recognize that bus #11 powers actuation subsystem "A" and that deenergizing the subsystem does not cause it to actuate.

Level: RO Exam

KA: SYS 013K5.02 (2.9/3.3)

Lesson Plan Objective: 17473 Identify the affect on AFAS operation (trip logic) when a sensor channel and/or actuation logic channel is deenergized.

Source: Mod Q14636 & 14647

Level of knowledge: comprehension

References:
1. SD-036A pages 26-30, 37, 57 + Fig 36-12

013 Engineered Safety Features Actuation K5 Knowledge of the operational implications of the following concepts as they apply to the ESFAS: (CFR: 41.5 / 45.7) K5.02 Safety system logic and reliability 2.9 3.3

Bank Question: 14 Answer: D

1 Pt(s) Unit 1 was operating at 100% power when a large-break LOCA occurred inside containment. Given the following events and conditions:

- RCS pressure = 50 psia
- RWT level = 10 ft
- Containment pressure = 20 psig

If containment air cooler 14 was in standby prior to the accident, which one of the following statements correctly describes the containment air cooler cooling water valve configuration?

A. The inlet valve is fully open
The 8" outlet valve is fully open
The 4" outlet valve is fully closed

B. The inlet valve is throttled to a mid position
The 8" outlet valve is fully open
The 4" outlet valve is open

C. The inlet valve is fully open
The 8" outlet valve is throttled to a mid position
The 4" outlet valve is fully closed

D. The inlet valve is throttled to a mid position
The 8" outlet valve is fully open
The 4" outlet valve is closed

Distracter Analysis: The standby containment air cooler has both 8" and 4" outlet valves initially shut. The 8" outlet valve fully opens on SIAS. The inlet valve opens to a throttled mid-position on SIAS and fully opens on a RAS. The 4" outlet valve is manually controlled by the operator – and is normally shut on the standby air cooler. The 4" valve does not reposition on a SIAS or RAS.

A. **Incorrect**: The containment air cooler SRW inlet valve is throttled to a mid-position. It does not fully open until after RAS occurs.
Plausible: If applicant is unaware of valve response or the RAS set point. Partially correct – the 8" outlet valve is fully open and the 4" outlet valve is closed.

B. **Incorrect**: The 4" outlet valve will not open on a SIAS
Plausible: If the applicant confused the 4" outlet valve response and the 8" outlet valve response on a SIAS

C. **Incorrect**: The 8" outlet valve is fully opened by the SAIS signal and the inlet valve is throttled
Plausible: If the applicant reverses the inlet and outlet valve actuations

D. **Correct**:

Level: RO Exam

KA: SYS 022A1.04 (3.2/3.3)

Lesson Plan Objective: none

Source: New

Level of knowledge: comprehension – requires understanding the effects of the SIAS and RAS signals – must combine both memory level knowledges and integrate answer.

References:
1. SD-011 pages 2, 5, 12-13
2. EOP-05-1 page 44

022 Containment Cooling A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCS controls including: (CFR: 41.5 / 45.5) A1.04 Cooling water flow 3.2 3.3

Bank Question: 15 Answer: B

1 Pt(s) Unit 1 was operating at 100% power when a LOCA occurred. Given the following events and conditions:

0200 LOCA occurred inside containment
0203 Containment pressure peaked 20 psig
0240 Containment pressure dropped below 4 psig
0245 RWT level reached .75 ft but RAS failed to actuate
- Containment pressure was 3.5 psig and slowly decreasing
- Containment sump level was 40 inches and increasing

0246 The operators perform all required actions in EOP-5 (Loss of Coolant Accident) up to step S (Verify RAS Actuation).

Which one of the following statements correctly describes the (1) containment spray (CS) system configuration at the time of the RAS failure, and (2) the required operator actions to respond to the RAS failure in EOP-5 (Loss of Coolant Accident)?

A. (1) CS pumps are running in injection mode.
(2) Operators should NOT realign containment spray.

B. (1) CS pumps are running in injection mode.
(2) Align CS pumps for containment sump recirculation.

C. (1) CS pumps are stopped.
(2) Align CS pumps for containment sump recirculation.

D. (1) CS pumps are stopped.
(2) Operators should NOT realign containment spray.

Distracter Analysis: SIAS occurs at 2.8 psig in containment, CSAS occurs at 4.25-psig pressure in containment, RAS occurs at 30" in the RWT. EOP-5 does not allow operators to secure the CS pumps prior to RAS occurring if containment pressure is reduced below the CSAS actuation. The containment spray pumps will continue to run until Step W (Restore containment environment) – which occurs after RAS actuation (step S.).

A. **Incorrect**: Operator action is required to realign CS for injection per EOP-5 attachment 6.
Plausible: Partially correct – the CS pumps are running in injection mode. Containment pressure is < CSAS – operators may think that they do not need to start CS pumps if pressure is < CSAS.

B. **Correct**: CS pumps must be realigned for safety injection per EOP-5 step S.1.c by opening the sump discharge valves 1SI-4144-MOV and 1-SI-4145-MOV per Attachment 6.

C. **Incorrect**: CS pumps are not secured on RAS – or when containment pressure < CSAS. Must wait until after RAS to secure CS pumps.
Plausible: HPSI pumps are automatically secured on RAS – and it makes sense to want to secure CS pumps when containment pressure < CSAS.

D. **Incorrect**: CS pumps are not secured on RAS – or when containment pressure < CSAS. Must wait until after RAS to secure CS pumps. Operators are required to manually align components for RAS failure in Attachment 6.
Plausible: If applicants think that RAS secures CS pumps (like LPSI pumps) or think that CS pumps are not required with containment pressure < 4.5 psig CSAS.

Level: RO Exam

KA: SYS 026A2.05 (3.7/4.1)

Lesson Plan Objective: not classified – Verify a recirculation *actuation signal (RAS)*

Source: New

Level of knowledge: comprehension

References:
1. EOP-5-1 pages 43-47
2. SD-048 pages 25-29 + Fig 48-9
3. SD-52 page 37
4. EOP ATT-1 page 1

026 Containment Spray A2 Ability to (a) predict the impacts of the following malfunctions or operations on the CSS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) A2.02 Failure of automatic recirculation transfer 4.2* 4.4*

Bank Question: 16 Answer: B

1 Pt(s) Unit 1 was operating at 100% power when a LOCA occurred inside containment. Given the following events and conditions:

- Containment pressure peaked at 30 psig and dropped to 20 psig
- The 11 SRW header is idle
- The 12 SRW header is in operation
- The SRO directs you to verify the containment spray cooling alignment

Which one of the following statements correctly describes (1) the expected component cooling (CC) flow in each SDC Hx and (2) what action (if any) must be taken to restore containment spray (CS) cooling in accordance with EOP-5 (*Loss of Coolant Accident*)?

A. (1) CC flow is expected to be at maximum in both SDC Hx's.
(2) Restore the 11 SRW header to operation to provide cooling to the 11 CCW Hx.

B. (1) CC flow is expected to be at maximum in both SDC Hx's.
(2) Do NOT restore the 11 SRW header to operation. Verify the 12 SRW header is cooling the 12 SDC Hx.

C. (1) CC flow is expected to be isolated to the 11 SDC Hx but at maximum in the 12 SDC Hx.
(2) Restore CC flow to the 11 SDC Hx and restore SRW flow to the 11 SRW header.

D. (1) CC flow is expected to be isolated to the 11 SDC Hx but at maximum in the 12 SDC Hx.
(2) Do NOT restore flow to either the 11 SDC Hx or the 11 SRW headers.

Distracter Analysis: If containment pressure exceeds 25 psig and the 11 SRW header is idle, flow should not be restored to the 11 SRW header until after consulting with the TSC to prevent destroying the CACs by water hammer.

A. **Incorrect**: If containment pressure > 25psig, EOP-5 step G.6.a.1 RNO states that SRW flow should not be restored in the 11 SRW header to prevent water hammer damage from CAC voiding.
Plausible: If the applicant is not aware of this restriction – note that the containment pressure limit is only 10 psig for the 12 SRW

header. Restriction applies if the containment pressure exceeded 25 psig at any time – not just at the time of performing the step.

B. **Correct**: CC flow is at maximum but the 11 SRW should not be restored until after the TSC is consulted to prevent water hammer.

C. **Incorrect**: CC flow will be at maximum in the 11 SDC – CC flow is not effected by the SRW header being idled. Flow should not be restored to the 11 SRW header
Plausible: Provided for psychometric balance of distracters

D. **Incorrect**: CC flow will be at maximum in the 11 SDC – CC flow is not effected by the SRW header being idled.
Plausible: Partially correct – should not restore flow to the 11 SRW header if containment pressure > 25 psig.

Level: RO Exam

KA: SYS 026A3.02 (3.9*/4.2*)

Lesson Plan Objective: LOI-201-5-6 Obj 1.8 - Given a value of containment pressure, determine if a SRW header may be restored. LOI-015-1-3 Obj. 6.0 - Given an ESFAS signal, identify the effects on CCW components.

Source: New

Level of knowledge: comprehension

References:
1. EOP-5-1 pages 18-19
2. SD-052 pages 16, 57

026 Containment Spray A3 Ability to monitor automatic operation of the CSS, including: (CFR: 41.7 / 45.5) A3.02 Verification that cooling water is supplied to the containment spray heat exchanger 3.9* 4.2*

Bank Question: 17 Answer: D

1 Pt(s) Which one of the following statements does NOT describe a function of the condensate system?

A. Provide a source of water to main turbine exhaust hood sprays

B. Provide seal water to the heater drain pumps

C. Provide a backup source of supply for makeup to the component cooling water system

D. Provide a source of supply for the condensate booster pump seal water cooler

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Distracter Analysis:

A. **Incorrect**: This IS a function of the condensate system
Plausible: If the applicant is not aware of the system functions

B. **Incorrect**: This IS a function of the condensate system
Plausible: If the applicant is not aware of the system functions

C. **Incorrect**: This IS a function of the condensate system
Plausible: If the applicant is not aware of the system functions

D. **Correct**: This is NOT a function of the condensate system – but the condensate system provides a backup water supply to the service water system

Level: RO Exam

KA: SYS 056G2.1.27 (2.8/2.9)

Lesson Plan Objective: 18463 – Recall the purpose of the condensate system – 24382 - Obtain the knowledges and abilities to operate the condensate system

Source: MOD Q24620 - revised stem – now tests what is NOT a function vice was IS a function – and changed 3 distracters

Level of knowledge: memory – normally these questions are too simple to include on a site-specific test. However, this system is distinctive in that the listing of the system functions is not obvious. In addition, there is a bank question and lesson plan objective that supports this knowledge. This question was determined to be > LOD 1 because the bank question difficulty rating was only 85%,

which demonstrates adequate difficulty and discriminatory power. Note that this question was a further modification of the bank question, which made it more discriminatory.

References:
1. SD-44 page 1

056 Condensate 2.1.27 Knowledge of system purpose and or function. (CFR: 41.7) 2.8/2.9

Bank Question: 18 Answer: B

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- The feedwater system is aligned for normal operations
- The condensate system is aligned for normal operations

Which one of the following statements correctly describes the (1) the recommended number of running condensate pumps per OI-11A and (2) the reason for this alignment?

A. (1) 2 (instead of 3) condensate pumps should be running
(2) To ensure adequate suction pressure for the SGFPs

B. (1) 2 (instead of 3) condensate pumps should be running
(2) To prevent running the heater drain pumps at shutoff head

C. (1) 3 (instead of 2) condensate pumps should be running
(2) To prevent running the heater drain pumps at shutoff head

D. (1) 3 (instead of 2) condensate pumps should be running
(2) To ensure adequate suction pressure for the SGFPs

Distracter Analysis: K/A match justification: The selection of optimum condensate pump / condensate booster pump combinations for various power levels is based on maintaining adequate condensate flow to the main feedwater system without deadheading the heater drain pumps. The question matches the K/A because the optimum pump configuration is based on the cause-effect relationships between the condensate system and the main feedwater system.

A. **Incorrect**: The purpose for running 2 condensate pumps (instead of 3) condensate pumps is to prevent running the heater drain pumps at shutoff head. There will be adequate SGF pump suction pressure with either 2 or 3 condensate pumps.
Plausible: Partially correct – the number of running condensate pumps is correct.

B. **Correct**: per OI-11A for Unit 2

C. **Incorrect**: There is a limitation on the number of condensate pumps that should be operating at power levels > 70% on Unit 2 due to capacity limitations of the heater drain pumps.
Plausible: Partially correct – wrong number of pumps – right reason for Unit 2.

D. **Incorrect**: Should not operate 3 condensate pumps on Unit 2.
Plausible: If the applicant confuses the correct line up between Unit 1 and Unit 2. This is the correct answer for Unit 2 and is the correct answer in the bank question.

Level: RO Exam

KA: SYS 056K1.03 (2.6*/2.6)

Lesson Plan Objective: 18467 – Determine the plant operating limits for various running combinations of the condensate / condensate booster pumps

Source: MOD Q24630

Level of knowledge: memory

References:
1. SD-44 pages 9-10, 35
2. OI-11A Unit 2 pages 6, 20-22, 71
3. OI-11A Unit 1 pages 6, 74

056 Condensate K1 Knowledge of the physical connections and/or cause-effect relationships between the Condensate System and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.03 MFW 2.6* 2.6

Bank Question: 19 Answer: B

1 Pt(s) Unit 1 was operating at 100% power when a loss of main feedwater occurred. Given the following events and conditions:

- A reactor trip occurred
- SGIS occurred
- 1-PI-1013A thru D indicate 890 psia (#11 S/G pressure)
- 1-PI-1023A thru D indicate 750 psia (#12 S/G pressure)
- 1-LI-1114C & 1-LR-1114D indicate -180 inches (#11 S/G level)
- 1-LI-1124C & 1-LR-1124D indicate -210 inches (#12 S/G level)

What is the present status of the S/G water level control system?

A. Both SGs are being fed from AFW due to an AFAS and the operator actions required from EOP-0.

B. AFAS actuated, feeding to the#11 S/G and restoring level; AFAS block to #12 S/G isolating flow.

C. AFAS actuated, feeding to the #12 S/G and restoring level; AFAS block to #11 S/G isolating flow.

D. Both SGs have an AFAS block signal isolating flow although an AFAS signal has occurred.

Distracter Analysis:

A. **Incorrect**: The #12 S/G is isolated due to > 115 psid between the 11 and 12 S/Gs – AFAS block signal is generated
Plausible: If the applicant does not recognize the AFAS block signal or recall the AFAS actuation setpoints.

B. **Correct**:

C. **Incorrect**: The #12 S/G is isolated due to > 115 psid between the 11 and 12 S/Gs – AFAS block signal is generated
Plausible: If the applicant reverses the AFAS block logic

D. **Incorrect**: The #12 S/G is isolated due to > 115 psid between the 11 and 12 S/Gs – AFAS block signal is generated
Plausible: If the applicant does not understand the AFAS block logic or concludes that the SGIS signal isolates AFW flow to the S/Gs. Included primarily for psychometric balance.

Level: RO Exam

KA: SYS 059K3.02 (3.6/3.7)

Lesson Plan Objective: 17474 - Remember the plant conditions and actions of the following: (response to include initiation devices, coincidence logic, component(s) status, and alarms when applicable):

Source: Bank Q16704

Level of knowledge: comprehension

References:
1. SD-36A/B pages 26-37 + Table 5-6

059 Main Feedwater K3 Knowledge of the effect that a loss or malfunction of the MFW will have on the following: (CFR: 41.7 / 45.6) K3.02 AFW system 3.6 3.7

Bank Question: 20 Answer: B

1 Pt(s) Unit 2 was operating at 100% power when a degraded voltage condition occurred on the grid. Given the following events and conditions:

- Service transformer U-4000-22 faulted and was electrically isolated
- The 2B DG failed to start
- An AFAS signal was generated
- The 0C DG was started and connected to 4.16 KV bus 07

Which one of the following statements correctly describes how power should be restored to the 23 AFW pump?

A. Power should be rerouted to the 24 bus from the 0C DG by closing breakers 152-0701 and 152-2406 only.

B. Power should be rerouted to the 24 bus from the 0C DG by closing disconnects 189-2406 and breakers 152-0701, 152-2406.

C. Power should be rerouted to the 24 bus from service bus 11 via transformer U-4000-11 by closing breaker 152-2401.

D. Power should be rerouted to the 24 bus from the 23 bus by closing breaker 152-2301.

Distracter Analysis: While it is acknowledged that applicants do not need to recall breaker numbers, they should be able to determine the number of breakers required to close the 0C DG onto the 24 bus. They should also be able to determine that C and D are not correct by understanding the basic system alignment – without knowing breaker numbers.

A. **Incorrect**: Disconnects 189-2406 must also be closed.
Plausible: If the applicant is not familiar with the 4.16 KV electrical distribution system and does not recall that the disconnects must be first be closed to rout power from the 07 bus to the 24 bus.

B. **Correct**:

C. **Incorrect**: Power cannot be routed from U-4000-11.
Plausible: Power could be routed from U-4000-22 by closing breaker 152-2401. Also power can be cross-tied to service bus 11 but must use transformer U-4000-12 for this crosstie.

D. **Incorrect**: Cannot cross-connect the 23 and 24 buses per Tech Specs.

Plausible: This might physically provide power if the fault on U-4000-12 did not degrade the tie.

Level: RO Exam

KA: SYS 061K2.02 (3.7*/3.7)

Lesson Plan Objective: LOI-004B-1 objective 2.0 - Identify the physical connections and/or evaluate the cause-effect relationships between the 4KV system and the following systems: a. 13.8 KV system, b. Diesel Generators, c. 480 V System.

Source: New

Level of knowledge: comprehension

References:
1. SD-004 pages 23 and Figure 2
2. LOI-004B-1.ppt slides 5, 12
3. Drawing FSAR Fig 8-1 61001SH0001

061 Auxiliary/Emergency Feedwater K2 Knowledge of bus power supplies to the following: (CFR: 41.7) K2.02 AFW electric drive pumps 3.7* 3.7

Bank Question: 21 Answer: D

1 Pt(s) Unit 2 was operating at 100% power a loss of offsite power occurred. Given the following events and conditions:

- The 21 AFW pump auto-started and ran at 4600 rpm
- The Emergency 250 VDC Bus 23 was deenergized due to a bus fault

Which one the following statements correctly describes the status of the lube oil supply and cooling flow?

A. Lube oil flow is inadequate because the saddle pump is not operating. Lube oil is cooled by service water.

B. Lube oil flow is inadequate. Although the saddle pump is operating, the rotating rings on the pump shaft will not provide a sufficient supply of oil above 4600 rpm. Lube oil is cooled by the AFW pump discharge.

C. Lube oil flow is adequate. The rotating oil rings on the pump shaft will provide a sufficient oil supply. Lube oil is cooled by service water.

D. Lube oil flow is adequate. The saddle pump is operating. Lube oil is cooled by the AFW pump discharge.

Distracter Analysis:

A. **Incorrect**: The saddle pump is operating and lubrication is adequate
Plausible: If the applicant thinks that the saddle pump is DC-driven. The 250 VDC bus 23 powers the main turbine emergency lube oil and seal oil pumps.

B. **Incorrect**: Lube oil flow is adequate. The saddle pump was installed in 2005 to ensure that lubrication was adequate at pump speeds > 4600 rpm.
Plausible: Partially correct. It is true that the rotating oil "slinger" rings do not provide adequate oil flow > 4600 rpm. However, the saddle pump was installed specifically to remedy this situation. Lube oil cooling is provided by AFW pump discharge.

C. **Incorrect**: Lube oil cooling is provided by condensate, not service water. The rotating rings on the 21 AFW pump shaft do not provide adequate oil flow > 4600 rpm – which is why the saddle pumps were installed.
Plausible: Partially correct. The lube oil flow will be adequate.

D. Correct:

Level: RO Exam

KA: SYS 061K4.13 (2.7/2.9)

Lesson Plan Objective: 17449 - LOI-036A-1 slide 9 Remember the automatic control signals and initiating devices.

Source: New

Level of knowledge: memory

References:
1. LOI-036A-1 slides 74-80
2. SD-036A/B pages 15-16, 39
3. SD-016 page 2

061 Auxiliary/Emergency Feedwater K4 Knowledge of AFW design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7) K4.13 Initiation of cooling water and lube oil 2.7/2.9

Bank Question: 22 Answer: B

1 Pt(s) Unit 1 was operating at 100% power when a loss of offsite power occurred. Given the following events and conditions:

0200 The reactor tripped and SIAS actuated
0205 The 1A DG was loaded on bus 11 at 4500 KW
0205 The 1B DG was loaded on bus 14 at 3550 KW

Which one of the following statements correctly describes the significance of these diesel generator loads?

A. 1A DG is running within the continuous load limits
1B DG is running in excess of the continuous load limits and should be shutdown to prevent damage to the engine

B. 1A DG is running within the continuous load limits
1B DG is running in excess of the continuous load limits but within the 30-minute load limit and should be monitored closely

C. 1A DG is running in excess of the continuous load limits and should be shutdown to prevent damage to the engine
1B DG is running within the continuous load limits

D. 1A DG is running in excess of the continuous load limits but within the 30-minute load limit and should be monitored closely
1B DG is running within the continuous load limits

Distracter Analysis: The maximum sustainable load for the 1A EDGs is 5400 KW and 1B EDG = 3000 KW. OI-21 states that the EDGs shall NOT exceed their continuous load limits "during normal operations". The LOOP and SIAS is not "normal operations" and the EDGs may be operated up to their 30-minute rated limits.

A. **Incorrect**: The 1B EDG is running within the 30 minute load limit (3600 KW) and should NOT be shutdown
Plausible: Partially correct - the 1A EGD is operating within its' continuous load limit. The 1B EDG does exceed the continuous load limit – and OI-21B 6.4.A.3 requires NOT operating > 3000 KW unless approved by a special test procedure or by the General Supervisor- Nuclear Operations under normal conditions. Initial condition A.4 also limits the 1B DG to < 2.3 MW if it is powering the 14 bus and SIAS has not actuated.

B. **Correct**:

C. **Incorrect**: The 1A EDG does not exceed the continuous load limit of 5400 KW. The 1B DG exceeds the continuous load limit of 3000 KW
Plausible: If the applicant reverses the load limits and does not recognize that DGs should be allowed to continue to run during emergencies.

D. **Incorrect**: The 1A EDG does not exceed the continuous load limit of 5400 KW. The 1B DG exceeds the continuous load limit of 3000 KW
Plausible: If the applicant reverses the load limits between the DGs

Level: RO Exam

KA: SYS 062A1.01 (3.4/3.8)

Lesson Plan Objective: LOI-024A-1-1 Obj 1.3

Source: new

Level of knowledge: memory

References:
1. OI-21A page 9
2. OI-21B page 22
3. LOI-024A-1-1 slide 23

062 AC Electrical Distribution A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ac distribution system controls including: (CFR: 41.5 / 45.5) A1.01 Significance of D/G load limits 3.4 3.8

Bank Question: 23 Answer: C

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- 125 V DC GROUNDING DETECTION alarm is received on 1C33
- The CRS directs the NLO to locally verify if DC grounds exist on all DC buses
- The NLO reported that:
  - The RED LED was **Lit** for the 11 125 VDC bus on the ground detection system panel in the Unit 1 cable spreading room
  - The RED LED was **Out** for the 21 125 VDC bus on the ground detection system panel in the Unit 2 cable spreading room
- The NLO also conducted a test for grounds on the 14 125 VDC bus in accordance with OI-26A. Given the following test results:
-

  Step 1.a: "PLACE <u>AND</u> HOLD the GROUND TEST SWITCH to LMP TST" - RESULTS:
  - POSITIVE GROUND FAULT = **Lit**
  - NEGATIVE GROUND FAULT = **Lit**

  Step 1.d "PLACE <u>AND</u> HOLD the GROUND TEST SWITCH to GND TST" – RESULTS:
  - POSITIVE GROUND FAULT = **Lit**
  - NEGATIVE GROUND FAULT = **Not lit**

Which one of the following selections correctly describes (1) the impact of this malfunction on the 11 and 14 125 VDC bus and (2) what should be done to respond to these symptoms?

A. (1) The 11 125 VDC bus is grounded, the 14 125 VDC bus is not grounded
(2) Enter AOP-7J for loss of 11 125 V DC bus

B. (1) The 21 125 VDC bus is grounded, the positive phase has grounded on the 14 125 VDC bus
(2) Enter AOP-7J for loss of 14 125 V DC bus

C. (1) The 11 125 VDC bus is grounded, the negative phase has grounded on the 14 125 VDC bus
(2) Commence ground isolation on the 11 and 14 125 VDC buses

D. (1) Unable to determine which phase has grounded
(2) Submit an IR and continue troubleshooting

Distracter Analysis: The alarm on 1C33 detects grounds on the 11 and 21 125 VDC busses. The red LED indicates the ground is on the 11 125 VDC bus. The test on the 14 125 VDC bus shows a ground on the negative phase.

A. **Incorrect**: The OI-26 test shows there are grounds on the negative phase of the 14 125 V DC bus. AOP-7J is not entered for just the grounding of a single phase.
Plausible: Partially correct – the alarm on 1C33 is not related to the ground on the 14 125 VDC bus.

B. **Incorrect**: The 11 125 VDC bus is grounded – not the 21 125VDC bus. The negative phase of the 14 125VDC bus has grounded – not the positive phase. AOP-7J is not entered for a ground on single phase.
Plausible: If the applicant does not understand how to read the ground detector on the 14 125 VDC bus and thinks that the grounding of a single phase constitutes entry conditions for AOP-7J.

C. **Correct**:

D. **Incorrect**: The negative phase of the 14 125 VDC bus has grounded – this CAN be determined from the test.
Plausible: Submitting an IR is the required action per OI-26A step B.1.g – but this does not directly mitigate the problem.

Level: RO Exam

KA: SYS 063A2.01 (2.5/3.2*)

Lesson Plan Objective: 35923 – Given ground indications on any 120 V or 208 V ungrounded electrical systems, determine the required course of action when grounds are indicated on 120 V or 208 V systems.

Source: New

Level of knowledge: comprehension

References:
1. OI-26A pages 9 and 19
2. SD-002 pages 11, 14 + Figure 2-1
3. AOP-7J page 4
4. 1C33 T-20

063 DC Electrical A2 Ability to (a) predict the impacts of the following malfunctions or operations on the DC electrical systems; and (b) based on those predictions, use procedures

to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) A2.01 Grounds 2.5 3.2*

Bank Question: 24 Answer: D

1 Pt(s)

Unit 1 was operating at 100% power. Unit 2 was shutdown in mode 6 conducting a summer refueling outage. The results of Tech Spec Surveillances 3.8.3.1 and 3.8.3.2 indicated the following:

- FOST 1A storage = 45,000 gallons
- FOST 1A – indicates water content exceeds the limits of the diesel fuel oil testing program
- FOST 11 storage = 40,000 gallons
- FOST 11 – indicates total particulates exceed the limits of diesel fuel oil testing program
- FOST 21 storage = 70,000 gallons
- FOST 21 – indicates oil is within limits of the diesel fuel oil testing program

Which one of the following selections correctly describes all of the required actions that would comply with Tech Specs, allow the maximum action times and prevent having to declare any EDG to be inoperable immediately

References Provided: Tech Spec 3.8.3

A. Reduce FOST 1A water content to within limits within 48 hours
Reduce FOST 11 total particulates within specifications within 7 days
Restore FOST 21 level to > 72,300 gallons within 1 hour and
restore level to > 85,000 gallons within 48 hours

B. Reduce FOST 1A water content to within limits within 48 hours
Reduce FOST 11 total particulates within specifications within 30 days
Restore FOST 21 level to > 72,300 gallons within 1 hour and
restore level to > 85,000 gallons within 48 hours

C. Reduce FOST 1A water content to within limits within 30 days
Reduce FOST 11 total particulates within specifications within 30 days
Restore FOST 21 level to > 85,000 gallons within 2 hours

D. Reduce FOST 1A water content to within limits within 30 days
Reduce FOST 11 total particulates within specifications within 7 days
Restore FOST 21 level to > 85,000 gallons within 48 hours

Distracter Analysis: FOST 1A has high water content – water content must be reduced within 30 days per action statement E.1.
FOST 11 has high particulates – must be reduced within 7 days per D.1.
FOST 21 level must be restored to > 85,000 gallons within 48 hours per C.3.

A. **Incorrect**: FOST 1A does not need to be restored within 48 hours because it only has high total particulates. FOST 11 does not need to be restored within 7 days – the impurities are not total particulates so E.1 applies. Although these actions would indeed comply with Tech Specs they are not the maximum action times.
Plausible: If you do not count the contents of FOST 1A and 11 due to the impurities, then FOST 21 must be raised to > 72,300 gallons within 1 hour to comply with TS Action B.1. These actions comply with Tech Specs but are not the maximum action times.

B. **Incorrect**: FOST 1A does not need to be restored within 48 hours because it only has high total particulates.
Plausible: If the applicant does not note action statement D.1 or thinks that contaminated fuel oil cannot be counted as part of the inventory. The other action statements can be considered correct.

C. **Incorrect**: No need to restore FOST 21 to > 85,000 gallons within 2 hours because Unit 2 is in mode 6. In addition, must reduce total particulates in FOST 11 within 7 days – not 30 days.
Plausible: This action would be required if Unit 2 was > mode 5.

D. **Correct**: This complies with all Tech Spec action statements and allows maximum action statement time.

Level: RO Exam

KA: SYS 064K6.08 (3.2/3.3)

Lesson Plan Objective: 17908 "Given Tech Specs and EDG related conditions, implement the required actions based on DG operability."

Source: New

Level of knowledge: analysis

References:
1. Tech Spec 3.8.3
2. SD-23 pages 1, 84 + Figures 24C-3, 24C-4
3. SD-24A pages 32-37 + Figures 24A-5, 24A-14

064 Emergency Diesel Generator K6 Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: (CFR: 41.7 / 45.7) K6.08 Fuel oil storage tanks 3.2 3.3

Bank Question: 25 Answer: A

1 Pt(s) Units 1 and 2 are operating at 100% power with a liquid waste discharge in progress.

Which one of the following statements correctly describes the discharge path, automatic protective feature and the discharge limits?

Fill in the blanks.

The liquid waste system discharges into the _____(1)_____, and is terminated by closing _____(2)_____ in order to maintain discharge limits below _____(3)_____.

A.
1. **Circulating water discharge conduits**
2. **Discharge isolation valves 0-CV-2201 and 0-CV-2201**
3. **The fixed setpoint of 0-RI-2201**

B.
1. **Salt-water emergency discharge header**
2. **Discharge isolation valves 0-CV-2191 and 0-CV-2192**
3. **The Plant Computer High alarm setpoint**

C.
1. **Salt-water emergency discharge header**
2. **Discharge isolation valves 0-CV-2191 and 0-CV-2192**
3. **The fixed setpoint of 0-RI-2201**

D.
1. **Circulating water discharge conduits**
2. **Discharge isolation valves 0-CV-2201 and 0-CV-2202**
3. **The Plant Computer High alarm setpoint**

Distracter Analysis: K/A match analysis: The K/A tests knowledge of the process monitor system and the effects of how changes in radiation intensity effect limits. The limits in question apply to process streams, not to area (whole body) limits. Decided to test whether the applicant understands the regulatory bases behind these limits. Testing the actual limits for process streams would be > RO knowledge. Because the PRMs monitor only particulate, liquid and gaseous discharge streams, ROs are not expected to correlate process stream activity with actual radiation limits in 10CFR20.

A. **Correct**: - right path, right limits, right setpoint

B. **Incorrect**: Wrong discharge path, wrong isolation valves, wrong setpoint

Plausible: If the applicant does not recognize the process controls for the discharge - psychometric balance

C. **Incorrect**: Wrong discharge path, wrong limits
Plausible: Partially correct – the setpoint is right

D. **Incorrect**: Wrong setpoint for the alarm
Plausible: Partially correct – the discharge path and valves are correct.

Level: RO Exam

KA: SYS 073K5.02 (2.5/3.1)

Lesson Plan Objective: 18385 – Identify the Radiation Monitors that have a control interface with another system and state their control functions.

Source: New

Level of knowledge: memory

References:
1. SD-077 pages 1, 11-12
2. SD-12 page 11

073 Process Radiation Monitoring ~~K5 Knowledge of the operational implications as they apply to concepts as they apply to the PRM system: (CFR: 41.5 / 45.7) K5.03 Relationship between radiation intensity and exposure limits 2.9* 3.4~~ K4 Knowledge of PRM system design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
K4.01 Release termination when radiation exceeds setpoint 4.0 4.3

Unable to prepare a question for K5.03 within a reasonable length of time. Systematically selected a K/A to match the question that had been prepared.

Bank Question: 26 Answer: A

1 Pt(s) Unit 1 and Unit 2 were operating at 100% when a LOCA occurred on Unit 1. Given the following events and conditions:

- The 11 containment spray pump failed to start
- 1-SI-657 (SDC temperature control valve) has failed shut
- The 12 salt water (SW) normal discharge header is blocked

Which one of the following statements is correct regarding the capability of the service water (SRW) system to remove emergency heat loads?

A. The 12 SW emergency discharge header must be lined up before emergency heat loads can be adequately removed

B. Only the 11 train of SRW is required to adequately remove emergency heat loads under existing conditions

C. Only the 12 train of SRW is required to adequately remove emergency heat loads under existing conditions

D. Cannot remove emergency heat loads unless further repairs are made to cooling components

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Distracter Analysis: Loss of the 11 CS pump makes the A train of containment spray inoperable. The blockage of the 12 SW discharge header disables the associated 11 CCW and 11 SRW heat exchangers. If the 11 SW train is operated, then only the 11 and 12 containment air coolers will be operable – not adequate alone for heat removal. If the 12 SW emergency discharge line up is completed, the 11 SW train must first be removed from service – but this line up makes the 13 / 14 containment air coolers and the 12 containment spray pump operable – which results in adequate heat removal.

A. **Correct**: Realigning the 12 SW emergency discharge line causes the 12 CS train and the 13/14 containment air coolers to be operable and remove heat.

B. **Incorrect**: The 11 train of SRW only provides cooling to the 11/12containment air coolers. This is not enough to remove accident heat loads.
Plausible: If the applicant thinks that the 11/12 containment air coolers are adequate without containment spray

C. **Incorrect**: The 12 SW train discharge line is blocked. Cooling will not be provided to the 12 CS and 13/14 containment air cooler trains without a lineup change.
Plausible: If the applicant thinks that the 12 train is operable under these conditions

D. **Incorrect**: Can remove adequate heat loads by using the 12 SW emergency discharge lineup.
Plausible: If the applicant is not familiar with this lineup – or if the applicant thinks that the failure of the 1-SI-657 causes a common mode failure in the SDC heat exchangers – note that 1-SI-657 (SDC temperature control valve) controls CCW discharge flow in a common discharge line when in shutdown cooling. If this valve was in the SI recirculation flow path, it could potentially block both coolers. But this valve is bypassed during safety injection. Adding this failure causes this distracter to be more credible.

Level: RO Exam

KA: SYS 076A3.02 (3.7/3.7)

Lesson Plan Objective: 18098 – Identify when SRW flow is established through the SRW heat exchanger and the basis for this requirement.

Source: New

Level of knowledge: comprehension

References:
1. SD-12 pages 8-9
2. SD-52/61 pages 27-29, 34
3. SD-11 pages 88-9, 25
4. SD-15 page 26

Note - there are no drawings showing these systems that are readily accessible in the SDs - and I am unable to print (or easily view) the engineering drawings

076 Service Water A3 Ability to monitor automatic operation of the SWS, including: (CFR: 41.7 / 45.5) A3.02 Emergency heat loads 3.7 3.7

Bank Question: 27 Answer: C

1 Pt(s)

Unit 1 and Unit 2 were operating at 100% power when a reduction in instrument air header pressure occurred. Given the following events and conditions:

- Unit 1 instrument air header pressure decreased to 80 sig.
- The operators entered AP-07D and took all required actions

Which of the following actions should have occurred?

1. The standby instrument air compressor started
2. Containment instrument air isolation (IA-2085-CV) closed
3. Plant air header automatic isolation valve (PA-2059-CV) closed
4. Plant air to instrument air cross connect valve (PA-2061-CV) opened

A. Actions 1 and 2 only

B. Actions 1 and 4 only

C. Actions 1, 3 and 4 only

D. Actions 2, 3 and 4 only

Distracter Analysis:
1. The standby instrument air compressor started at 93 psig
2. Containment instrument air isolation (IA-2085-CV) closed at 75 psig
3. Plant air header automatic isolation valve (PA-2059-CV) closed at 85 psig
4. Plant air to instrument air cross connect valve (PA-2061-CV) opened at 88 psig

A. **Incorrect**: 2 does not occur until 75 psig
Plausible: Partially correct – 1 occurs at 93 psig.

B. **Incorrect**: Not a complete list – 3 occurs also
Plausible: If the applicant does not recall the set point

C. **Correct**:

D. **Incorrect**: Action 2 does not occur until 75 psig
Plausible: partially correct – actions 3 and 4 occur

Level: RO Exam

KA: SYS 078A4.01 (3.1/3.1)

Lesson Plan Objective: 18167 Recall the setpoints associated with the design features.

Source: MOD Q20304

Level of knowledge: memory

References:
1. AOP-7D page 5
2. SD-019 pages 12, 20-21, 37-38, 46, 57+Figure 19-1

078 Instrument Air A4 Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.01 Pressure gauges 3.1 3.1

Bank Question: 28 Answer: A

1 Pt(s) Unit-2 is in Mode 6 with refueling in progress and containment purge in service. Given the following events and conditions:

- A momentary loss of power causes the operating purge exhaust fan to trip
- The purge supply fan continues to run (fails to automatically trip)
- Containment pressure reads 0.35 psig
- The gaseous waste release permit is still valid

What is the most likely effect on (1) system parameters and (2) what action(s) is (are) required to resume refueling?

A. 1. Spent fuel pool level increases
2. Secure the normal containment purge lineup and restart containment purge using the Hydrogen purge system

B. 1. Refuel pool level increases
2. Initiate a containment vent and restart the normal containment purge lineup

C. 1. Spent fuel pool level increases
2. Initiate a containment vent

D. 1. Refuel pool level increases
2. Restart the normal containment purge lineup

Distracter Analysis: Refueling pool level changes--correct per OI-36 general precaution F. The Main Exhaust Fan tripping would cause containment pressure to increase by several tenths psig. With the transfer tube gate valve open, pool level will increase accordingly due to the increased differential pressure between the SFP area and containment.

A. **Correct**:

B. **Incorrect**: Refuel pool level will decrease because containment differential pressure increases.
Plausible: Partially correct – cannot immediately restore the normal purge lineup because containment pressure > 0.3 psig – but can vent containment to reduce pressure and restart the normal purge lineup.

C. **Incorrect**: Initiating a containment vent would lower containment pressure but would not establish sufficient conditions to permit refueling operations. Must also restore containment purge.
Plausible: Partially correct – the spent fuel pool level would rise.

D. **Incorrect**: Refuel pool level would decrease not increase. Initiating a containment vent would restore containment pressure to allow restarting the normal containment purge BUT a containment vent is not sufficient to resume refueling
Plausible: Provided for psychometric balance

Level: RO Exam

KA: SYS 103G2.1.23 (3.9/4.0)

Lesson Plan Objective: 23949 Knowledge of the effect that a loss or malfunction of the containment purge system will have on the following: 38029K301.

Source: Mod Q20602

Level of knowledge: comprehension

References:
1. OI-36 pages 5, 9
2. SD-060B pages 15, 19, 22

103 Containment 2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 45.2 / 45.6) 3.9/4.0

Bank Question: 29 Answer: A

1 Pt(s) Unit 1 was operating at 100% power when the 12 CEDM MG set is noted to be arcing and sparking. Given the following events and conditions:

- TCBs 1-9 are closed
- 12 MG set output voltage = 240 volts
- 12 MG set output amps = 50 amps / phase

If the operator opens the 12 CEDM MG set output breaker, which one of the following statements correctly describes the (1) concerns associated with MG set shutdown and (2) the alarm that will annunciate when the 12 MG Set breaker is opened?

A. 1. CEAs may drop due to voltage transients
2. 1C05 D-46 (MG SET NO OUTPUT)

B. 1. CEAs may drop due to voltage transients
2. 1C05 D-48 (CEDS NO CONTR VOLT)

C. 1. The 4 TCBs associated with the 12 MG set will open
2. 1C05 D-46 (MG SET NO OUTPUT)

D. 1. The 4 TCBs associated with the 12 MG set will open
2. 1C05 D-48 (CEDS NO CONTR VOLT)

Distracter Analysis: KA match analysis: The KA tests the location and interpretation of alarms on the CRD system. The location of CRD alarms is rather simplistic knowledge. The determination was made to test the part of the K/A that has the highest cognitive value - the interpretation of the alarms. This knowledge is tested by asking the applicant to predict the alarm that will annunciate if operator action is taken. This meets the intent of this K/A.

A. **Correct**:

B. **Incorrect**: "CEDS no control voltage" will not annunciate because CEDS will not lose their 15 V DC control power. A plant mod was installed to add a redundant 15 VDC power supply on the back of the CPP panels.
Plausible: Prior to the modification, a loss of power from the associated MG set could potentially cause a loss of control power to CEDS

C. **Incorrect**: The 4 TCBs will not open if TCB-9 is closed

Plausible: This action occurs if TCB-9 is open. Partially correct – the alarm is right.

D. **Incorrect**: The 4 TCBs will not open if TCB-9 is closed. "CEDS no control voltage" will not annunciate because CEDS will not lose their 15 V DC control power. A plant mod was installed to add a redundant 15 VDC power supply on the back of the CPP panels.
Plausible: Provided for psychometric balance

Level: RO Exam

KA: SYS 001K6.12 (2.9*/3.2*)

Lesson Plan Objective: ??? – (no number assigned but objective is stated in Vision under system 37375 – "Respond to the loss of a 208/120 volt instrument bus". Also have "Investigate the CCEDS no control voltage alarm" with no objective number assigned.

Source: New

Level of knowledge: comprehension

References:
1. OI-42 pages 45-46
2. SD-55 pages 10, 18, 28 + Figures 55-13, 55-16, 55-22
3. 1C05 D46 and D-48

001 Control Rod Drive K6 Knowledge of the effect of a loss or malfunction on the following CRDS components: (CFR: 41.7/45.7) K6.12 Location and interpretation of CRDS ac/dc status alarms 2.9* 3.2*

Bank Question: 30 Answer: A

1 Pt(s)

Unit 1 was at 100% power when an alarm was received on the loose parts monitor. Given the following events and conditions:

- The loose parts monitor channel 1 is in service and alarmed
- CEAs were being moved at the time of the alarm
- The following message was showing on the channel:
  - "ALARM **NOT** RESETTING"
  - The alarm will not reset
- There are no indications of audible impacts when the channel was monitored
- The alarming channel was printed out

Which one of the following statements correctly describes (1) the most likely detector location for the alarm and (2) the required action(s) to be taken per OI-37?

A. 1. The reactor pressure vessel head and closure stud
2. Obtain CRS permission and bypass the alarm

B. 1. The reactor pressure vessel head and closure stud
2. Declare the channel 1 to be inoperable and startup channel 2

C. 1. Reactor cold leg nozzle
2. Obtain CRS permission and bypass the alarm

D. 1. Reactor cold leg nozzle
2. Declare the channel 1 to be inoperable and startup channel

---

Distracter Analysis: K/A Match Analysis: There are no automatic actions associated with the Loose Parts Monitoring (LPM) system at CCNP. The K/A is to test the ability to monitor operation of the system as it is used in the plant.

A. Correct:

B. Incorrect: The required action is to bypass the channel with CRS permission.
Plausible: Partially correct – the location of the sensor is correct.

C. Incorrect: There is no sensor on the reactor cold leg nozzle.
Plausible: Recalling location of the LPM sensors is required knowledge per objective 17401. Partially correct – the action is correct.

D. **Incorrect**: There is no sensor on the reactor cold leg nozzle. Declaring channel 1 inoperable and starting channel 2 is not a required action
Plausible: Recalling location of the LPM sensors is required knowledge per objective 17401 and determining actions to be taken for a LPM alarm is required knowledge by objective 17375. Declaring a channel inoperable is typical action for an alarming channel that will not reset – but it is not required by OI-37. Psychometrically balanced.

Level: RO Exam

KA: SYS 002A3.02 (2.6*/2.8)

Lesson Plan Objective: 17375 & 17401 – Using provided reference respond to a lose parts monitor alarm / Recall the purpose of the loss parts monitor and identify the RCS locations monitored

Source: Mod Q14477 & Q14478

Level of knowledge: memory

References:
1. SD-64D pages 4, 22-23
2. OI-37 pages 4, 6-9

002 Reactor Coolant A3 Ability to monitor automatic operation of the RCS, including: (CFR: 41.7 / 45.5) A3.02 Containment sound-monitoring system 2.6* 2.8

Bank Question: 31 ***Answer: C***

1 Pt(s) Match the CEDS signal/function in column A with the CEA position in column B. (Note: positions in column B may be used once, more than once, or not at all)

COLUMN A CEDS Function/Signal	COLUMN B CEA POSITION
____ A. Upper Electrical Limit	1. 0 inches
____ B. Lower Electrical Limit	2. 8 inches
____ C. Regulating group operating band	3. 3 inches
____ D. Rod Bottom	4. 3 to 135 inches
____ E. Exercise Limit	5. 8 to 129 inches
	6. 129 inches
	7. 135 inches

	A B C D E
A.	**6, 2, 5, 3, 7**
B.	**6, 3, 4, 1, 7**
C.	**7, 3, 4, 1, 6**
D.	**7, 2, 5, 3, 6**

Distracter Analysis:

A. **Incorrect**: Upper electrical limit is 135, lower electrical limit and operating band is set at 3 to 135 vice 8 to 129, rod bottom is 0 vice 3 inches, exercise limit is 129 vice 135 inches
Plausible: If applicant confuses the rod positions

B. **Incorrect**: Upper electric limit and exercise limit are reversed
Plausible: Partially correct - operating band and rod bottom are correct

C. **Correct**:

D. **Incorrect**: Lower electrical limit, operating band and rod bottom limit are incorrect

Plausible: partially correct – upper electrical limit and exercise limit are right – operating band is off.

Level: RO Exam

KA: SYS 014K1.01 (3.2*/3.6)

Lesson Plan Objective: 17144 – Identify how the control element drive system (CEDS) provides the following indications: a. Control element assembly position display system (CEAPDS), b. Core mimic display, c. SPDS

Source: Bank Q36501

Level of knowledge: memory

References:
1. SD-55 pages 12-14

014 Rod Position Indication K1 Knowledge of the physical connections and/or cause effect relationships between the RPIS and the following systems: (CFR: 41.3 to 41.9 / 45.7 to 45.8) K1.01 CRDS 3.2* 3.6

Bank Question: 32 Answer: D

1 Pt(s) Unit 1 was operating at 60% power when a loss of offsite power occurred. Given the following events and conditions:

- The reactor and turbine tripped
- HIC / PIC-4056 are in automatic
- A failure in the reactor regulating system has prevented the Tave modulating signal from being available for valve control
- Condenser vacuum = 19.5 inches
- Steam pressure increases to 900 psig

Which one of the following statements correctly describes the operation of the turbine bypass valves (TBVs) and atmospheric dump valves (ADVs)?

A. TBVs quick open
ADVs quick open

B. TBVs remain closed
ADVs modulate open in response to steam pressure

C. TBVs modulate open in response to steam pressure
ADVs remain closed

D. TBVs remain closed
ADVs remain closed

Distracter Analysis:

A. **Incorrect**: Turbine bypass valves and atmospheric dump valves will not quick open because reactor power was < 63%.
Plausible: If the applicant is not aware that the quick open signal is only generated when reactor power is between 8% and 63%

B. **Incorrect**: Atmospheric dump valves will not modulate open in response to steam pressure.
Plausible: If the applicant reverses the control scheme between the turbine bypass valves (modulate in response to steam pressure) and the atmospheric steam dumps (modulate in response to Tave)

C. **Incorrect**: Turbine bypass valves will remain closed due to condenser vacuum < 20 inches.
Plausible: This is the normal expected response from the reactor trip at 60% power.

D. **Correct**: Turbine bypass valves remain closed due to condenser vacuum < 20 inches. Atmospheric dump valves remain closed due

to the loss of the reactor reg signal. The quick open signal is not generated because reactor power is < 63%.

Level: RO Exam

KA: SYS 041A1.02 (3.1/3.2)

Lesson Plan Objective: 24397 - Given plant conditions and / or parameters, evaluate the operations of the TBVs/ADVs for normal and emergency operating conditions.

Source: New

Level of knowledge: comprehension

References:
1. SD-83A pages 12-18

041 Steam Dump/Turbine Bypass Control A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SDS controls including: (CFR: 41.5 / 45.5) A1.02 Steam pressure 3.1 3.2

Bank Question: 33 Answer: D

1 Pt(s) Unit 1 was in OP-04 (*Plant Shutdown from Power Operation to Hot Standby*). Given the following events and conditions:

- The operators had reached step 6.2 (*Planned Reactor Shutdown from Greater Than 20% Power*)
- Main generator load = 175 MWe
- Turbine testing will NOT be performed
- The CRS directed the CRO to proceed to step 6.2.D.1

"6.2.D.1 REMOVE Turbine Generator Load as follows:...
b. SHUTDOWN the Main Turbine PER OI-43A, Section titled SHUTDOWN OF THE TURBINE GENERATOR"

Which one of the following statements correctly describes the proper sequence for (1) reducing turbine load to 0 MWe, and (2) removing the turbine generator from service if turbine speed exceeds 1800 rpm when the 11 GEN BUS BKR 552-22 is opened?

A. (1) Reduce load from 175 MWe to 0 MWe by adjusting the load selector on the turbine control panel
(2) Verify *Loss of Load CH Trip BYP* annunciator is CLEAR, trip the reactor, implement EOP-0 (*Post-Trip Immediate Actions*)

B. (1) Reduce load from 175 MWe to 0 MWe by adjusting the load selector on the turbine control panel
(2) Verify *Loss of Load CH Trip BYP* annunciator is CLEAR, trip the turbine, implement AOP-7E (*Main Turbine Malfunction*)

C. (1) Pick up load on the TBVs until generator output reaches 40 MWe, then reduce load using the load selector on the turbine control panel until main generator load reaches 0 MWe
(2) Verify *Loss of Load CH Trip BYP* annunciator is CLEAR, trip the turbine, implement AOP-7E (*Main Turbine Malfunction*)

D. (1) Pick up load on the TBVs until generator output reaches 40 MWe, then reduce load using the load selector on the turbine control panel until main generator load reaches 0 MWe
(2) Verify *Loss of Load CH Trip BYP* annunciator is CLEAR, trip the reactor, implement EOP-0 (*Post-Trip Immediate Actions*)

Distracter Analysis: Turbine load is reduced to 40 MWe by picking up load on the TBVs, then reduced to 0 MWe using the load select

function. The TG output breakers are opened and if turbine speed increases to 1800 rpm, then if the *Loss of Load CH Trip BYP* is clear, the reactor is tripped and EOP-0 is entered. If the *Loss of Load CH Trip BYP* is on alarm, then the turbine is tripped and AOP-7E (Main Turbine Malfunction) is entered.

A. **Incorrect**: The correct sequence is "D". Load is reduced from 175 to 40 MWe using TBVs
Plausible: If the applicant thinks the turbine load is reduced from 175 MWe to 0 MWe using the load select function. Part (2) of the distracter is correct.

B. **Incorrect**: The correct sequence is "D". Load is reduced from 175 to 40 MWe using TBVs
Plausible: If the applicant thinks the turbine load is reduced from 175 MWe to 0 MWe using the load select function and does not recognize the significance of the *Loss of Load CH Trip BYP* annunciator being clear

C. **Incorrect**: The correct sequence is "D". If the *Loss of Load CH Trip BYP* annunciator is clear, the operator shall trip the reactor not the turbine. Tripping the turbine would cause an automatic reactor trip / RPS actuation and may require a 10CFR50.72 notification.
Plausible: If the applicant does not understand the significance of the *Loss of Load CH Trip BYP* annunciator being clear

D. **Correct**: This is the correct sequence.

Level: RO Exam

KA: SYS 045A4.02 (2.7/2.6*)

Lesson Plan Objective: 34623 – Shutdown the unit using the "Planned Reactor shutdown from greater than 20% Power Method"

Source: Mod Q37813 – provided by CCNP as a replacement question.

Level of knowledge: comprehension

References:
1. OP-4 pages 9-11
2. OI-43A pages 44-45
2. SD-98-1A pages 30-31

045 Main Turbine Generator A4. Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.02 T/G controls, including breakers 2.7 2.6*

Bank Question: 34 Answer: B

1 Pt(s) Unit 1 was operating at 100% power with primary to secondary tube leakage. Given the following events and conditions:

- There was a small air leak into the main condenser
- RI-1752 (Condenser Off-Gas Monitor) = 250 cpm
- Condenser off-gas flow rate was subsequently reduced from 16 cfm to 8 cfm by repairing the air leak into the condenser

Which one of the following statements correctly describes the expected change in the indication for process monitor RI-1752?

A. RI-1752 will increase to approximately 500 cpm because the off-gas activity will be concentrated due to the flow reduction.

B. RI-1752 will remain constant at approximately 250 cpm because the increased rate of decay due to the reduction in the transit time offsets the decrease in flow.

C. RI-1752 will remain constant at approximately 250 cpm because the N-16 gamma source term has effectively decayed away by the time the off-gas reaches RI-1752 and the background activity level in the vicinity of the detector will not change.

D. RI-1752 will decrease to approximately 125 cpm because the flow rate has been reduced by 50%.

Distracter Analysis:

A. **Incorrect**: The indicated value for RI-1752 will remain constant because while the reduction in flow rate past the RAD monitor causes only ½ as much radioactive gas to pass the by the probe in any given time period, each molecule of radioactive gas will be twice as likely to decay while passing the probe, resulting in the same indicated reading.
Plausible: If the applicant does not understand the relationship between activity concentration and flow rate.

B. **Correct**:

C. **Incorrect**: The N-16 gamma source term does not decay away completely and the off-gas detector does not see only background activity levels.
Plausible: N-16 gamma has a 6 second half life and decays very quickly.

D. **Incorrect**: The indicated value for RI-1752 will remain constant.
Plausible: If the applicant does not understand the relationship between activity concentration and flow rate.

Level: RO Exam

KA: SYS 055K1.06 (2.6/2.6)

Lesson Plan Objective: none

Source: MOD MP2 bank Q6100051

Level of knowledge: comprehension

References:
1. SD-077 page 12
2. LOI-077-1-1.ppt slides 21-26

055 Condenser Air Removal K1 Knowledge of the physical connections and/or cause effect relationships between the CARS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.06 PRM system 2.6 2.6

Bank Question: 35 Answer: C

1 Pt(s) Unit 1 was operating at 100%. The operators were discharging reactor coolant waste evaporator distillate to the reactor coolant waste monitor tanks. Given the following events and conditions:

- The conductivity of the distillate is within purity specifications
- RCS chemistry is within normal limits

Assuming the waste evaporators are functioning as designed, which one of the following statements correctly describes the potential environmental concerns associated with the discharge of evaporator distillate?

A. The distillate may contain excessive concentrations of radioactive Iodine.

B. The distillate may contain excessive amounts of radioactive noble gases.

C. The distillate may contain excessive amounts of Tritium.

D. The distillate may contain excessive amounts of boric acid.

Distracter Analysis:

A. **Incorrect**: Radioactive Iodine is removed from the discharge effluent when the evaporators are operating as designed. Radioactive Iodine is designed to be reduced by a factor a 50x. If it is not reduced, the conductivity cell will respond to ionic impurities and the distillate will be recycled back to the evaporator feed tank. The reactor coolant waste evaporators discharge to the reactor coolant waste monitoring tank.
Plausible: If the applicant does not recognize the design functions of the reactor coolant waste evaporators.

B. **Incorrect**: All gases (including noble gases) are stripped out of the distillate.
Plausible: if the applicants are unfamiliar with the design requirements for the waste evaporators.

C. **Correct**: Tritium passes through the waste evaporators undiminished.

D. **Incorrect**: Boric acid is removed from the evaporator distillate – this is the purpose of the waste evaporators. Distillate is designed to contain less than 10 ppm boric acid.

Plausible: if the applicants are unfamiliar with the design requirements for the waste evaporators.

Level: RO Exam

KA: SYS 068G2.1.30 (3.9/3.4)

Lesson Plan Objective: none

Source: New

Level of knowledge: memory

References:
1. SD-071C pages 3, 10

068 Liquid Rad Waste K4 Knowledge of design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7) K4.01 Safety and environmental precautions for handling hot, acidic, and radioactive liquids 3.4 4.1

Shifted K/As – determined that a valid question could not be prepared for the original K/A: ~~068 Liquid Rad Waste 2.1.30 Ability to locate and operate components, including local controls. (CFR: 41.7 / 45.7) 3.9/3.4~~

Bank Question: 36 Answer: B

1 Pt(s) Unit 1 was in mode 6 conducting refueling operations. Given the following events and conditions:

- A containment purge is in progress
- Power is lost to RE-5316A (Containment Area Radiation Monitor)

Which one of the following statements correctly describes (1) the automatic system response (if any), and (2) the immediate action (if any) required by Tech Specs?

A. (1) The containment purge is automatically terminated.
(2) Refueling may proceed.

B. (1) The containment purge shall be manually terminated
(2) Suspend all core alterations and movement of irradiated fuel assemblies until after the containment purge is isolated.

C. (1) The containment purge is automatically terminated.
(2) Immediately suspend all core alterations and movement of irradiated fuel assemblies.

D. (1) The containment purge may be continued.
(2) Refueling may proceed.

Distracter Analysis:

A. **Incorrect**: Loss of power to RE-5316A will not automatically terminate the containment purge – requires 2 of 4 channels to automatically terminate the purge.
Plausible: Partially correct – Tech Spec 3.3.7 requires suspension of core alterations and movement of irradiated fuel assemblies.

B. **Correct**: Loss of power to RE-5316A requires manual termination of the containment purge IAW OI-36 initial conditions 6.2.A.7.

C. **Incorrect**: The containment purge is not automatically terminated by loss of power to one channel of CIS.
Plausible: Partially correct – the action to suspend core alterations and movement of irradiated fuel assemblies is appropriate.

D. **Incorrect**: Refueling may not proceed with the loss of one channel.
Plausible: If the applicants do not recall Tech Spec 3.3.7 and 3.9.3 immediate action statements.

Level: RO Exam

KA: SYS 072K3.01 (3.2*/3.4*)

Lesson Plan Objective: 18379 – Given the status of any radiation monitor, use the Tech Specs, OIs ERPIP and ARM to determine operability and/or actions required.

Source: New

Level of knowledge: comprehension

References:
1. SD-77 pages 1-3
2. SD-048 pages 29-30 Fig 48-10
3. Tech Spec 3.3.7
4. Tech Spec 3.9.3
5. OI-35 Attachment 1D page 1, Table 1 page 3
6. OI-36 page 9
7. AOP-7J pages 12-13

072 Area Radiation Monitoring K3 Knowledge of the effect that a loss or malfunction of the ARM system will have on the following: (CFR: 41.7 / 45.6) K3.01 Containment ventilation isolation 3.2* 3.4*

Bank Question: 37 Answer: C

1 Pt(s) Units 1 and 2 were operating at 100% power when a rupture occurred on the instrument air header. Given the following events and conditions:

- Instrument air pressure dropped to 80 psig.
- The air leak was isolated by manual operator action
- Instrument air pressure increased to normal operating pressure

Which one of the following statements correctly describes (1) the response of 1-CV-2059 (PA HDR ISOL VLV) to the instrument air header rupture, and (2) the actions required to restore the plant air system when instrument air system has been repressurized?

A. **(1) Plant air will cross connect to supply instrument air by automatically opening 1-CV-2059.**
(2) The plant air system must be isolated from instrument air by manually closing 1-CV-2059.

B. **(1) Plant air will cross connect to supply instrument air by automatically opening 1-CV-2059.**
(2) The plant air system will automatically isolate from instrument air by closing 1-CV-2059 when instrument air system pressure increases above 85 psig.

C. **(1) Plant air will isolate to supply instrument air only by automatically closing 1-CV-2059.**
(2) The plant air system loads must be restored from instrument air by manually opening 1-CV-2059.

D. **(1) Plant air will isolate to supply instrument air only by automatically closing 1-CV-2059.**
(2) The plant air system loads will automatically be restored when 1-CV-2059 automatically opens when instrument air pressure increases above 85 psig.

Distracter Analysis:

A. **Incorrect**: 1-CV-2059 does not automatically open to supply instrument air. It closes to isolates plant air system loads and supply pressure to instrument air.
Plausible: This sequence is typical for many other plants. 1-CV-2061 responds this way at 88 psig.

B. **Incorrect**: 1-CV-2059 does not automatically open to supply instrument air and does not automatically close to isolate plant air.
Plausible: This design feature would work – and is used at other plants.

C. **Correct**:

D. **Incorrect**: 1-CV-2059 does not automatically open when instrument air pressure is restored. It must be manually reopened.
Plausible: This control scheme would work and is actually used at other plants.

Level: RO Exam

KA: SYS 079A2.01 (2.9/3.2)

Lesson Plan Objective: 18166 – Identify the design features that provide a backup for the instrument air system during a partial or total loss of the system.

Source: New

Level of knowledge: comprehension

References:
1. SD-19 pages 34-35
2. AOP-7D pages 3-18

079 Station Air A2 Ability to (a) predict the impacts of the following malfunctions or operations on the SAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) A2.01 Cross-connection with IAS 2.9 3.2

Bank Question: 38 Answer: A

1 Pt(s) Unit 1 was operating at 100% power when a reactor trip occurred. Given the following events and conditions:

- The operators are completing their post trip actions in EOP-0 (*Post Trip Immediate Actions*)
- The 11 MSIV drifted shut
- RCPs 11A and 12B are running
- Pressurizer level is 85 inches
- Pressurizer pressure is 1860 psia

If the 12B RCP trips for no apparent reason, which one of the following statements correctly describes the required actions (if any) in EOP-0?

A. No action is required

B. Start the 12A RCP

C. Trip the 11A RCP

D. Shut the 12 MSIV

Distracter Analysis: EOP-0 Step E.3.1 requires tripping all running RCPs if no RCPs are operating in a loop with a S/G available for heat removal, trip all RCPs. The question is whether or not the 11 S/G is considered available. The determination is that the 11 S/G is available, even though the MSIV is shut, because the ADV is operable to remove heat.

A. **Correct**: The 11 S/G is considered available for heat removal as long as the ADV is operable.

B. **Incorrect**: The correct action is to do nothing
Plausible: Starting the 12 RCP will restore flow to the 12 S/G – which is available for heat removal.

C. **Incorrect**: The correct action is to do nothing
Plausible: Tripping 11A RCP may sound reasonable if the applicant determines that closing the 11 MSIV causes the 11 S/G to be unavailable for heat removal.

D. **Incorrect**: The correct action is to do nothing
Plausible: This will place the 12 RCS loop in the same condition as the 11 RCS loop and enhance natural circulation.

Level: RO Exam

KA: EPE 0000007 (EK3.01)

Lesson Plan Objective: - Given a reactor trip and plant conditions, determine the number of RCPs required to operate and identify the basis for the RCP trip strategy.

Source: New

Level of knowledge: comprehension

References:
1. EOP-0 page 9
2. EOP-0 Bases Document pages 23-25

000007 (CE/E02) Reactor Trip - Stabilization - Recovery / 1 EK3 Knowledge of the reasons for the following as the apply to a reactor trip: (CFR 41.5 /41.10 / 45.6 / 45.13) EK3.01 Actions contained in EOP for reactor trip 4.0 4.6

Bank Question: 39 Answer: C

1 Pt(s) Unit 1 was operating at 100% power. Given the following events and conditions over a 2 minute time period:

- Pressurizer level lowered by 1 inches
- RCS Tave raised by 0.5 degree F
- Charging flow = 44 GPM
- Letdown = 0 gpm
- CBO flow = 6 gpm

Which one of the following statements correctly describes (1) the RCS leak rate and (2) the expected plant response to restore pressurizer level (if possible)?

References Provided: AOP-2A Unit 1 Attachment 1 pages 1-2

A. (1) < 15 gpm
(2) Letdown flow will be reduced to raise pressurizer level

B. (1) 15-30 gpm
(2) Letdown flow will be reduced to restore pressurizer level

C. (1) 30-80 gpm
(2) The standby charging pump will start

D. (1) > 80 gpm
(2) Both the standby and backup charging pumps will start

Distracter Analysis: Using Att 1 of AOP-2A, "C" correct leak rate Pzr level decrease of 18.9 GPM – (-39.4) GPM due to 0.5 °F temperature change = +58.3 gals / 2min = 29.2 gpm/min (line item "o").

Charging – letdown = 44 gpm (letdown is secured)
CBO = 6 gpm

Total RCS leakage = 29.2 + 44 – 6 = 67.2 gpm

A. **Incorrect**: The RCS leak rate = 67 gpm
Plausible: If the applicant reverses the +/- sign on the 29.2 gpm (due to a combination of PZR level increasing and Tave lowering), the answer becomes 9 gpm

B. **Incorrect**: The RCS leak rate = 67 gpm

Plausible: If the applicant reverses the +/- sign on the 39.4 gpm (due to Tave lowering), the answer becomes 27 gpm

C. **Correct**: RCS leak rate = 66 gpm

D. **Incorrect**: The RCS leak rate = 67 gpm. The 2nd backup charging pumps will not start
Plausible: if the applicant fails to divide the effects of ΔPZR level and ΔTave by 2 min, the answer is 96.3 gpm

Level: RO Exam

KA: APE 0000008EK3.01 (4.0/4.6)

Lesson Plan Objective: ???? – Given plant data and using attachment #1, calculate RCS leakage.

Source: Mod Q41658 – 7 versions of this question – bank question answer was wrong. Modified bank question to produce correct answer, changed to error bands and added 2nd part on system response to match K/A.

Level of knowledge: analysis

References:
1. AOP 2A Unit 1 attachment 2
2. SD-56 Figure 56-9

000008 Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open) AA1 Ability to operate and / or monitor the following as they apply to the Pressurizer Vapor Space Accident: (CFR 41.7 / 45.5 / 45.6) AA1.06 Control of PZR level 3.6 3.6

Bank Question: 40 Answer: B

1 Pt(s) Unit 2 was operating at 100% power when a small break LOCA occurred. Given the following events and conditions:

- Pressurizer level = 205 inches and very slowly decreasing
- The charging pump selector switch on 2C07 is selected to charging pumps 22 and 23
- Prior to the LOCA, the running charging pump was drawing 80 amps

Which one of the following statements correctly describes the expected effect on charging pump 22 amperage when compared before and after the LOCA?

A. Amps will increase from 80 to ~105 amps

B. Amps will increase from 0 to ~80 amps

C. Amps will remain constant at ~80 amps

D. Amps will decrease from 80 to ~60 amps

Distracter Analysis: With the charging pump selector switch in 22-23, the 21 charging pump is running, the 22 charging pump is the 1st backup pump, and the 23 charging pump is the 2nd backup pump. As pressurizer level decreases, the 1st backup charging pump will start at –9 inches from program level. At 100% power, this will be 215"-9"=206 inches). The 2nd backup charging pump will start at –14 inches (215-14=201). Because the charging pumps are positive displacement pumps, the pump amperage will remain approximately constant – unlike centrifugal charging pumps. Verified charging pump running amps by looking at amp meters in control room.

A. **Incorrect**: The charging pump amperage does not vary significantly with pressure.
Plausible: If the applicant thinks that the 22 pump is running and the amperage will increase with decreasing back pressure, increasing flow (like a centrifugal pump)

B. **Correct**: The 22 pump will start at 206 inches in the pressurizer and will run at the normal running amperage of 80 amps

C. **Incorrect**: The 22 pump was not running prior to the LOCA so amperage was 0.
Plausible: If the applicant thinks that the 22 pump was the running pump

D. **Incorrect**: The 22 pump runs at 80 amps
Plausible: If the applicant thinks that the 22 will start but will run at a lower amperage than the 21 pump because of constant flow resistance in the charging line

Level: RO Exam

KA: EPE 000009EA2.12 (2.8/2.7)

Lesson Plan Objective: none

Source: New

Level of knowledge: comprehension

References:
1. SD-041 pages 23-25 & Fig 6-7

000009 Small Break LOCA / 3 EA2 Ability to determine or interpret the following as they apply to a small break LOCA: (CFR 43.5 / 45.13) EA2.12 Charging pump ammeter 2.8 2.7

Bank Question: 41 Answer: A

1 Pt(s) Unit 1 was operating at 100% power when a large-break LOCA occurred. Given the following events and conditions:

- The 11 4KV bus was deenergized due to equipment failures
- The operators implemented step T.1 of EOP-5 and were restoring power to the 11 4KV bus from the 0C EDG
- The operators had reached step T.1.b.(5) which reads:

> **(5) Dispatch an operator to operate disconnect 189-1106 as follows:**
>
> **(a) Obtain the 189-1106 keys from the CR key locker.**
>
> **(b) Close 0C DG 11 4KV BUS DISC, 189-1106.**

Which one of the following statements correctly describes (1) the location and (2) the proper method of closing DISC 189-1106?

A. **(1) The 27' switchgear room**
(2) Insert the Kirk keys and unlock the 0C 4KV bus disconnect, then move the disconnect handle upwards until the disconnects close with a loud bang. Do not release the handle prior to full travel

B. **(1) The 27' switchgear room**
(2) Insert the Kirk keys and unlock the 0C 4KV bus disconnect then move the disconnect handle upwards and release the handle before it reaches the midway point. The disconnects will close with a loud bang.

C. **(1) 45' switchgear room**
(2) Move the disconnect handle upwards until the disconnects close with a loud bang. Do not release the handle prior to full travel. Then insert the Kirk keys and relock the 0C 4KV bus disconnect.

D. **(1) 45' switchgear room**
(2) Move the disconnect handle upwards and release the handle before it reaches the midway point. The disconnects will then close with a loud bang. Then insert the Kirk keys and relock the 0C 4KV bus disconnect.

Distracter Analysis: The breaker is located in the "associated switch gear room" – the 27;' elevation switchgear room. EOP-5 does not provide specific direction regarding either location of the disconnects or the proper method to close the disconnects. Additional guidance is provided in OI-21C.

A. **Correct**:

B. **Incorrect**: The method of closing the disconnect is incorrect – must not release handle prior to full travel.
Plausible: Partially correct – the location of DISC 189-1106 is correct. Operation of Kirk keys is proper.

C. **Incorrect**: The location of DISC 189-1106 is incorrect. The Kirk keys must be unlocked before the disconnect can be operated.
Plausible: The method of operation is correct.

D. **Incorrect**: The location and method of operation are both incorrect.
Plausible: Provided for psychometric balance of distracters.

Level: RO Exam

KA: EPE 000011G2.1.30 (3.9/3.4)

Lesson Plan Objective: LOI-024C-1-1.ppt 1.5.1 Explain how closure of the OC/1A output breaker will occur onto it's respective 4KV bus for local or remote operation.

Source: New

Level of knowledge: memory

References:
1. EOP-5 page 51
2. OI-21C pages 50-62
3. LOI-024C-1-1.ppt pages 8, 121, 167, 171

000011 Large Break LOCA / 3 2.1.30 Ability to locate and operate components, including local controls. (CFR: 41.7 / 45.7) 3.9/3.4

Bank Question: 42 Answer: D

1 Pt(s) Unit 1 was operating at 100% when a spurious reactor trip occurred. Given the following events and conditions:

- The operators implemented EOP-0
- The operators secured 2 RCPs
- Tave = 532°F
- RCS ΔT= 5°F
- Steam dumps and turbine bypass valves were operating as designed to remove heat from the RCS
- RCPs 11A and 12B were running
- RCP 11A tripped on overcurrent

Assuming all MSIVs remained open, which one of the following statements correctly describes the effect on the RCS temperatures following the RCP trip?

		Loop 11			Loop 12	
	T_{ave}	T_{hot}	T_{cold}	T_{ave}	T_{hot}	T_{cold}
A.	→	↓	↑	→	↑	↓
B.	↑	↑	↑	↓	↑	↓
C.	→	↑	↓	↓	↑	↓
D.	↓	↓	↓	→	↑	↓

Distracter Analysis: When the 11A RCP trips, the loop flow reverses because there are no RCPs operating in loop 11. This reverse flow in loop 11 is limited by the anti-rotation devices on RCPs 11A and 11B. Tave does not change significantly – the decay heat load is not effected and the loss of the heat input from the 11A RCP =13 Mwt or ~ 0.2% RTP – which is much less when compared with the decay heat output from the core = 1% and the 12B RCP. Tave remains the same as the heat output does not change substantially. Loop 12 flow increases slightly due to lower core D/P – from the loss of the 11A RCP but loop 12 is now removing most of the heat load from the core so ΔT increases ~ 2X. This causes Thot ↑ and Tcold ↓. Loop 11 reverse flow causes Tcold to become the same as the loop 12 Tcold (↓) and loop 11 Thot is approximately the same as loop 11 Tcold – that is it ↓ because the steam pressure in the 11 S/G is the same as steam pressure in the 12 S/G (they are still cross-connected). This implies Tave loop 11 ↓.

A. **Incorrect**: With reverse flow in the 11 loop, temperatures go to Tcold loop 12.
Plausible: If there were no reverse flow in the 11 loop, this would approximate ΔT going to ~0.

B. **Incorrect**: With reverse flow in the 11 loop, temperatures go to Tcold loop 12.
Plausible: If the applicant reverses the effects and thinks that loop 11 temperatures go to Thot instead of Tcold

C. **Incorrect**:
Plausible: If the applicant thinks that the 11A RCP provides a significant amount of the heat input to the RCS, Tave could drop. If the applicant thinks that the 11 S/G acts as a heat source, then ΔT could actually increase because flow has decreased.

D. **Correct**:

Level: RO Exam

KA: APE 000015/17AK1.04 (2.9/3.1*)

Lesson Plan Objective: none

Source: New

Level of knowledge: analysis

References:
1. SD-064A page 21
2. SD-064D pages 2-3, 29-30

000015/17 RCP Malfunction / 4 AK1. Knowledge of the operational implications of the following concepts as they apply to Reactor Coolant Pump Malfunctions (Loss of RC Flow): (CFR 41.8 / 41.10 / 45.3) AK1.04 Basic steady state thermodynamic relationship between RCS loops and S/Gs resulting from unbalanced RCS flow 2.9 3.1*

Bank Question: 43 Answer: D

1 Pt(s) Unit 1 was operating at 100% power when a problem developed in the CVCS system. Given the following events and conditions:

- Pressurizer level = 205 inches
- Letdown = 29 gpm
- VCT level = 105 inches
- Alarm 1C07 F-45 (*CHG HDR Flow Lo / Press Lo*) annunciated
- The 11 charging pump was observed to be running with the amperage cycling erratically between 0 and 5 amps
- The 12 charging pump is the 1st backup charging pump
- The 13 charging pump is the 2nd backup charging pump

Which one of the following statements correctly describes (1) the causes of the observed symptoms and (2) the required operator actions?

A. (1) The 11 charging pump discharge relief valve has failed open.
(2) Enter AOP-2A (*Excessive Reactor Coolant Leakage*) - start the 12 charging pump and attempt to maintain pressurizer level.

B. (1) The 11 charging pump discharge relief valve has failed open.
(2) Isolate letdown, secure the 11 charging pump to reseat the discharge relief valve and restart the 11 charging pump.

C. (1) The 11 charging pump is gas bound.
(2) Locally vent the 11 charging pump to restore NPSH.

D. (1) The 11 charging pump is gas bound.
(2) Verify the 12 charging pump started, locally vent the 11 charging pump.

Distracter Analysis:

A. **Incorrect**: The charging pump discharge relief valve has not failed open. If this relief HAD failed open, charging pumps running amperage would fluctuate but amps would be high, not low.
Plausible: If the discharge relief HAD failed open, entering AOP-2A is a plausible response as you meet the entry conditions.

B. **Incorrect**: The charging pump discharge relief valve has not failed open. If this relief HAD failed open, charging pumps running amperage would fluctuate but amps would be high, not low.

Plausible: If the discharge relief HAD failed open, this is a plausible response to attempt to reseat the relief valve.

C. **Incorrect**: Locally venting the 11 charging pump with pressurizer level < -9 inches from program is not a valid operator action. Must verify the 1st backup charging pump has started to restore pressurizer level. If the pump lost NPSH, it is possible that damage may occur – the operators should secure the pump ASAP.
Plausible: Venting a gas bound pump is a valid response to restoring pump NPSH for a centrifugal pump – not a positive displacement pump.

D. **Correct**: The 1st backup charging pump should have started at 215 – 9 = 206 inches by the pressurizer level program. Venting a gas-bound positive displacement pump will eliminate gases and prevent further damage from occurring.

Level: RO Exam

KA: APE 000022AA1.06 (2.9/2.7)

Lesson Plan Objective: 17583 Given a set of plant conditions determine the following: The cause and indications of Gas Binding, When it is required to vent a charging pump.

Source: MOD Q14585

Level of knowledge: comprehension

References:
1. SD-064D Figures 5, 8
2. SD-041 pages 20, 51
3. AOP-2A pages 4, 7-8
4. 1C07 F-45

000022 Loss of Reactor Coolant Makeup / 2 AA1. Ability to operate and / or monitor the following as they apply to the Loss of Reactor Coolant Pump Makeup: (CFR 41.7 / 45.5 / 45.6) AA1.06 CVCS charging pump ammeters and running indicators 2.9 2.7

Bank Question: 44 Answer: D

1 Pt(s) Unit 2 was in mode 4 on shutdown cooling. Given the following events and conditions:

- RCS pressure = 240 psia
- RCS Tcold = 245°F
- RCS pressure drifted up to 260 psia
- AOP-3B Contains a caution that reads:

*"1. Do **NOT** allow RCS pressure to exceed 260 PSIA while the SDC Header Return Isolation valves, 2-SI-651-MOV and 2-SI-652-MOV, are open."*

Which one of the following statements correctly describes (1) the first or primary method to maintain pressure less than 260 psia, and (2) the reason or basis for this CAUTION?

A. (1) LTOP will actuate to reduce RCS pressure
(2) To prevent exceeding the design pressure of the SDC heat exchanger

B. (1) The SDC suction line relief valve RV-468 will lift to reduce RCS pressure
(2) To protect the SDC flow path from overpressure due to simultaneous operations of three charging pumps

C. (1) 2-SI-651-MOV and 2-SI-652-MOV will close
(2) To prevent the SDC return header from exceeding its design pressure

D. (1) The control room operators must reduce pressure by opening auxiliary spray
(2) To ensure the discharge pressure of the SDC pumps remains less than the design pressure of the SDC system

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Distracter Analysis: The AOP-03B basis document states: "The design pressure of the Shutdown Cooling System (SDC HX and LPSI pumps) is 500 psig. Shutoff head of the SDC pumps is approximately 180 psid. *Maintaining RCS pressure below 260 psia ensures the discharge pressure of the SDC pumps remains less than design pressure of the SDC system."*

A. Incorrect: LTOP does not protect the SDC system from exceeding 260 psia.

Plausible: The SDC Hx is a limiting component for SDC pressure.

B. **Incorrect**: RV-468 lifts at 315 psia and will not prevent exceeding 260 psia.
Plausible: The basis for the relief valve setpoint is valid.

C. **Incorrect**: The valve interlock on 2-SI-651-MOV and 2-SI-652-MOV does not close the valves – it only prevents them from opening. The valve interlock operates at 295 psia with an alarm at 270 psia.
Plausible: The basis for the valve interlock is correct.

D. **Correct**: As stated in the AOP-3B bases document.

Level: RO Exam

KA: APE 000025AA1.06 (2.9/2.7)

Lesson Plan Objective: 18238 – Identify how system design provides overpressure protection between MOVs 651 and 652 and the SDC piping between 651 and the LPSI pump discharge piping.

Source: Mod Q20490

Level of knowledge: memory

References:
1. AOP-3B Bases Document page 11
2. AOP-3B Unit 2 page 7
3. SD-052 page 27
4. OP-5 Unit 2 pages 26, 29, 37
5. OP-5 Unit 1 pages 27, 28 + Figure 8

000025 Loss of RHR System / 4 AK3. Knowledge of the reasons for the following responses as they apply to the Loss of Residual Heat Removal System: (CFR 41.5,41.10 / 45.6 / 45.13) AK3.02 Isolation of RHR low-pressure piping prior to pressure increase above specified level 3.3 3.7

Bank Question: 45 Answer: A

1 Pt(s) Unit 1 was operating in mode 4. Given the following events and conditions in sequence:

- SDC cooling train A was in service
- Letdown was still in service for a special test
- Initial RCS pressure = 150 psia
- RE-3819 (component cooling radiation detector) alarmed on 1C22
- The auxiliary building instrument air header depressurized
- The leaking component was subsequently isolated

Which one of the following statements correctly describes (1) the location of the leak into the CCW system and (2) the level response in the CCW head tank?

A. (1) The SDC heat exchanger
(2) CC head tank level increases until it overflows into the auxiliary building gravity drain system

B. (1) The SDC heat exchanger
(2) CC head tank level increases until the leak is isolated, then it remains steady

C. (1) The letdown heat exchanger
(2) CC head tank level increases until it overflows into the auxiliary building gravity drain system

D. (1) The letdown heat exchanger
(2) CC head tank level decreases until the leak is isolated, then it remains steady

---

Distracter Analysis: CC header pressure is ~75 psig. RCS/SDC system pressure is 150 psia. Initial RCS Leakage from the SDC HXs would be into, not out of the CC system. The letdown system HXs also operate at approximately RCS pressure because the letdown backpressure regulators are downstream of the letdown HXs. Loss of instrument air to the auxiliary building causes a loss of letdown and the CC head tank fill valve to fail open and continuously fill the head tank until it overflows. The head tank will fill up – first from the leak, then from the demineralized water system until it overflows.

A. Correct:

B. **Incorrect**: The CC head tank level would continue to increase even after the leak was isolated because the head tank fill valve fails open on a loss of instrument air
Plausible: If the applicant thinks that the loss of instrument air to the head tank fill valve causes the fill valve to fail shut.

C. **Incorrect**: CC Head tank level will not crop because letdown pressure > CC pressure. The CC head tank level would continue to increase after the leak was isolated because the head tank fill valve fails open on a loss of instrument air.
Plausible: Partially correct – the tank would overflow.

D. **Incorrect**: The CC head tank level would continue to increase even after the leak was isolated because the head tank fill valve fails open on a loss of instrument air
Plausible: If the applicant thinks letdown HX pressure is < CC pressure AND the fill valve fails shut. Note that letdown would isolate on a loss of instrument and would depressurize. This makes the leak into the letdown system more plausible. Also - if the applicant thinks that the loss of instrument air to the head tank fill valve causes the fill valve to fail shut (it fails open).

Level: RO Exam

KA: APE 000026AA1.05 (3.1/3.1)

Lesson Plan Objective: 18164 – Given plant conditions and/or parameters, determine the most likely source of leakage into the CCW system. 18158 – Given a scenario involving radiological contamination of the CCW system and appropriate procedures, determine the required actions.

Source: Mod Q20387

Level of knowledge: analysis

References:
1. SD-015 pages 13-14, 17, 56

000026 Loss of Component Cooling Water / 8 AA1. Ability to operate and / or monitor the following as they apply to the Loss of Component Cooling Water: (CFR 41.7 / 45.5 / 45.6) AA1.05 The CCWS surge tank, including level control and level alarms, and radiation alarm 3.1 3.1

Bank Question: 46 Answer: D

1 Pt(s) Unit 1 was operating at 100% power when a failure occurred in the pressurizer pressure control system. Given the following events and conditions:

- The RCS was operating at normal operating temperatures and pressures
- One set of backup heaters spuriously energized
- Letdown is in manual
- The operators do not take any manual action

Prior to any pressurizer pressure control signals being actuated, what is the initial effect (if any) of this failure on indicated pressurizer level (on LT-110-X) and why will this occur?

A. Indicated pressurizer level will increase – because of the increase in actual pressurizer level caused by the volumetric expansion of the water in the pressurizer.

B. Indicated pressurizer level will increase – because the density of the water in the variable leg of pressurizer level transmitters will be less than the density of the water in the pressurizer.

C. Indicated pressurizer level will remain constant – because indicated pressurizer level is compensated for changes in the density of the water in the pressurizer.

D. Indicated pressurizer level will decrease – because the density of the water in the variable leg of pressurizer level transmitters will be greater than the density of the water in the pressurizer.

Distracter Analysis: The energized backup heaters will raise the temperature of the pressurizer until pressure control signals are generated. Prior to the actuation of the spray valve, the pressurizer level indication will show a slight decrease because the temperature of the water in the pressurizer is slightly higher than the temperature in the water in the variable leg of the pressurizer level detector and the density in the reference leg is therefore > than the density of the water in the pressurizer. Although the actual pressurizer water level increases due to volumetric expansion, the mass remains the same and the density of the water in the reference leg is > than the density of the hotter water in the pressurizer.

A. **Incorrect**: Pressurizer level will not increase – it will decrease due to the density of the water in the variable leg being > than the heated water in the pressurizer. The backup heaters will raise pressurizer temperature but the water in the variable leg will take longer to reach thermal equilibrium with the rest of the pressurizer.
Plausible: The increase in pressurizer water temperature will cause an increase in the actual level of the pressurizer water as the water expands. Note that this (increase) was the correct answer to bank question Q27966 – which the class has seen 3x. The average difficulty score was 62%.

B. **Incorrect**: Pressurizer level will not increase – it will decrease due to the density of the water in the variable leg being > than the heated water in the pressurizer. Note that this (increase) was the correct answer to bank question Q27966 – which the class has seen 3x. The average difficulty score was 62%.
Plausible: If the applicant reverses the effects of the density change.

C. **Incorrect**: Pressurizer level will decrease – the pressurizer level signal is not density compensated.
Plausible: Other signals are density compensated and this could work – if density compensation was used.

D. **Correct**:

Level: RO Exam

KA: APE 000027AA2.14 (2.8/2.9)

Lesson Plan Objective: 27966 – Given any failure in RCS pressure temperature or level instrument, predict the response of the system (heaters, spray, charging, letdown) to that failure.

Source: Mod Q28823

Level of knowledge: comprehension

References:
1. SD-064D pages 8-9

000027 Pressurizer Pressure Control System Malfunction / 3 AA2. Ability to determine and interpret the following as they apply to the Pressurizer Pressure Control Malfunctions: (CFR: 43.5 / 45.13) ~~AA2.14 RCP injection flow 2.8 2.9 (there is no RCP injection flow in a CE design reselected)~~ AA2.01 Conditions which will cause an increase in PZR level 3.4 3.8

Bank Question: 47 Answer: A

1 Pt(s) Which one of the following statements correctly describes the effect (if any) that time in core life has on the pressure transient associated with the design basis ATWS event?

A. RCS pressure increase will be more rapid at BOL than at EOL because the moderator temperature coefficient is more negative at EOL.

B. RCS pressure increase will be more rapid at EOL than at BOL because the moderator temperature coefficient is more negative at EOL.

C. RCS pressure increase will be more rapid at BOL than at EOL because the moderator temperature coefficient is less negative at EOL.

D. RCS pressure increase will be more rapid at EOL than at BOL because the moderator temperature coefficient is less negative at EOL.

Distracter Analysis: For a given amount of positive reactivity, the negative reactivity from the temperature increase of the reactor coolant is = MTC * ΔT. This negative reactivity will offset the positive reactivity from the rods and maintain the core in a critical state (but not super-critical). If MTC is small, the rise in ΔT must be proportionately greater. As a result, the RCS system temperatures and pressures will be greater for an ATWS at BOL when MTC is at a minimum.

A. **Correct**: small MTC at BOL will lead to a larger temperature increase, which results in a more rapid RCS pressure rise at BOL.

B. **Incorrect**: the pressure transient is larger at BOL.
Plausible: candidate reverses the effect of MTC.

C. **Incorrect**: MTC is more negative not less negative at EOL
Plausible: Partially correct – the pressure rise is more rapid at BOL. The candidate could reverse the changes in MTC between BOL and EOL.

D. **Incorrect**: the pressure transient is larger at BOL; MTC is more negative at EOL.
Plausible: If the candidate reverses the logic.

Level: RO Exam

KA: EPE 029 EK1.08 (2.8/3.2)

Lesson Plan Objective: none

Source: Bank Ques_945.1 Catawba

Level of knowledge: comprehension

References:
1. OP-CN-EP-FRS pages 1-7
2. FR-S1 Bases Document page 11

KA EPE 029 Anticipated Transient w/o Scram EK1.01 Reactor nucleonics and thermo-hydraulics behavior 2.8 3.1

Bank Question: 48 Answer: B

1 Pt

Unit 2 has experienced a steam generator tube rupture (SGTR) from 100% power. Given the following events and conditions:

- The operators have entered EOP-06 (*Steam Generator Tube Rupture*)
- RCS subcooling margin is 0°F
- RCPs are not running
- Natural circulation cannot be verified

Which one of the statements correctly completes the description of the reflux boiling cooling flow path during this event?

Steam enters the ____(1)____ of the S/G U-tubes where the steam condenses and re-enters the core area via the S/G ____(2)____.

A. (1) Hot leg (2) Cold leg

B. (1) Hot leg (2) Hot leg

C. (1) Cold leg (2) Hot leg

D. (1) Cold leg (2) Cold leg

Distracter Analysis:

A. **Incorrect**: steam returns via the hot leg
Plausible: partially correct – steam enters via the hot leg

B. **Correct**: Reflux boiling occurs when steam enters the hot leg – of the S/G , condenses and returns to the reactor via the hot leg. Only the S/G-RCS lot is involved.

C. **Incorrect**: The steam enters the hot leg
Plausible: partially correct – the steam returns via the cold leg

D. **Incorrect**: cold legs are not affected during reflux boiling
Plausible: provided for psychometric balance

Level: RO Exam

KA: EPE 000038EK1.04(3.1*/3.3)

Lesson Plan Objective: LOI-201-5-6.ppt 1.2.3 – Given RCS parameters, identify the appropriate response for a loss of coolant accident (LOCA) per EOP-5: Identify the core heat removal mechanism for a large break or small break LOCA.

Source: Bank Ques_601.1Catawba Audit Exam 2001

Level of knowledge: memory

References:
1. LOI 201-5.6 Slide 17

000038 Steam Generator Tube Rupture / 3 EK1 Knowledge of the operational implications of the following concepts as they apply to the SGTR: (CFR 41.8 / 41.10 / 45.3) EK1.04 Reflux boiling 3.1* 3.3

Bank Question: 49 Answer: A

1 Pt(s) Unit 1 was operating at 100% when the 12 steam generator feedwater pump (SGFP) spuriously tripped. Given the following events and conditions:

- A reactor trip occurred
- All systems operated as designed

Which one of the following statements correctly describes the expected response of the (1) feedwater regulating valves (FRVs), (2) bypass feedwater valves (BFVs) and (3) the SGFP speed controller to this transient?

A. **(1) FRVs ramp shut**
(2) BFVs are positioned to 3.8% of full load feedwater flow
(3) SGFPs are set back to 3400 rpm and negative bias is removed

B. **(1) FRVs ramp shut**
(2) BFVs are positioned to 3.8% of full load feedwater flow
(3) SGFPs are tripped and AFW flow is initiated

C. **(1) FRVs are positioned to 3.8% of full load feedwater flow**
(2) BFVs are positioned to 3.8% of full load feedwater flow
(3) SGFPs are set back to 3400 rpm and positive bias is removed

D. **(1) FRVs are positioned to 3.8% of full load feedwater flow**
(2) BFVs ramp shut
(3) SGFPs are set back to 3400 rpm and negative bias is removed

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Distracter Analysis:

A. **Correct**:

B. **Incorrect**: SGFPs are not tripped – the remaining pump continues to operate
Plausible: Partially correct – the FRVs and BFRVs are positioned as stated. If the applicant is unfamiliar with the feedwater control system – s/he may think the SGFPs trip.

C. **Incorrect**: The FRVs are ramped shut, not positioned at 3.8%.
Plausible: Partially correct – the BFRVs are positioned and the SGFPs are set back as stated.

D. **Incorrect**: The FRVs are ramped shut and the BFRVs are positioned to 3.8%.
Plausible: If the applicant reverses the FRV and BFRV responses.

Level: RO Exam

KA: APE 000054AA2.05 (3.5/3.7)

Lesson Plan Objective: 18441 – Identify the response of the MFV, BFV and SGFP to a reactor trip/turbine trip from any power level with or without a vital instrument bus loss.

Source: MOD Q24604, 24605, 20950, 20952, 39349

Level of knowledge: memory

References:
1. SD-045A pages 3, 30-31

APE 000054 (CE/E06) Loss of Main Feedwater / 4 AA2. Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW): (CFR: 43.5 / 45.13)
AA2.05 Status of MFW pumps, regulating and stop valves 3.5 3.7

Bank Question: 50 Answer: B

1 Pt(s) Unit 1 was operating at 100% when a LOCA occurred.

Which one of the following statements correctly describes the FSAR design basis coping time for the 125 VDC batteries to power vital loads?

A. 2 hours with a loss of one charger

B. 2 hours with a loss of AC power/SBO

C. 8 hours with a loss of one charger

D. 8 hours with a loss of AC power/SBO

Distracter Analysis:

A. **Incorrect**: The design basis accident is a loss of AC power, not a loss of one charger
Plausible: Partially correct – the design basis coping time is 2 hours

B. **Correct**:

C. **Incorrect**: The design basis coping time is 2 hours and the design basis accident is a loss of AC power, not a loss of one charger
Plausible: Station batteries are designed for a minimum capacity of 1500 amp hours nominal based on a 8 hour discharge to min cell voltage of 1.78 volts. This is stated in the system description and the applicant may no understand the difference between the design capacity and the design basis coping time in the FSAR.

D. **Incorrect**: The design basis coping time is 2 hours
Plausible: Partially correct – the design basis accident is a loss of all AC power.

Level: RO Exam

KA: EPE 000055EK3.01 (2.7/3.4)

Lesson Plan Objective: 17803 – Recall the electrical performance and design attributes of the following 125 VDC and 120 VAC Vital system components:
a. Station 125 VDC batteries SOER 81-2, 83-5)

Source: Bank Q15892

Level of knowledge: memory

References:
1. SD-002 pages 15-16

000055 Station Blackout / 6 EK3 Knowledge of the reasons for the following responses as the apply to the Station Blackout: (CFR 41.5 / 41.10 / 45.6 / 45.13) EK3.01 Length of time for which battery capacity is designed 2.7 3.4

Bank Question: 51 Answer: C

1 Pt(s) Units 1 was operating at 100% and Unit 2 was in mode 4 conducting a heat up following a refueling outage when a loss of offsite power (LOOP) occurred on both units. Given the following events and conditions:

Unit 2 Parameters
- T_{cold} = 275°F
- SDC is not in service
- 21 AFW pump is aligned for auto-start

Which one of the following statements correctly describes (1) the required operation of the AFW pumps on Unit 2 and (2) the reason for this requirement?

References Provided: Steam Tables

A. (1) 21 AFW pump feeds the S/Gs. The 23 AFW pump is placed in pull-to-lock.
(2) To ensure that the 23 AFW pump does not auto start in order to prevent overloading the vital bus.

B. (1) 22 AFW pump feeds the S/Gs. The 23 AFW pump is placed in pull-to-lock.
(2) To ensure that the 23 AFW pump does not auto start in order to prevent unnecessary DG fuel consumption.

C. (1) The 23 AFW pump feeds the S/Gs, 21 and 22 AFW pumps are not operating.
(2) Steam pressure is too low to run the 21 and 22 AFW pumps.

D. (1) The 23 AFW pump feeds the S/Gs. The 21 and 22 AFW pumps are not operating.
(2) To prevent cavitating the 11 AFW pump by minimizing total feedwater flow to the S/Gs.

Distracter Analysis: K/A Match Analysis: This question tests the K/A by postulating a situation where a LOOP occurs and the applicant has to recognize that the motor driven AFW pump (23) is the only pump supplying water to the S/Gs. The applicant has to determine that the 2 turbine driven AFW pumps (21 and 22) do not have enough steam pressure to pump water.

With a Told of 275°F, steam pressure is 45 psia or 30 psig. The steam driven AFW pumps operate down to ~64 psia (50 psig) after which they do not provide adequate rpm to inject feedwater, hence are not considered to be available. Note that the procedure does not provide guidance regarding the availability of the steam driven AFW pumps.

A. **Incorrect**: At 275 °F, steam pressure is too low for turbine drive AFW pump operation.
Plausible: If applicants do not recognize that steam pressure is too low. Note the EOPs allow operators to select either the 21 or 22 AFW pump to feed the S/Gs, – but not both pumps at the same time

B. **Incorrect**: At 275 °F, steam pressure is too low for turbine drive AFW pump operation.
Plausible: This is the correct EOP basis for preferentially using the steam driven AFW pumps over the electric AFW pump.

C. **Correct**: The steam driven AFW pumps operate down to 50-psig steam pressure after which they no longer have sufficient motive force to feed the S/Gs.

D. **Incorrect**: The bases using the 23 AFW is not correct – it is not based on preventing cavitation.
Plausible: The AOP has a caution regarding feed rate limits that is based on cavitation – this is a valid bases – for a different caution.

Level: RO Exam

KA: APE 000056AA1.10 (4.3/4.3)

Lesson Plan Objective: 19155 – Identify the basis for using the steam driven AFW pumps as the preferred method of restoring SG levels versus the motor driven AFW pump in AOP-3F.

Source: New

Level of knowledge: comprehension

References:
1. SD-36A page Table 5-1 and Figures 36-2, 3
2. AOP-3F Unit 2 page 12
3. AOP-3F Bases page 11

000056 Loss of Off-site Power / 6 AA1. Ability to operate and / or monitor the following as they apply to the Loss of Offsite Power: (CFR 41.7 / 45.5 / 45.6) AA1.10 Auxiliary/emergency feedwater pump (motor driven) 4.3 4.3

Bank Question: 52 Answer: D

1 Pt(s) Unit 1 was operating at 100% power when a loss of 120 VAC vital instrument bus 1Y09 occurred. Given the following events and conditions:

- The feedwater transient caused a turbine/reactor trip
- Letdown isolated
- Charging pump 11 is running
- VCT level transmitter LT-226 lost power
- VCT pressure transmitter PT-225 lost power
- VCT low level alarm annunciated

Assuming no operator action, which one of the following statements correctly describes the CVCS response to this transient?

A. The VCT will immediately isolate – the charging pump suction immediately shifts to the RWT.

B. The VCT will immediately isolate – charging pumps will trip on low suction pressure.

C. VCT level will decrease until charging pump suction shifts to the RWT.

D. VCT level will decrease until charging pumps lose suction.

Distracter Analysis: LT-226 provides signals to the VCT level alarm and the control signal to start/stop the makeup system. When power is lost, indicated VCT level on LIA-226 is 0". CCNP does not normally run the makeup system in auto when at power. LT-227 (does not lose power) provides level signals to LC-227A that controls the VCT inlet valve (divert to WPS) and LC-227B that opens the RWT suction valve.

A. **Incorrect**: LT-226 does not isolate the VCT.
Plausible: If the applicant confuses LT-226 and LT-227, this would be the correct answer.

B. **Incorrect**: LT-226 does not isolate the VCT.
Plausible: If the applicant confuses LT-226 and LT-227, and forgets that LT-227 isolates the VCT and shifts suction to the RWT, this would be the answer.

C. **Incorrect**: Charging pump suction will not shift to the RWT. LT-227 controls this signal and does not lose power.

Plausible: If the applicant thinks LT-226 controls the RWT suction valve interlock. Partially correct – letdown will isolate if 1Y09 is lost.

D. **Correct**: LT-226 causes an alarm on VCT level and starts the makeup pump (if in auto makeup). The loss of letdown due to the loss of 1Y09 will cause the VCT level to decrease.

Level: RO Exam

KA: APE 000057AA2.13 (3.0/3.4)

Lesson Plan Objective: 17546 – Explain CVCS response to a failure of LT-226 (VCT level transmitter) & 17853 - Given a loss of a 120-volt Vital AC bus, implement the necessary actions to mitigate the plant transient and restore power to the affected plant equipment per AOP-7J

Source: MOD Q14565

Level of knowledge: comprehension

References:
1. SD-0418, 19-20, 28
2. OI-26B Attachment 1B pages 32, 34, 41
3. AOP-7I Bases Document pages 8-10

000057 Loss of Vital Ac Elec. Inst. Bus. / 6 AA2. Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: (CFR: 43.5 / 45.13) AA2.13 VCT level and pressure indicators and recorders 3.0 3.4

Bank Question: 53 Answer: D

1 Pt(s) Unit 1 was in mode 6 conducting a refueling outage. Given the following events and conditions:

- 120 VDC battery 11 was removed from service for maintenance
- The reserve battery is not available
- Battery charger 11 was out of service for maintenance
- 120 VAC vital instrument buses are aligned normally
- Battery charger 23 failed

Assuming no operator actions have been taken, which one of the following statements correctly describes the appropriate section of AOP-7J (*Loss of 120 Volt Vital AC or 125 Volt Vital DC Power*) that should be implemented (if any)?

References Provided: AOP-7J pages 1-8

A. AOP-7J should not be entered

B. Section V (*11 120 Volt Vital AC Instrument Bus 1Y01*)

C. Section IX (*22 120 Volt Vital AC Instrument Bus 2Y02*)

D. Section XI (*11 125 Volt DC Bus)*

Distracter Analysis:

A. **Incorrect**: The 11 125 volt DC bus was deenergized when the 23 battery charger failed. This caused the 11 and 21 120 vital AC instrument buses to be deenergized – until the operators are able to shift the manual transfer switch on the 11 and 21 inverters to the backup 120 VAC instrument bus.
Plausible: If the applicant does not recognize that a loss of 120 VDC/AC buses have occurred – this could be plausible if the applicant links that the manual transfer switch between the 120 VDC bus and 120 VAC backup instrument bus was an automatic transfer switch – or does not recognize that the 23 charger feeds the 11 120 DC bus.

B. **Incorrect**: The 11 120 VDC bus and the 11 and 21 vital AC instrument buses are deenergized – section XI of AOP-7J is appropriate.

Plausible: If the applicant thinks that only the 11 125 VDC instrument bus has been deenergized and the 11 120 VAC instrument bus was deenergized, this would be the correct choice.

C. **Incorrect**: The correct section of AOP-7J is section XI, not section IX.
Plausible: If the applicant thinks that only the 22 120 VDC instrument bus has been deenergized, this would be the correct choice.

D. **Correct**:

Level: RO Exam

KA: APE 000058G2.4.4 (4.0/4.3)

Lesson Plan Objective: 17839 – Given the control board indications of an electrical malfunction, identify the immediate actions and evaluate what bus(es) is/are deenergized.

Source: New

Level of knowledge: comprehension

References:
1. SD-017 pages 3-4, Figures 17/18-1
2. AOP-7J pages 6-8
3. SD-004 Figure 1
4. SD-002 Figure 2-1

APE 000058 Loss of DC Power / 6 2.4.4 Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures. (CFR 41.10 / 43.2 / 45.6) 4.0/4.3

Bank Question: 54 ***Answer: A***

1 Pt(s) Unit 2 was operating at 100% power when a loss of offsite power (LOOP) occurred. Given the following events and conditions:

- The SRW system was electrically and mechanically aligned normally per OI-15 with the 21 and 22 SRW pumps running
- When the LOOP occurs, the 2A and 2B EDGs start and energize their respective 4 KV vital buses
- The 21 SRW pump tripped on overcurrent when it's associated load group was reenergized by the sequencer

Assuming no operator action, which one of the following statements correctly describes the status of the SRW system one minute after the LOOP?

A. Only the 22 SRW pump is running – SRW pump 23 should be manually aligned and started to provide SRW flow to the 21 SRW header to meet SRW flow requirements

B. Only the 22 SRW pump is running – SRW must be cross-connected to supply loads on the 21 SRW header to meet SRW flow requirements

C. The 22 and 23 SRW pumps are running – the 21 and 22 headers are being supplied with adequate SRW flow

D. The 22 and 23 SRW pumps are running on the 22 header – the 21 header must be aligned to the 23 SRW pump to meet SRW flow requirements

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Distracter Analysis: K/A Match Analysis: The K/A is to test knowledge of the automatic actions (alignments) that occur on the service water system during an ESFAS. There was a bank question (Q20566) that tested this knowledge that was already used twice for training this class. The average difficulty rating for Q20566 was 93%. Reusing this question without modification may not be discriminatory. The decision was made to use bank question Q20568 – which is a modification of Q20566 – to test this K/A. Although the correct answer is a manual action, the applicant must determine that the automatic action does NOT occur because of the normal line-up for the swing SRW pump. It was our determination that this meets the intent of the K/A while maintaining operational validity and adequate discriminatory power.

A. **Correct**:

B. **Incorrect**: The 22 SRW cannot provide adequate SRW flow to both the 22 and 21 headers.
Plausible: If the applicant does not recognize that one SRW will not provide sufficient flow to meet post-accident requirements.

C. **Incorrect**: The 23 SRW will not auto-start – must be manually aligned (electrically and mechanically) to the 21 header
Plausible: If the applicant is not aware that the 23 SRW pump is normally aligned to the 22 SRW header

D. **Incorrect**: The 23 SRW pump does not auto-start on the 22 header unless the 22 SRW pump fails
Plausible: Partially correct – the 23 SRW must be mechanically aligned to the 21 SRW header to provide flow

Level: RO Exam

KA: APE 000062AK3.02 (3.6/3.9)

Lesson Plan Objective: 18097 – Identify the initiating ESFAS signal that will start or stop the SRW pumps

Source: MOD Q20568 – also Q20566 – version with C the correct answer. Q20568 never used with this class. Q20566 used 1x with a difficulty rating of 93%

Level of knowledge: comprehension

References:
1. SD-011 pages 25, figures 11-6, 7, 8

000062 Loss of Nuclear Service Water / 4 AK3. Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: (CFR 41.4, 41.8 / 45.7) AK3.02 The automatic actions (alignments) within the nuclear service water resulting from the actuation of the ESFAS 3.6 3.9

Bank Question: 55 Answer: C

1 Pt(s) Unit 1 was operating at 100% power when a loss of instrument air occurred. Given the following events and conditions:

- The operators enter AOP-7D (*Loss of Instrument Air*)
- Instrument air pressure is decreasing at a rapid and continuous rate

Which statement correctly describes (1) when to trip the reactor, and (2) the reason for this action?

A. **(1) 40 psig and decreasing**
(2) The TBVs require 40 psig to quick open

B. **(1) 40 psig and decreasing**
(2) The FRVs fail as-is at 40 psig

C. **(1) 50 psig and decreasing**
(2) The TBVs require 50 psig to quick open

D. **(1) 50 psig and decreasing**
(2) The FRVs fail as-is at 50 psig

Distracter Analysis:

A. **Incorrect**: The reactor should be tripped at 50 psig not 40 psig. TBVs will not quick open if instrument air pressure drops below 50 psig
Plausible: Provided for psychometric balance of distracters

B. **Incorrect**: The reactor should be tripped at 50 psig not 40 psig.
Plausible: Partially correct – the FRVs will fail as-is at 40 psig

C. **Correct**:

D. **Incorrect**: The FRVs fail as-is at 40 psig not 50 psig
Plausible: Partially correct – the pressure requiring a reactor trip is correct per AOP-7D

Level: RO Exam

KA: APE 000065AK3.08 (3.7/3.9)

Lesson Plan Objective: 18190 – Given AOP-7D, determine the Operator actions for a loss of instrument air in the following situations: a. modes 1 and 2

Source: MOD Q20301

Level of knowledge: memory

References:
1. AOP-7D page 7
2. SD-019 pages 46-47

000065 Loss of Instrument Air / 8 AK3. Knowledge of the reasons for the following responses as they apply to the Loss of Instrument Air: (CFR 41.5,41.10 / 45.6 / 45.13)
AK3.08 Actions contained in EOP for loss of instrument air 3.7 3.9

Bank Question: 56 Answer: A

1 Pt(s) Unit 1 was conducting a reactor startup at 1% power. Given the following events and conditions:

- Reactor power was 1%
- The operator was withdrawing group 5 rods to raise power
- Following the withdrawal command, the operator released the "raise/lower switch
- Group 5 CEA counters continued to step out
- The operators implement AOP-1B (*CEA Malfunction*)

Which one of the following statements correctly describes the required operator response?

A. Stop rod withdrawal by selecting "off" on CEDS

B. Stop rod withdrawal by moving the "raise/lower" switch to the "lower" position

C. Stop CEA motion by selecting an alternative CEA regulating group

D. Trip the reactor and implement EOP-0

Distracter Analysis:

A. **Correct**: AOP-1B step 1 requires selecting "off" on CEDS before tripping the reactor

B. **Incorrect**: This action is not allowed by AOP-1B
Plausible: The "insert" signal always overrides the "withdrawal" signal so this may seem to make sense to an applicant

C. **Incorrect**: This action is not required by AOP-1B
Plausible: This may seem to make sense as it would potentially remove an errant withdrawal signal from the effected CEA group – depending on the location and nature of the fault

D. **Incorrect**: This action is not required unless selecting "off" fails to terminate the rod withdrawal – this is the alternate action for step 1
Plausible: Tripping the reactor is required as the alternate action – and this is the answer to the bank question

Level: RO Exam

KA: APE 000001AK2.05 (2.9*/3.1)

Lesson Plan Objective: 19066 – Recognize the conditions which require a reactor trip during the implementation of AOP-1B

Source: Mod Q20508

Level of knowledge: memory

References:
1. AOP-1B page 7

000001 Continuous Rod Withdrawal / 1 AK2. Knowledge of the interrelations between the Continuous Rod Withdrawal and the following: (CFR 41.7 / 45.7) ~~AK2.05 Rod motion lights 2.9* 3.1~~ AK2.01 Rod bank step counters 2.9 3.2

Bank Question: 57 Answer: D

1 Pt(s) Units 1 and 2 were in mode 3 when and electrical problem occurred. Given the following events and conditions:

- 120 VAC power supply 2Y02 failed.

Which one of the following statements correctly describes the effect (if any) of this failure on the wide range logarithmic (WRlog) nuclear instrumentation?

A. No WRlog NI channels lost power

B. Only Unit 1 WRlog NI channel "B" lost power

C. Only Unit 2 WRlog NI channel "B" lost power

D. Both Unit 1 and Unit 2 WRlog NI channels "B" lost power

Distracter Analysis: K/A Match Analysis – Including the "switch position" in this question is difficult. The reference package does not support this level of detail. Will investigate for potential addition when on site for pre-validation.

A. **Incorrect**: 2Y02 provides power to Unit 1 and Unit 2 WRlog NI channel B
Plausible: This would be the correct answer for loss of power to 1Y02.

B. **Incorrect**: 2Y02 provides power to Unit 1 and Unit 2 WRlog NI channel B
Plausible: Partially correct – provided for psychometric balance

C. **Incorrect**: 2Y02 provides power to Unit 1 and Unit 2 WRlog NI channel B
Plausible: Partially correct – this would be true for linear power range channels

D. **Correct**:

Level: RO Exam

KA: APE 032 AK2.01 (2.7*/3.1

Lesson Plan Objective: LOI-078A LO 2.1

Source: New

Level of knowledge: memory

References:
1. LOI-078-1-1 slides 49-52

000032 Loss of Source Range NI /AK2. Knowledge of the interrelations between the Loss of Source Range Nuclear Instrumentation and the following: (CFR 41.7 / 45.7) AK2.01 Power supplies, including proper switch positions 2.7* 3.1

Bank Question: 58 Answer: D

1 Pt(s) Unit 1 was in mode 3 preparing to conduct a reactor startup. Given the following events and conditions:

- RCS activity was 1% of Tech Spec limits
- There is a 20 gpm tube leak in the 11 S/G

Which one of the following statements correctly describes the response of the main steamline radiation monitors?

A. 1-RIC-5421A will show no significant increase
1-RIC-5421 will show no significant increase

B. 1-RIC-5421A will increase significantly
1-RIC-5421 will show no significant increase

C. 1-RIC-5421A will show no significant increase
1-RIC-5421 will increase significantly

D. 1-RIC-5421A will increase significantly
1-RIC-5421 will increase significantly

Distracter Analysis: K/A Match Analysis: The K/A is tested by asking of the applicant recognizes that the MSL Rad Monitors respond primarily to N16 gamma – by postulating conditions where N16 gamma does not exist and seeing of the applicants recognize that this does NOT mean that a tube rupture did NOT occur. This parallels actual industry events where the tube rupture occurred after the reactor trip and the N16 gamma source term decayed away. This was judged to meet KA match requirements while maintaining adequate discriminatory power.

There is no N16 gamma generated in mode 3 without reactor neutron flux. The MSL radiation monitors will not detect SG tube leakage when RCS activity is low (1% of Tech Specs)

A. Correct:

B. Incorrect: MSL radiation monitors will not detect S/G tube leakage in mode 3 – no N16 gamma present, RCS activity is too low for a 20-gpm leak to indicate.
Plausible: MSL radiation monitors are supposedly highly sensitive to S/G tube leakage. The 1-RIC-5421A monitor is calibrated on N16 gamma and is supposed to be more sensitive than the 1-RIC-5421

monitor. Applicants expect to see a more sensitive response from the 1-RIC-5421A monitor when at power.

C. **Incorrect**: With only 1% of Tech Spec activity, 1-RIC-5421 will not respond to a SG tube of 40 gpm
Plausible: If the applicant recognizes that N16 is not present and expect one of the MSL monitors to respond to the leakage

D. **Incorrect**: Neither MSL Rad monitor will respond to this leakage condition.
Plausible: Both monitors will respond when the plant is at power.

Level: RO Exam

KA: APE 000037AA1.06 (3.8*/3.9*)

Lesson Plan Objective: 18384 Describe the response to and the conditions that will indicate a system failure of the … Main Steamline radiation monitors.

Source: New

Level of knowledge: comprehension

References:
1. SD-077 pages 12, 14-17
2. SD-083A page 18
3. AOP-4 pages 5, 7, 11, 13-15
4. OP-1 page 23

000037 Steam Generator Tube Leak / 3 AA1. Ability to operate and / or monitor the following as they apply to the Steam Generator Tube Leak: (CFR 41.7 / 45.5 / 45.6)
AA1.06 Main steam line rad monitor meters 3.8* 3.9*

Bank Question: 59 Answer: C

1 Pt(s) Unit 1 was conducting a plant startup when a reduction in condenser vacuum occurred. Given the following events and conditions:

- Turbine load is 100 MWe and rising when condenser vacuum began to degrade
- The operators enter AOP-7G (*Loss of Condenser Vacuum*)
- Condenser vacuum suddenly drops to 19.5" Hg
- Annunciator "LOSS OF LOAD CH TRIP BYP" is in alarm

Which one of the following statements completely describes the expected system response and/or required operator actions?

A. The reactor and turbine will be manually tripped; heat removal will be on the TBVs; SGFPs will continue to operate.

B. The turbine will trip automatically; the operators will trip the reactor; heat removal will be on the TBVs; SGFPs will trip.

C. The turbine will trip automatically; the operators will trip the reactor; heat removal will be on the TBVs; SGFPs will continue to operate.

D. The turbine will trip automatically; the operators will trip the reactor; heat removal will be on the ADVs; SGFPs will trip.

Distracter Analysis: 1000 MWe x 10% = 100 MWe – the at-power Rx trips are removed. The LOSS OF LOAD CH TRIP BYP alarm is clear indication that the at-power trips are removed.

A. **Incorrect**: The turbine will automatically trip at 22.5 "Hg. Heat removal will be on the ADVs because the TBVs will be inoperable at 20 " Hg. The SGFPs will trip at 20 "Hg.
Plausible: If the applicant does not recognize the turbine trip, TBV limits and SGFP trip setpoints.

B. **Incorrect**: Heat removal will be on the ADVs because the TBVs shut at 20 "Hg.
Plausible: If the applicant is not aware that TBVs are inoperable at 20 "HG

C. **Correct**:

D. **Incorrect**: The reactor will not automatically trip on a turbine trip below 15% power

Plausible: If the applicant fails to recognize that the turbine trip / reactor trip is not operable < 15% or fails to recognize that 120 MWe is < 15%. AOP-07G addresses 465 MWe as the decision point for manually tripping the reactor.

Level: RO Exam

KA: APE 000051AA2.02 (3.9/4.1)

Lesson Plan Objective: 27167 - Given a loss of condenser vacuum and/or plant conditions and parameters, determine the correct operator response. 27163 – Identify three major plant components that are affected by a loss of condenser vacuum, and how they impact plant operation.

Source: New

Level of knowledge: memory

References:
1. AOP-7G page 5
2. SD-093-1C page 26

000051 Loss of Condenser Vacuum / 4 AA2. Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum: (CFR: 43.5 / 45.13) AA2.02 Conditions requiring reactor and/or turbine trip 3.9 4.1

Bank Question: 60 Answer: C

1 Pt(s) A waste gas discharge was in progress. Given the following events and conditions:

- 0-RE-2191 (*Gaseous Waste Disch RMS*) high radiation alarm occurred

Which one of the following statements correctly describes (1) the automatic action that occurred and (2) the immediate followup action required?

A. **(1) Shuts waste gas discharge CVs 0-WGS-2191 / 2192**
(2) Purge the waste gas discharge header

B. **(1) Shuts waste gas discharge header flow control valve 0-WGS-2191-PCV**
(2) Purge the waste gas discharge header

C. **(1) Shuts waste gas discharge CVs 0-WGS-2191 / 2192**
(2) Verify shut waste gas discharge header flow control valve 0-WGS-2191-PCV

D. **(1) Shuts waste gas discharge header flow control valve 0-WGS-2191-PCV**
(2) Manually shut waste gas discharge CVs 0-WGS-2191 / 2192

Distracter Analysis:

A. **Incorrect**: Purging the waste gas discharge header is not a required action
Plausible: Partially correct – the automatic action (1) is correct

B. **Incorrect**: The discharge header control valve does not automatically shut. Purging the waste gas discharge header is not a required action
Plausible: Provided for psychometric balance of distracters

C. **Correct**:

D. **Incorrect**: 0-WGS-2191-PCV does not automatically shut. CVs 0-WGS-2191/2192 DO automatically shut
Plausible: If the applicant reverses the auto-isolation feature.

Level: RO Exam

KA: APE 000060G2.4.31 (3.3/3.4)

Lesson Plan Objective: LOIA0P6C – Accidental Gaseous Waste Release. - 18385 Identify the radiation monitors that have a control function interface with another system and state their control functions.

Source: Bank Q24720

Level of knowledge: memory

References:
1. SD-77 pages 8-11, 18
2. 1C33-ALM T-13 page 20
3. AOP-6C pages 10-11

000060 Accidental Gaseous Radwaste Rel. / 9 2.4.31 Knowledge of annunciators alarms and indications, and use of the response instructions. (CFR: 41.10 / 45.3) 3.3/3.4

Bank Question: 61 Answer: D

1 Pt(s) Units 1 and 2 control rooms were evacuated due to a fire. Given the following events and conditions:

- The operators implemented AOP-9A-1 *(Control Room Evacuation and Safe Shutdown due to a Severe Control Room Fire)* and arrived at step BQ.2 *(Borate the RCS)* of the procedure.
- After commencing the boration, the operators note:
  - PZR level = 249 inches (increasing)
  - PZR pressure = 2200 psia (increasing)
  - 11 charging pump is running
  - T_{hot} = 535°F (increasing)
  - Letdown was stopped
  - RCPs were tripped
  - SGFPs were tripped

Which one of the following statements correctly describes the actions in AOP-9A-1 that are designed specifically for the purpose of controlling pressurizer level?

A. Manually cycle the PORV to reduce level to 160 inches.

B. Establish letdown and auxiliary spray to control level at 250 inches.

C. Stop the 11 charging pump and allow RCP bleedoff and ambient losses to reduce level at 160 inches.

D. Increase steam flow through the ADVs to maintain RCS cooldown rate at 100°F/hr to control level at 250 inches.

Distracter Analysis: Although pressurizer level is very high, the priority is to borate the RCS while cooling down at < 100°F/hr. Pressurizer level should be controlled at 250 inches until boration has been completed.

A. **Incorrect**: Opening the PORV is not permissible – could lead to a LOCA if it sticks open.
Plausible: Opening the PORC would reduce pressurizer level and pressure.

B. **Incorrect**: Letdown should not be reestablished because the goal is to conserve coolant inventory.

Plausible: Reestablishing letdown will reduce pressurizer level - auxiliary spray will be established to control pressure – but later in the procedure.

C. **Incorrect**: The 11 charging pump must continue to operate to borate the RCS for adequate SDM. RCP bleedoff has already been stopped to preserve inventory.
Plausible: Pressurizer level and pressure are high in the band – a concern may be going solid in the pressurizer and stopping the charging pump would address this concern. This answer would be correct after the RCS has been borated to 2300 ppm.

D. **Correct**: Pressurizer pressure and level should be maintained by controlling the ADV, which controls the cooldown rate.

Level: RO Exam

KA: APE 000068AA2.07 (4.1/4.3)

Lesson Plan Objective: LOI-202-9A-11 LO 3.0 Recall the actions performed on plant systems to prevent or minimize the following: A. Loss of RCS inventory and/or depressurization… LO 11.0 Explain the bases for [the] initial RCS temperature band prior to commencing boration.

Source: Mod Q25293

Level of knowledge: memory

References:
1. AOP-9A-1 page 56
2. AOP-9A-1 Bases Document pages 7-8

000068 Control Room Evac. / 8 AA2. Ability to determine and interpret the following as they apply to the Control Room Evacuation: (CFR: 43.5 / 45.13) AA2.07 PZR level 4.1 4.3

Bank Question: 62 Answer: B

1 Pt(s) Unit 1 was recovering from a loss of offsite power and a loss of all feedwater in EOP-8 (*Functional Recovery Procedure*). Given the following events and conditions:

- The operators were directed to respond in Appendix (4) *Core and RCS Heat Removal* in HR-1 (*S/G Heat Sink with no SIS Operation*) to reduce RCS subcooling margin.

Which one of the following statements correctly describes (1) the method for lowering RCS subcooled margin, and (2) the controllers/positioners for implementing the preferred method?

A. (1) Initiate auxiliary spray
(2) Cycle 1-CVC-517-CV (*AUX Spray Line Stop*) as necessary to control auxiliary spray flow

B. (1) Initiate auxiliary spray
(2) Open 1-CVC-517-CV and cycle 1-CVC-518-CV (*12B LOOP CHG*) and 1-CVC-519-CV (*11A LOOP CHG*) as necessary to control auxiliary spray flow

C. (1) Raise pressurizer pressure by energizing heaters
(2) Energize proportional heaters using the handswitch

D. (1) Raise pressurizer pressure by energizing heaters
(2) Energize proportional and backup heaters using the handswitches

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Distracter Analysis:

A. **Incorrect**: The NOTE in OI-1H allows that the preferred method for initiating Auxiliary spray is to control spray flow by cycling the loop CHG valves 1-CVC-519-CV and 1CVC-518-CV in order to maintain the charging line downstream of 1-CVC-518/9-CV at the same temperature as the regenerative heat exchanger
Plausible: Partially correct – this would initiate aux spray flow but it is not the preferred method

B. **Correct**: - correct method, correct operation

C. **Incorrect**: This is not the correct method to reduce subcooling margin
Plausible: Increasing pressure would increase subcooling margin – and one step in Appendix (4) of EOP-8 allows the operator to lower

RCS subcooling to as near 25 °F as practical by deenergizing pressurizer heaters

D. **Incorrect**: This is not the correct method to reduce subcooling margin
Plausible: Increasing pressure would increase subcooling margin – and one step in Appendix (4) of EOP-8 allows the operator to lower RCS subcooling to as near 25 °F as practical by deenergizing pressurizer heaters

Level: RO Exam

KA: EPE 000074EK2.09 (2.6*/2.6*)

Lesson Plan Objective: 19047 – Given plant conditions recall the appropriate recovery actions for Core and RCS Heat Removal (Tasks 12-15)

Source: Mod Q20389

Level of knowledge: memory

References:
1. EOP-8 Attachment (4) HR-1 page 73
2. OI-1H page 9
3. SD-064A Figure 13
SD-041 Figure 6-5

000074 Inad. Core Cooling / 4 EK2 Knowledge of the interrelations between the and the following Inadequate Core Cooling: (CFR 41.7 / 45.7) EK2.09 Controllers and positioners 2.6* 2.6*

Bank Question: 63 Answer: D

1 Pt(s) Unit 1 was operating at 100% at 0400 on 8/25/2006 when chemistry reported that RCS samples indicated a high level of activity due to Iodine spiking. Given the following events and conditions:

- Chemistry reports the following trend in RCS activity levels have reached 100 μCi/gm

Which one of the following statements correctly describes the required actions in accordance with (1) AOP-6A (*Abnormal Reactor Coolant Chemistry*), and (2) the least restrictive actions that comply with Tech Specs?

References Provided: Tech Spec 3.4.15

A. (1) Maximize letdown and purification flow to reduce RCS contamination levels.
(2) Reduce power below 75% no later than 0600. Operation may continue at this level as long as RCS activity is reduced below 1 μCi/gm no later than 0600 on 8/29.

B. (1) Bypass purification ion exchangers to prevent contaminating the ion exchange resin unnecessarily and reduce dose.
(2) Reduce power below 75% no later than 0600. Operation may continue at this level as long as RCS activity is reduced below 1 μCi/gm no later than 0600 on 8/29.

C. (1) Bypass purification ion exchangers to prevent contaminating the ion exchange resin unnecessarily and reduce dose.
(2) Commence shutdown to mode 3 at 0800 on 8/25.

D. (1) Maximize letdown and purification flow to reduce RCS contamination levels.
(2) Commence shutdown to mode 3 at 0800 on 8/25.

Distracter Analysis: K/A match analysis: The K/A asks for "knowledge of the reasons" for the actions. The reasons or bases for the Tech Spec actions are contained in Tech Spec bases. Knowledge of Tech Spec bases is beyond what is expected from an RO – considered to be SRO level of knowledge. The question is therefore limited to the knowledge of how and why the ion exchangers are used to reduce fission product activity.

A. **Incorrect**: If fission product activity reaches the unacceptable region of curve 3.4.15-1, then action B requires shutdown within 6 hours.
Plausible: Partially correct – the action to maximize purification flow is per AOP-6A. The applicant may misread the tech spec LCO B. or may think that once the fission product activity is reduced to the acceptable operation region of curve 3.4.15-1, then LCO B no longer applies. 100 hours from the time RCS activity exceeds the limit of 1 μCi/gm expires at 0600 on 8/29.

B. **Incorrect**: Purification flow must be maximized not stopped in order to clean up the high activity. The reactor must be shutdown to mode 3 within 6 hours.
Plausible: If the applicant thinks that high activity could contaminate the purification ion exchangers and that the contamination levels due to an Iodine spike will reduce on their own accord as the Iodine activity decays away. The applicant may misread the tech spec LCO B. or may think that once the fission product activity is reduced to the acceptable operation region of curve 3.4.15-1, then LCO B no longer applies. 100 hours from the time RCS activity exceeds the limit of 1 μCi/gm expires at 0600 on 8/29.

C. **Incorrect**: Purification flow must be maximized not stopped in order to clean up the high activity.
Plausible: If the applicant thinks that high activity could contaminate the purification ion exchangers and that the contamination levels due to an Iodine spike will reduce on their own accord as the Iodine activity decays away. Partially correct – the shutdown is a correct action per Tech Specs

D. **Correct**: If fission product activity reaches the unacceptable region of curve 3.4.15-1, then action B requires shutdown within 6 hours.

Level: RO Exam

KA: APE 000076AK3.05 (2.9/3.6)

Lesson Plan Objective: Recall required actions for the following chemistry action levels: Action level 1, Action level 2, Action level 3.

Source: New

Level of knowledge: comprehension

References:
1. Tech Spec 3.4.15

2. AOP-6A pages 6-7
3. Tech Spec Basis 3.4.15

APE 000076 High Reactor Coolant Activity / 9 AK3. Knowledge of the reasons for the following responses as they apply to the High Reactor Coolant Activity: (CFR 41.5,41.10 / 45.6 / 45.13) AK3.05 Corrective actions as a result of high fission-product radioactivity level in the RCS 2.9 3.6

Bank Question: 64 ***Answer: A***

1 Pt(s) Unit 2 was operating at 100% power when an RCS leak occurred. Given the following events and conditions:

- Unidentified RCS leakage = 0.5 gpm
- Identified RCS leakage = 4.5 gpm
- S/G leakage = 2 gpd
- RO reports an increase RCS leakage from an unknown source
- The operators implement AOP-2A (*Excessive RCS Leakage*)

Which one of the following conditions would require Unit 2 to be shutdown per Tech Specs?

Reference Provided: Tech Spec 3.4.13

A. 5 gpm leakage identified from an RCP integral heat exchanger

B. 5 gpm leakage from the packing gland on PORV-402

C. 5 gpm leakage by the seat of SI-652-MOV

D. 40 gpd steam generator tube leakage

Distracter Analysis:

A. **Correct**: RCP integral HX is considered pressure boundary leakage.

B. **Incorrect**: The leakage would be considered identified leakage - so identified leakage = 4.5 + 5 = 9.5 < 10 Tech Spec limit
Plausible: If the applicant incorrectly adds the S/G leakage to the identified leakage 2 + 4.5 + 5 = 11.5 > 10 gpm – or adds the unidentified RCS leakage to the identified RCS leakage 0.5 + 4.5 + 5 = 10 gpm = Tech Spec limit, or decides that this leakage is unidentified leakage.

C. **Incorrect**: The leakage would be considered identified leakage - so identified leakage = 4.5 + 5 = 9.5 < 10 Tech Spec limit
Plausible: If the applicant incorrectly adds the S/G leakage to the identified leakage 2 + 4.5 + 5 = 11.5 > 10 gpm – or adds the unidentified RCS leakage to the identified RCS leakage 0.5 + 4.5 + 5 = 10 gpm = Tech Spec limit, or decides that this leakage is unidentified leakage.

D. **Incorrect**: 40 gpd SG tube leakage = 40 gpd /1440 min/day = 0.03 gpm - 0.03 gpm + 5 gpm = 5.03 gpm < 10 gpm Tech Spec limit

Plausible: If the applicant cannot make the conversion from gpd to gpm or adds 40 + 5 = 45 gpm > 10 gpm.

Level: RO Exam

KA: APE CE/A16AA2.2 (2.9/3.7)

Lesson Plan Objective: 19071 - Given plant conditions indicting an RCS leak, the license candidate shall quantify leakage then direct and/or implement the applicable actions to mitigate the event in progress. 19078 – Given calculated RCS leak rate values: implement the applicable actions for RCS leakage to include the following: Tech Spec 3.4.13 RCS leakage

Source: Bank Q28870

Level of knowledge: comprehension

References:
1. Tech Spec definitions section 1.1 page 1.1-4
2. Tech Spec 3.4.13

CE/A16 Excess RCS Leakage / 2 AA2. Ability to determine and interpret the following as they apply to the (Excess RCS Leakage) (CFR: 43.5 / 45.13) AA2.2 Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments. IMPORTANCE RO 2.9 SRO 3.7

Bank Question: 65 Answer: C

1 Pt(s) Unit 1 was operating at 100% power. Given the following events and conditions:

- Shift turnover was in progress
- The oncoming control room operator (CRO) was delayed in arriving at the site due to an automobile accident
- His assigned trainee, an applicant for a reactor operator's license, is present for turnover
- The off-going CRO has reached his overtime limits

If the Shift Manager does not grant any waivers to the requirements, which one of the following statements correctly describes how the shift turnover may be conducted in compliance with NO-1-207 (*Nuclear Operations Shift Turnover)*?

A. The off-going Unit 1 CRO may turn over to the on-coming Unit 1 CRS who can then turnover to the on-coming Unit 1CRO when he arrives. The Trainee can perform the duties of the CRO under instruction by the RO.

B. The Unit 1 RO positions may be combined for up to 2 hours in order to accommodate the unexpected absence.

C. The off-going Unit 1 CRO is required to remain in his position until the on-coming Unit 1 CRO arrives and receives a face-to-face turnover even if he exceeds his overtime limits.

D. The Unit 2 CRO can function as the Unit 1 CRO for up to 2 hours until the on-coming Unit 1 CRO arrives for turnover.

Distracter Analysis:

A. **Incorrect**: This is allowable without a specific waiver by the Shift Manager in accordance with section 5.1.A.4. Shift turnover must be face-to-face.
Plausible: The shift manager has authority to waive the requirement for a face-to-face turnover and allow a qualified intermediary to bridge the gap.

B. **Incorrect**: This practice is not allowed by NO-1-207.
Plausible: Tech Spec 5.2.2.c. allows gapping the CRO position for up to 2 hours – but the there are interpretations that indicate this is not allowable unless the operator is incapacitated in the middle of the

shift (can't find this interpretation the reference material – no bases document provided for Tech Spec 5.2.2)

C. **Correct**:

D. **Incorrect**: The Unit 1 and Unit 2 CRO positions may not be combined in accordance with NO-1-207
Plausible: The Shift Manager may waive this requirement – but no waivers have been granted per the stem conditions.

Level: RO Exam

KA: G2.1.3 (3.0/3.4)

Lesson Plan Objective: none

Source: New

Level of knowledge: memory

References:
1. NO-1-207 page 14
2. Tech Spec 5.2

G2.1.3 Knowledge of shift turnover practices. (CFR: 41.10 / 45.13)
IMPORTANCE RO 3.0 SRO 3.4

Bank Question: 66 Answer: D

1 Pt(s) Unit 1 was operating at 100% power when the operators discovered CEA alignment problems. Given the following events and conditions:

0200 Regulating group 1 is at 133 inches in the core – all rods are in alignment
0205 CEA group 5 was inserted from 133 inches to 123 inches
0210 CEA group 5 was withdrawn from 123 inches to 133 inches
0215 CEA #1 in Reg Group 5 was discovered to be at 123 inches
0220 CEA #2 in Reg Group 5 was discovered to be at 123 inches
0245 CEA #1 was realigned to 133 inches

Which of the following statements correctly describes the latest time that CEA #2 is required to return to alignment in accordance with Tech Specs?

A. 0305

B. 0310

C. 0315

D. 0320

Distracter Analysis: This question tests the application of the rules on completion time extensions for subsequent components under the same LCO in Tech Spec 1.3.

A. **Incorrect**: CEA #2 must be restored to alignment by 0320 – 1 hour from the time that the LCO 3.1.4 is entered on CEA #2.
Plausible: This completion time is 1 hour from the time of occurrence – when CEA #2 probably became stuck in the core.

B. **Incorrect**: CEA #2 must be restored to alignment by 0320 – 1 hour from the time of occurrence – when CEA #2 probably became misaligned.
Plausible: This time is 1 hour from the first entry into LCO 3.1.4 action A – on CEA #1.

C. **Incorrect**: CEA #2 must be restored to alignment by 0320 – 1 hour from the time that the LCO 3.1.4 is entered on CEA #2.
Plausible: This time is 1 hour from the time that the LCO 3.1.4 is first entered on CEA #1.

D. **Correct**:

Level: RO Exam

KA: G2.1.11 (3.0/3.8)

Lesson Plan Objective: none

Source: New

Level of knowledge: comprehension

References:
1. Tech Spec 1.3
2. Tech Spec 3.1.4

G2.1.11 Knowledge of less than one hour technical specification action statements for systems. (CFR: 43.2 / 45.13) IMPORTANCE RO 3.0 SRO 3.8

Bank Question: 67 Answer: A

1 Pt(s) Unit 1 was in mode 6 conducting refueling operations. Given the following events and conditions:

- The plant was preparing for conducting initial core offload

Which one of the following events is explicitly required to be announced over the plant paging system in accordance with SO-04-03 (*GS-NPO Expectations for Site Announcements by Operating Crew*)?

A. Commencing draining down to reduced inventory

B. Opening the transfer tube gate valve

C. Moving the up-ender into refueling position

D. Raising a fuel bundle from the core

Distracter Analysis:

A. **Correct**: Explicitly listed under "Commencement of significant evolutions or plant transients" as the 4th line item.

B. **Incorrect**: Not explicitly required to be announced per SO-04-03.
Plausible: Not a trivial evolution

C. **Incorrect**: Not explicitly required to be announced per SO-04-03.
Plausible: Not a trivial evolution

D. **Incorrect**: Not explicitly required to be announced per SO-04-03.
Plausible: Not a trivial evolution

Level: RO Exam

KA: G2.1.14 (2.5/3.3)

Lesson Plan Objective: none

Source: New

Level of knowledge: memory

References:
1. SO-04-03 page 1

G2.1.14 Knowledge of system status criteria which require the notification of plant personnel. (CFR: 43.5 / 45.12) IMPORTANCE RO 2.5 SRO 3.3

Note: This is the second time we have tested this KA. We have no explicit reason to suppress the KA but it seems to be over-emphasizing the K/A. We may want to shift to a different KA.

Bank Question: 68 Answer: A

1 Pt(s) Unit 1 and Unit 2 were operating at 100% power. Given the following events and conditions:

- Maintenance requested to take the 1A diesel generator out of service for a modification
- All other sources of power were operable

Which one of the following statements correctly and completely describes the actions required within 1 hour prior to starting the maintenance?

A. Perform operability verification of Unit 1 ZB train equipment only in accordance with OI-49 (*Operability Verification*)

B. Perform operability verification of Unit1 and Unit 2 ZB train equipment in accordance with OI-49

C. Perform operability verification of Unit 1 ZB train equipment and Unit 2 ZA train equipment in accordance with OI-49

D. Perform operability verification of Unit 1 and Unit 2 ZB train equipment and verify 2A, 2B and the 0C diesel generators available to Unit 2 in accordance with OI-49

Distracter Analysis:

A. **Correct**: Per OI-49

B. **Incorrect**: Only Unit 1 ZB train is required to be verified operable.
Plausible: The Unit 1 ZB operability verification checks many components/equipment on both Unit 1 and Unit 2.

C. **Incorrect**: Only Unit 1 ZB train is required to be verified operable.
Plausible: The Unit 1 ZB operability verification checks many components/equipment on both Unit 1 and Unit 2.

D. **Incorrect**: Only Unit 1 ZB train is required to be verified operable.
Plausible: The Unit 1 ZB operability verification checks many components/equipment on both Unit 1 and Unit 2.

Level: RO Exam

KA: G2.2.24 (2.6/3.8)

Lesson Plan Objective: none

Source: New

Level of knowledge: memory

References:
1. MN-1-101 pages 15-16
2. Tech Spec 3.8.1
3. OI-49 pages 2, 5-10

G2.2.24 Ability to analyze the affect of maintenance activities on LCO status. (CFR: 43.2 / 45.13) IMPORTANCE RO 2.6 SRO 3.8

Bank Question: 69 Answer: D

1 Pt(s) Unit 1 is conducting a refueling outage. Given the following events and conditions:

- The initial removal of the core is in progress
- A CEA is being withdrawn from the core

WRlog NI channel	CPS at start of withdrawal	Expected CPS	CPS Now
A	10	15	25
B	11	11	11
C	13	12	12
D	8	9	8

Which one of the following statements correctly describes the Refueling Control Room Operator's (RCRO) responsibility?

A. Continue the withdrawal while observing all NI channels

B. Stop the CEA withdrawal and observe nuclear indications

C. Stop the CEA withdrawal and report the problem the FHS

D. Insert the CEA back into the core

Distracter Analysis:

A. **Incorrect**: Count rate in channel A has unexpectedly doubled – required to inert any CEA which is being withdrawn
Plausible: Other channels show no increase. If count rate had NOT doubled, FHS-305 step 5.3.B.1 allows continuing withdrawing the CEA as long as 2 WRlog channels are operable

B. **Incorrect**: Count rate in channel A has unexpectedly doubled – required to inert any CEA which is being withdrawn
Plausible: If count rate had NOT doubled – FHS-305 step 5.3.B.1 directs the operators to stop all fuel movement and observe the behavior of channel A in comparison to the other channels

C. **Incorrect**: Count rate in channel A has unexpectedly doubled – required to inert any CEA which is being withdrawn
Plausible: FHS-305 step 5.3.B.3 directs the operators notify the FHS and SM immediately if 2 channels indicate a sustained rising count rate.

D. **Correct**: FHS 305 step 5.3.B.2 requires inserting any CEAs that were withdrawn if the count rate in any single channel doubles.

Level: RO Exam

KA: G2.2.26 (2.5/3.7)

Lesson Plan Objective: none

Source: New

Level of knowledge: comprehension

References:
1. FH-305 page 13

G2.2.26 Knowledge of refueling administrative requirements. (CFR: 43.5 / 45.13)
IMPORTANCE RO 2.5 SRO 3.7

Bank Question: 70 Answer: C

1 Pt(s) Unit 2 was in mode 6 conducting a refueling outage. Given the following events and conditions:

- A guide tube insert (GTI) has been grappled and moved to the up-ender under the supervision of the Refueling Manager (RFM)

Which one of the following events requires ceasing all core alterations in accordance with Technical Procedure FH-305 (*Core Alteration*) (if any)?

A. One channel wide range logarithmic nuclear instruments fails high

B. Spent fuel pool ventilation exhaust filter is bypassed

C. Voice communications are lost between the RFM and the control room

D. There are no core alterations in progress, movement of the GTI may continue without interruption

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Distracter Analysis:

A. **Incorrect**: Refueling may continue – there are 3 other operable WRLog NI channels that remain operable.
Plausible: If the applicant is unfamiliar with the LCOs for WRLog NIs.

B. **Incorrect**: This does not require securing operations in containment
Plausible: This does require securing refueling operations in the spent fuel pool area.

C. **Correct**: Per FH-305 2.6.A

D. **Incorrect**: Movement of GTI is considered to be a core alteration
Plausible: If the applicant does not know what constitutes core alterations

Level: RO Exam

KA: G2.2.28 (2.6/3.5)

Lesson Plan Objective: none

Source: New

Level of knowledge: memory

References:
1. FH-305 pages 5-6, 9

G2.2.28 Knowledge of new and spent fuel movement procedures. (CFR: 43.7 / 45.13)
IMPORTANCE RO 2.6 SRO 3.5

Bank Question: 71 Answer: C

1 Pt(s) You are now a control room operator but in the past, you were an expert on steam generator U-tube plugging practices. Your radiation exposure history for this quarter is given as follows:

- The date is 8/25/06
- You received 100 mrem whole body from a medical procedure two weeks ago.
- You live in an area where background radiation is 80 mrem/year
- You visited the Ginna Nuclear Plant and received 950 mrem as estimated from the digital dosimeter from 7/5 to 7/9/06 but you have not yet received the results of the TLD reading
- You also visited the St Lucie Nuclear Plant and received 500 mrem TEDE from 12/5 to 12/15/05
- You have received 500 mrem TEDE for this year at CCNPP
- Neither the Plant General Manager nor the Vice President has been requested to authorize a dose extension.

Assuming all possible dose extensions have been authorized up the level of the worker's general supervisor, which one of the following statements correctly describes the maximum amount of whole body radiation you can receive at CCNP before you exceed your Annual Administrative Maximum Level (TEDE) for Constellation Energy?

A. 0 mrem

B. 1-500 mrem

C. 501-1000 mrem

D. >1000 mrem

Distracter Analysis: You have received 500 mrem at CCNP and 950 mrem at Ginna during this year. The background radiation and medical procedure do not count toward this limit. The exposure from St Lucie does not count toward the alert flag limit because it was received last calendar year. Your total TEDE for this year is 500+950=1450 mrem. Your Alert TEDE flag for CCNP is set at 2000 mrem. 2000-1450 = 550 mrem. In order to extend the alert flag limit > 2000 rem, plant general manager or site VP permission is required.

A. **Incorrect**: The margin to the alert flag limit is 550 mrem

Plausible: If the applicant thinks that the St Lucie exposure counts in this quarter (it is less than 365 days – but not within the same calendar year) or does not recognize that the alert flag limit is 2000,

B. **Incorrect**: The margin to the alert flag limit is 550 mrem
Plausible: If the applicant thinks that 1. The 100 mrem medical procedure counts toward the total exposure, or 2. 80 mrem background radiation counts towards the total, then the margin would be reduced < 500 mrem .

C. **Correct**: 500 mrem (CCNP) + 950 mrem (Ginna) = 1450 mrem dose: 2000 (flag) – 1450 (exposure) = 550 mrem margin to alert flag.

D. **Incorrect**: The margin to the alert flag limit is 550 mrem
Plausible: If the dose received at Ginna is not considered because the legal report of record from TLD reading has not yet been received (-950 mrem), or if the applicant thinks the alert flag is 3000 mrem (note this flag would be set for contractors who have received dose at other locations – but not for CCNP personnel even though they have incurred dose from Ginna).

Level: RO Exam

KA: G2.3.1 (2.6/3.0)

Lesson Plan Objective: none

Source: New

Level of knowledge: comprehension

References:
1. RP-1-100 pages 19-22, 67

G2.3.1 Knowledge of 10 CFR: 20 and related facility radiation control requirements. (CFR: 41.12 / 43.4. 45.9 / 45.10) IMPORTANCE RO 2.6 SRO 3.0

Bank Question: 72 Answer: C

1 Pt(s) An operator was touring the containment to inspect the maintenance work order for cleaning boric acid deposits from the reactor vessel head. Given the following events and conditions upon exiting the work area:

- The operator received an exposure of 2500 mrem to the left hand due to a small radioactive particle that lodged in the glove
- The operator's electronic dosimeter read 250 mrem
- The operator's TLD read 200 mrem
- The operator was working in a 100 DAC area in a full face respirator for 1 hour

Which one of the following statements correctly describes (1) the operator's legal dose from this work and (2) the annual administrative maximum dose level extension required to allow the operator to continue working in the RCA?

A. (1) TEDE = 200 mrem, SDE = 0 mrem, CEDE = 0 mrem
(2) The SDE is still within alert flag limits with no SDE dose extension required

B. (1) TEDE = 250 mrem, SDE = 2500 mrem, CEDE = 100 mrem
(2) The SDE must be extended up to 3 rem to allow adequate dose margin

C. (1) TEDE = 200 mrem, SDE = 2500 mrem, CEDE = 0 mrem
(2) The SDE is still within alert flag limits with no SDE dose extension required

D. (1) TEDE = 250 mrem, SDE = 2700 mrem, CEDE = 200 mrem
(2) The SDE may be extended up to 50 rem to allow adequate dose margin

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Distracter Analysis: The TEDE = 200 mrem – the TLD reading is the legal record, not the ERD. The SDE = 2500 mrem from the hot particle, the CEDE = 0 because a full-face respirator was worn. The annual admin alert flag for SDE is 10 rem < 2500 mrem so no extension is required.

A. **Incorrect**: The SDE exposure = 2500 mrem
Plausible: Partially correct – the other data is correct. If the applicant does not recognize that the hot particle in the hand area causes SDE exposure.

B. **Incorrect**: CEDE = 0 because a full face respirator prevents any intake of airborne radioactive contaminants. The annual admin alert limit for SDE is 10 rem – hence no extension is required
Plausible: If the applicant is not familiar with SDE and annual alert flag limits. The annual admin max limit for TEDE is 3.0 rem – if the applicant confuses TEDE and SDE limits.

C. **Correct**:

D. **Incorrect**: The SDE exposure = 2500 mrem, the CEDE exposure = 0 Can only extend SDE up to 40 rem – not 50 rem
Plausible: If the applicant adds the TEDE exposure to the SDE exposure, the answer would be 2700. The 50 rem SDE limit is the 10CFR 20 limit. If the applicant estimates the internal exposure by using the thumb rule 1 DAC-hr = 2.5 mrem, then the answer would be 80 DAC hours x 2.5 mrem/DAC-hr = 200 mrem CEDE

Level: RO Exam

KA:G2.3.4 (2.5/3.1)

Lesson Plan Objective: ???-?

Source: New

Level of knowledge: comprehension

References:
1. RP-1-100 pages 11-13, 16, 22

G2.3.4 Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized. (CFR: 43.4 / 45.10) IMPORTANCE RO 2.5 SRO 3.1

Bank Question: 73 Answer: B

1 Pt(s)

Unit 1 was operating at 100% power when a loss of offsite power and steam generator tube rupture (SGTR) on the 11 S/G occurred. Given the following events and conditions:

- The operators implemented EOP-06 (SGTR)
- The ADVs were being operated locally (manually) for cooldown
- Boration has not yet been started due to various system failures
- T_{hot} = 516°F (slowly decreasing)
- The operators reached step IV. J. 2 which reads:

*"**WHEN** T_{hot} is less than 515 °F,*
***THEN** isolate the most affected steam generator*

(1) Shut the 11 ADV using..."

Which one of the following statements correctly describes (1) the method for isolating the 11 ADV, and (2) the reason for cooldown below 515°F T_{hot} prior to S/G isolation?

A. **(1) Shut the 11 ADV by removing the manual override and aligning the hand transfer valves to position 2 in the 45 ft switchgear room**
(2) Cooldown below 515°F reduces shutdown margin below required values

B. **(1) Shut the 11 ADV by removing the manual override and aligning the hand transfer valves to position 2 in the 45 ft switchgear room**
(2) Ensures the 11 S/G safety valve will not lift and stick open, thereby releasing contamination to the environment

C. **(1) Shut the 11 ADV using the 1-HC-4056A (*Atmospheric Steam Dump Contr)* in the control room**
(2) Ensures the 11 S/G safety valve will not lift and stick open thereby releasing contamination to the environment

D. **(1) Shut the 11 ADV using the 1-HIC-4056A (*Atmospheric Steam Dump Contr)* in the control room**
(2) Cooldown below 515°F may cause reactor vessel void formations

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Distracter Analysis: If the ADVs were being operated locally, a remote override device has been installed. The remote override must be removed by procedure and the hand transfer switches must be realigned to position 2. Operating 1-HC-4056A will be ineffective if the hand transfer switches have been aligned to position 1 thereby removing control from the HC in the control room.

A. **Incorrect**: The requirement to cool down below 515°F prior to shutting the ADV has nothing to do with shutdown margin.
Plausible: Partially correct – the method of realigning the hand transfer switches is correct. There is a requirement not to cool down below 515°F unless boration is in progress – but this is not related to closing the ADV (this is the correct bases for another step in EOP-6).

B. **Correct**:

C. **Incorrect**: The hand controller is ineffective if the hand transfer switch is aligned to position 1 and the ADV is operated locally.
Plausible: Partially correct – the implication of taking this action at 515 °F is correct.

D. **Incorrect**: The hand controller is ineffective if the hand transfer switch is aligned to position 1 and the ADV is operated locally.
Plausible: Preventing excessive cooldown is a valid concern but is restricted by limiting the cooldown rate to 100°F/hr until reaching 300°F. The 515°F limit has nothing to do with this concern.

Level: RO Exam

KA: G2.4.34 (3.8/3.6)

Lesson Plan Objective: 19029 – Recall the strategy and major actions performed in EOP-6, SGTR, and what actions are required if safety functions are in jeopardy of being lost. Tasks 1, 3-23

Source: MOD Q26554

Level of knowledge: comprehension

References:
1. EOP-6 page 28
2. JPM EOP-6-3
3. EOP-6 TBD page 37
4. OI-8C pages 21-25

G2.4.34 Knowledge of RO tasks performed outside the main control room during emergency operations including system geography and system implications. (CFR: 43.5 / 45.13) IMPORTANCE RO 3.8 SRO 3.6

Bank Question: 74 Answer: B

1 Pt(s) Unit 1 is responding to a LOCA and has declared a site area emergency. Given the following timeline of events and conditions:

0200 The LOCA occurred
0205 Site area emergency was declared
0210 The Shift Manager approved the initial notification message for transmission to the State and Local Authorities

Which one of the following statements correctly describes the latest required times for emergency notification in accordance with ERPIP-105 (*Control Room Communicator*)?

A. 0215 – notify state and local authorities
0300 – notify NRC

B. 0220 – notify state and local authorities
0305 – notify NRC

C. 0225 - notify state and local authorities
0300 – notify NRC

D. 0225 – notify state and local authorities
0305 – notify NRC

Distracter Analysis:

A. **Incorrect**: Both times are too early
Plausible: If the times are measured from the actual event occurrence rather than when the classification was made.

B. **Correct**:

C. **Incorrect**: The offsite authorities must be notified no later than 0220. The NRC must be notified no later than 0305.
Plausible: If the applicant thinks that the offsite authorities must be notified within 15 minutes of the approval of the initial notification message and the NRC must be notified within 1 hour of the actual event.

D. **Incorrect**: The offsite authorities must be notified no later than 0220.
Plausible: Partially correct – the NRC must be notified no later than 0305.

Level: RO Exam

KA: G2.4.43 (2.8/3.5)

Lesson Plan Objective: 19603 – Notify offsite agencies of Emergency Notification

Source: Mod Q28531

Level of knowledge: memory

References:
1. ERPIP-105 attachment 2 pages 1, 5

G2.4.43 Knowledge of emergency communications systems and techniques. (CFR: 45.13)
IMPORTANCE RO 2.8 SRO 3.5

Bank Question: 75 Answer: B

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- A CEA drops into the center of the core
- The operators withdraw the regulating group to restore power to 100%

Which one of the following statements correctly describes (1) the effect on the planar radial peaking factor (FxyT), and (2) the preferred method used to monitor FxyT in the core?

A. **(1) FxyT will increase**
(2) The wide range logarithmic nuclear instruments measures FxyT and provides input to the CECOR program.

B. **(1) FxyT will increase**
(2) The in-core detector system measures FxyT and provides input to the CECOR program.

C. **(1) FxyT will decrease**
(2) FxyT is manually calculated from the in-core detector system inputs.

D. **(1) FxyT will decrease**
(2) FxyT is manually calculated from the wide range logarithmic nuclear instruments.

Distracter Analysis:

A. **Incorrect**: The preferred method for monitoring FxyT is to use the in-core detectors and the CECOR program
Plausible: Partially correct – FxyT will increase. The WR log channels are used to monitor core flux levels and provide a backup method to monitor FxyT if the in-core detectors are out of service

B. **Correct**: This is one of the primary functions of the in-core detectors

C. **Incorrect**: FxyT increases – not decreases.
Plausible: The in-core detectors are used to monitor FxyT – but using the manual calculation is the backup - not the preferred method

D. **Incorrect**: FxyT increases – not decreases.
Plausible: FxyT can be monitored using the WRlog channels (ex-core detectors) and can be manually calculated – but this not the preferred method.

Level: RO Exam

KA: SYS 015K5.13 (3.1/3.5)

Lesson Plan Objective: 17584 – Recall the purpose of the following systems: Incore Nuclear Instrumentation and CET Display System. CRO-212-3.2-10 objective 4.0 Recall how the peaking factors FxyT and FrT are calculated. 6.0 Recall where the peaking factors are monitored.

Source: New

Level of knowledge: memory

References:
1. LP CRO-212-3.2-10 pages 6-11
2. SD-78B pages 3-8
3. SD-78A page 6

015 Nuclear Instrumentation K5 Knowledge of the operational implications of the following concepts as they apply to the NIS: (CFR: 41.5 / 45.7) K5.13 Peaking and hot-channel factor 3.1 3.5