1. 2021 NRC 001

Given the following:

- Unit 1 was at Rated Thermal Power
- Subsequently the following plant conditions exist:
  - Pressurizer level is 16%
  - Pressurizer pressure is 1915 psig
  - Steam Generator A narrow range is 35%
  - Steam Generator B narrow range is 40%

Which of the following describes:
(1) Which First Out Annunciator <u>should</u> be LIT?
AND
(2) What is the correct order of immediate actions per EOP-0, Reactor Trip or Safety Injection?

A. (1) 1C04 1B 1-5, STEAM GENERATOR A WATER LEVEL LOW-LOW
(2) Verify Turbine Trip
Verify Reactor Trip
Check if SI is Actuated
Verify Power to AC safeguards busses

B. (1) 1C04 1B 1-5, STEAM GENERATOR A WATER LEVEL LOW-LOW
(2) Verify Reactor Trip
Verify Turbine Trip
Verify Power to AC safeguards busses
Check if SI is Actuated

C. (1) 1C04 1B 3-4, PRESSURIZER PRESSURE LOW
(2) Verify Turbine Trip
Verify Reactor Trip
Check if SI is Actuated
Verify Power to AC safeguards busses

D.✓ (1) 1C04 1B 3-4, PRESSURIZER PRESSURE LOW
(2) Verify Reactor Trip
Verify Turbine Trip
Verify Power to AC safeguards busses
Check if SI is Actuated

RO Tier 1 Group 1

Source:
New

Question History:
NA

K/A:
007EK2.03 - Reactor Trip
Knowledge of the interrelations between a Reactor Trip and the following: Reactor trip status panel
(Imp 3.5/3.6)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine from indications available which first out status light indicates the cause of the trip.

Cognitive Level:
Knowledge 1-I: The operator recall the setpoints for the first out indications must recall the proper order of actions required for a trip of the reactor from RTP.

10 CFR Part 55 Content:
55.41 7
55.45 7

Reference:
ARB 1CO4 1B 3-4, PRESSURIZER PRESSURE LOW, Rev 4
STPT 1.4, Pressurizer Pressure and Level, Rev 11 Section 1.3.1
EOP-0, Reactor Trip or Safety Injection, Rev 70 steps 1-4

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

The first-out annunciator will light when the setpoint has been exceeded to indicate the with cause of a reactor trip. The correct order of the immediate actions per EOP-0 is (2) Verify Reactor Trip, Verify Turbine Trip, Verify Power to AC safeguards busses, and Check if SI is Actuated.

A **INCORRECT:** The first part is wrong, plausible if the examinee incorrectly recalls the setpoint. The second part is wrong, plausible if the operator incorrectly recalls the order of required immediate action required.

B **INCORRECT:** The first part is wrong, plausible if the examinee incorrectly recalls the setpoint. The second part is correct.

C **INCORRECT:** The first part is correct. The second part is wrong, plausible if the operator incorrectly recalls the order of required immediate action required.

D **CORRECT:** See above.

Learning Objective:

DIAGNOSE and analyze the effects of and response to Reactor Protection System or associated Process Instrument malfunctions/failures in accordance with plant procedures.
(053.02.LP0361.006)

2. 2021 NRC 002
Given the following:

- A Safety Injection occurred on Unit 2 and the crew is currently in EOP-1.1 Unit 2, SI Termination at step 7, 'Check If Containment Spray Should Be Stopped'

- Subsequently, 2RC-430, PORV, opens and fails to reclose
- Attempts to close 2RC-516, PORV Block Valve fail
- Containment pressure is 6 psig and RISING SLOWLY

Which of the following is the reason the operators will be require to manually start the non-operating ECCS pumps?

A. Pressurizer level drops to 30%

B✓ RCS subcooling drops to 50°F

C. RCS pressure drops to 1700 psig

D. Total AFW flow to intact Steam Generators is 180 gpm

RO Tier 1 Group 1

Source:
Bank

Question History:
2007 Seabrook RO 2

K/A:
008AK3.03 Pressurizer Vapor Space Accident
Knowledge of the reasons for the following responses as they apply to the Pressurizer Vapor Space Accident: **Actions contained in EOP for PZR vapor space accident/LOCA**
(Imp 4.1/4.6)

Justification for K/A Match:
Matches the K/A by requiring the operator to evaluate plant conditions, indicating a vapor space accident and determining why or the reason an action was taken.

Cognitive Level:
Comprehension 3-PEO: The operator must diagnose the indications and determine the procedural outcome from said indications.

10 CFR Part 55 Content:
55.41 5
55.41 10
55.45 6
55.45 13

Reference:

EOP-1.1, SI Termination Unit 2 Rev 41
BG-EOP-1.1, Background SI Termination Rev 31

Proposed reference to be provided to the applicants during examination:

None

Original Question:

An inadvertent Safety Injection occurred and the operating crew is currently in ES-1.1, 'SI TERMINATION' at step 7, 'Check if SI Pumps Should Be Stopped'. Subsequently, one PORV opens and fails to reclose. Attempts to close the PORV's associated block valve fail. Containment pressure is at 5 psig and slowly increasing.

Which of the following conditions will require the operator to manually start the non-operating charging pump?

A. Pressurizer level drops to less than 30%.

B. RCS subcooling drops to less than 40" F.

C. RCS pressure drops to less than 1700 psig.

D. Total EFW flow to intact Steam Generators is less than 500 gpm.

Proposed Answer: B

Justification:

Per EOP-1.1, Foldout Page, SI Reinitiation Criteria, manually start ECCS pumps as necessary to restore subcooling and PZR level and go to EOP-1, LOSS OF REACTOR OR SECONDARY COOLANT if either condition below occurs:
RCS subcooling-Less than [62°F] 37°F.
-or-
Pressurizer level-Cannot be maintained greater than [26%] 11%

A **INCORRECT:** Plausible. Pressurizer level is one of the ECCS pump restart criteria, however the level requirement for adverse containment is <26%, the existing pressurizer level does not warrant an ECCS pump restart.

B **CORRECT:** See above.

C **INCORRECT:** Plausible. RCS pressure “stable or increasing” is one of the SI termination criteria. However, decreasing RCS pressure is not one of the ECCS reinitiation criteria, and this pressure is below the SI actuation setpoint.

D **INCORRECT:** Plausible. Adequate heat sink is one of the SI termination criteria in EOP-1.

Learning Objective:

RECOMMEND actions to ensure Core Cooling and Subcooling Margin are maintained.
(031.02.LP0435.011)

3. 2021 NRC 003
Given the following:

- Unit 1 has just been manually tripped from Rated Thermal Power due to a small break LOCA inside Containment
- The crew is performing EOP-0, Reactor Trip or Safety Injection, step 8 'Check RCS temperature'
- The following indications are noted:
  - Containment pressure is 7 psig and RISING SLOWLY
  - RCS pressure is 1710 psig and LOWERING SLOWLY
  - Pressurizer level is 11% and LOWERING
  - RCS subcooling is 35°F and LOWERING
  - 1P-30A and B Circ Water Pumps have tripped.
  - 1P-15A and B SI Pumps are both running indicating
    - 40 amps
    - 0 gpm flow
    - 1570 psig discharge pressure

Which of the following is the next procedural action to be taken?

A. Shut both 1MS-2017 and 1MS-2018, MSIVs

B✓ Stop both 1P-1A and 1P-1B, Reactor Coolant pumps

C. Place Steam Dump Mode Selector Switch in MANUAL

D. Adjust 1HC-468 and 1HC-478, Atmospheric Steam Dump controllers to 1050 psig

RO Tier 1 Group 1

Source:
New

Question History:
None

K/A:
009EA1.09 Small Break LOCA
Ability to operate and monitor the following as they apply to a small break LOCA:
RCP
(Imp 3.6/3.6)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the reason for action in EOP-0 that requires monitoring and operation of the RCPs during a SB LOCA.

Cognitive Level:
Comprehension 3-PEO: The operator must determine the actions to be taken, predicted from indications in an event.

10 CFR Part 55 Content:
55.41 5
55.45 5
55.45 6

Reference:
EOP-0, Reactor Trip or Safety Injection, Rev 70
BG-EOP-0, Background Reactor Trip or Safety Injection, Rev 45

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

Per EOP-0 the criteria for tripping the RCPs, per the foldout page are:

IF both conditions listed below occur, THEN trip both RCPs:

- RCS subcooling - LESS THAN [40°F] 31°F
- SI pumps – AT LEAST ONE RUNNING AND CAPABLE OF DELIVERING FLOW

The SI Pumps are not injecting, but are capable of delivering flow when RCS pressure lowers to shutoff head of the pumps.

Also per the background document, for the step to monitor the fold-out page, it states that, “The foldout page provides a list of important items that should be continuously monitored. If any of the parameters exceed their limits, the appropriate operations should be initiated.”

A **INCORRECT:** Plausible, this is an action carried out in EOP network. The information in the stem does not give indications of an uncontrolled cooldown.

B **CORRECT:** See above.

C **INCORRECT:** Plausible, as the step performed in the temperature control step if the steam dumps are available, however, with the steam dumps not available, this will not have an effect on the steam dumps.

D **INCORRECT:** Plausible as this is performed in the temperature control step the ADV is adjusted to 1005 psig normally, the value provided is used during a SGTR.

Learning Objective:

DESCRIBE the basis for Reactor Coolant Pump trip criteria and the conditions when Reactor Coolant Pump trip criteria does not apply.
(031.02.LP0405.009)

4. 2021 NRC 004

Given the following:

- The crew has entered CSP-P.1, Response to Imminent Pressurized Thermal Shock due to a RED condition on the Integrity CSF Status Tree

Which of the following describes the CSP-P.1 parameter that determines whether the Red condition on integrity was caused by a Large Break LOCA or an actual PTS event?

A. RVLIS level

B. SG pressure

C.✓ RHR flow rate

D. RCS temperature

RO Tier 1 Group 1

Source:
Bank

Question History:
2007 McGuire RO 42

K/A:
011EA2.13 Large Break LOCA
Ability to determine or interpret the following as they apply to a Large Break LOCA: **Difference between overcooling and LOCA indications**
(Imp 3.7/3.7)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall what procedural determined parameters identify the difference between an overcooling and LOCA event.

Cognitive Level:
Knowledge 1-F: The operator must recall what parameter identifies the difference between an overcooling or LOCA event.

10 CFR Part 55 Content:
55.43 5
55.45 13

Reference:
CSP-P.1, Response to Imminent Pressurized Thermal Shock, Rev 36
BG-CSP-P.1, Background Response to Imminent Pressurized Thermal Shock, Rev 30

Proposed reference to be provided to the applicants during examination:
None

Original Question:
The crew has entered FR-P.l , Response to Imminent Pressurized Thermal Shock due to a RED condition on the Integrity CSF Status Tree.

Which ONE (1) of the following describes the parameter that determines whether the Red condition on NC System integrity was caused by a iarge LOCA or an actual PTS event?

A. RVLIS level

B. SG pressure

C. ND flow rate

D. NC temperature

Proposed answer: C

Justification:
RHR flow indicates that RCS pressure is low and not recovering, indicating a large break LOCA

A **INCORRECT:** Plausible, as RVLIS level could indicate both a large or small break LOCA and a small break LOCA is a PTS concern.

B **INCORRECT:** Plausible, SG pressure will change and could be an indication of a LOCA or steam break which is a PTS concern.

C **CORRECT:** See above

D **INCORRECT:** Plausible, RCS temperature will change for a large break LOCA as well as a PTS concern (steam break).

Learning Objective:
DIFFERENTIATE between Reactor Coolant Systems leak and other accidents. (031.02.LP0435.013)

5. 2021 NRC 005
Given the following:

- Unit 2 was operating at Rated Thermal Power
- Safety Injection has actuated
- A transition has been made to EOP-1.1, SI Termination
- No charging pumps are running
- Component Cooling (CC) flow to the Reactor Coolant Pump (RCP) thermal barrier HX has been lost since the SI actuation

What action IAW EOP-1.1 is initially taken associated with RCP seal cooling and what is the reason for the action?

A. CC flow is established to the RCP thermal barriers to prevent thermal shock to the RCP seals.

B. CC flow is established to the RCP thermal barriers and then a Charging Pump is started, to prevent RCP shaft warping.

C. A Charging Pump is started and then CC flow is established to the RCP thermal barriers, to prevent steam binding of the CC system.

D.✓ RCP seal injection is isolated before starting a Charging Pump to avoid the delay of reestablishing Charging flow since RCP seals are already heated up.

RO Tier 1 Group 1

Source:
Bank

Question History:
2012 PBNP RO 3 (Question's original K/A was 026AK3.03)

K/A:
015/017AG2.4.6 Reactor Coolant Pump Malfunction
Knowledge of EOP mitigation strategies.
(Imp 3.7/4.7)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall the mitigation strategies in the EOP network that deal with reactor coolant pump malfunctions.

Cognitive Level:
Comprehensive

10 CFR Part 55 Content:
55.41.10
55.43.5
55.45.13

Reference:
EOP-1.1, SI Termination Rev 41
BG EOP-1.1, Background Document for SI Termination Rev 31

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following:

- *Unit 2 was operating at Rated Thermal Power*
- *Safety Injection has actuated*
- *A transition has been made to EOP-1.1, SI Termination*
- *No charging pumps are running*
- *Component Cooling (CC) flow to the Reactor Coolant Pump (RCP) thermal barrier HX has been lost since the SI actuation*

What action is initially taken associated with RCP seal cooling and what is the reason for the action?

A. CC flow is established to the RCP thermal barriers to prevent thermal shock to the RCP seals.

B. CC flow is established to the RCP thermal barriers and then a Charging Pump is started, to prevent RCP shaft warping.

C. A Charging Pump is started and then CC flow is established to the RCP thermal barriers, to prevent steam binding of the CC system.

D. RCP seal injection is isolated before starting a Charging Pump to avoid the delay of reestablishing seal cooling since RCP seals are already heated up.

Proposed Answer: D.

Justification:

With the loss of both CCW and Charging, the seal is assumed already heated up, and the seal injection is isolated from the charging system and charging is restored.

A **INCORRECT:** Plausible. With the loss of both CCW and Charging, the seal is assumed already heated up, and the seal injection is isolated from the charging system and charging is restored.

B **INCORRECT:** Plausible. With the loss of both CCW and Charging, the seal is assumed already heated up, and the seal injection is isolated from the charging system and charging is restored.

C **INCORRECT:** Plausible. With the loss of both CCW and Charging, the seal is assumed already heated up, and the seal injection is isolated from the charging system and charging is restored.

D **CORRECT:** See above.

Learning Objective:

IDENTIFY the bases for the steps in the Emergency Operating Procedures. (031.02.LP0405.005)

6. 2021 NRC 006

Given the following:

- The crew entered CSP-S.1, Response to Nuclear Power Generation/ATWS
- Step 4 'Initiate Emergency Boration of RCS' is being performed

Which of the following describes the basis for opening a PORV in CSP-S.1, if Pressurizer pressure is greater than 2335 psig?

A. To prevent passing two phase flow through the safety valves.

B. To ensure PTS limits will not be exceeded when the reactor is tripped and cools down

C. To minimize primary-to-secondary leakage in case of a SGTR, until other recovery actions can be taken.

D.✓ To allow sufficient borated injection flow into the RCS to ensure the addition of negative reactivity to the core.

RO Tier 1 Group 1

Source:
Bank

Question History:
2011 Diablo Canyon RO 5

K/A:
022AK1.02 Loss of Reactor Coolant Makeup
Knowledge of the operational implications of the following concepts as they apply to Loss of Reactor Coolant Makeup: **Relationship of charging flow to pressure differential between charging and RCS**
(Imp 2.7/3.1)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine the reason for control room actions when RCS pressure is high to ensure boration flow.

Cognitive Level:
Knowledge 1-B: The operator must recall the basis for the actions taken in CSP-S.1 for high PZR pressure.

10 CFR Part 55 Content:
55.41 8
55.41 10
55.45 3

Reference:
CSP-S.1, Response to Nuclear Power Generation/ATWS, Rev 43
BG CSP-S.1, Response to Nuclear Power Generation/ATWS, Rev 28

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Which of the following describes the basis for opening a PORV in FR-S.1, Response to Nuclear Power Generation/ATWS, if pressure is greater than 2335 psig?

A. To prevent passing two phase flow through the safety valves.

B. To ensure PTS limits will not be exceeded when the reactor is tripped and cools down.

C. To minimize primary-to-secondary leakage in case of a SGTR, until other recovery actions can be taken.

D. To allow sufficient borated injection flow into the RCS to ensure the addition of negative reactivity to the core.

Proposed Answer: D

Justification:

From CSP-S.1 Background: The check on RCS pressure is intended to alert the operator to a condition which would reduce boration. The PRZR PORV pressure setpoint is chosen as that pressure at which flow into the RCS is insufficient. The contingent action is a rapid depressurization to a pressure which would allow increased injection flow. When primary pressure drops 200 psi below the PORV pressure setpoint, the PORVs should be shut. The operator must verify successful closure of the PORVs, closing the isolation valves, if necessary.

A **INCORRECT**: Plausible. 2 phase flow through safeties is a concern for accidents such as SGTR, but not the bases for this check of pressure in CSP-S.1.

B **INCORRECT:** Plausible. PTS is a concern for overcooling events, such as a steam break but not the bases for this check of pressure in CSP-S.1.

C **INCORRECT:** Plausible. SGTR is not a concern in CSP-S.1 at this time. The concern is inserting negative reactivity to shutdown power generation.

D **CORRECT:** See above.

Learning Objective:

DESCRIBE the major actions accomplished by the Subcriticality Crtitical Safety Function Procedures.
(043.03.LP1996.012)

7. 2021 NRC 007
Given the following:

- Unit 2 is in MODE 5
- 2P-10A, RHR Pump is running in decay heat removal mode per OP 7A, Placing Residual heat Removal System in Operation
- 2P-11A, Component Cooling Water (CCW) Pump is running
- Bus 2B04 is currently deenergized for maintenance

- 2P-11A has inadvertently tripped
- The crew is currently in AOP-9B, Component Cooling System Malfunction, and SEP-1, Degraded RHR System Capability
- The crew is currently at step 25 of SEP-1, second bullet, which checks RHR differential temperature

Which of the following describes:
1) The RHR components that have lost cooling water flow?
2) What is the purpose of performing a check of the RHR differential temperature in this step?

A. 1) RHR heat exchanger and RHR pump seal cooler only.
2) If temperature differential is higher than expected, it indicates that RHR flow is insufficient to remove decay heat.

B✓ 1) RHR heat exchanger and RHR pump seal cooler only.
2) If temperature differential is lower than expected, it indicates that CCW flow is insufficient to remove decay heat.

C. 1) RHR heat exchanger, RHR pump seal cooler, and RHR pump motor lube oil cooler.
2) If temperature differential is higher than expected, it indicates that RHR flow is insufficient to remove decay heat.

D. 1) RHR heat exchanger, RHR pump seal cooler, and RHR pump motor lube oil cooler.
2) If temperature differential is lower than expected, it indicates that CCW flow is insufficient to remove decay heat.

RO Tier 1 Group 1

Source:
Bank

Question History:
2016 Beaver Valley Unit 1 RO 7

K/A:
025AK2.03 Loss of Residual Heat Removal System
Knowledge of the interrelations between Loss of Residual Heat Removal System and the following: **Service water or closed cooling water pumps**
(Imp 2.7/2.7)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the interrelationship between RHR System and CCW System, including the implication of a CCW Pump failure on RHR Decay Heat Removal.

Cognitive Level:
Comprehension 2-RI: The operator must recognize the interaction between RHR and CCW including implications of failures on each other.

10 CFR Part 55 Content:
55.41 7
55.45 7

Reference:

SEP-1, Degraded RHR System Capability Rev 22
BG SEP-1, Background Degraded RHR System Capability Rev 6
110E029 SH 1, Unit 2 Auxiliary Coolant, Rev 57

Proposed reference to be provided to the applicants during examination:

None

Original Question:

Given the following initial conditions:

- *Plant is in Mode 5*
- *1RH-P-1A, 'A' RHR pump is running*
- *1CC-P-1A, 'A' CCR pump is running*
- *DF bus is cleared for maintenance*

Final conditions:

- *1CC-P-1A, 'A' CCR pump trips on overcurrent*
- *1CC-P-1C, 'C' CCR pump failed to start*
- *Crew is performing AOP 1.15.1, Loss of Primary Component Cooling Water in conjunction with AOP 1.10.1, Loss of Residual Heat Removal Capability*

1) Which of the following describes the RHR components that have lost cooling water flow?
2) What is the reason for monitoring RHS inlet temperature at this time?

A. 1) RHR Hx and RHR pump seal cooler only.
2) If temperature exceeds 180°F, the RHR pumps must be tripped to prevent cavitation.

B. 1) RHR Hx and RHR pump seal cooler only.
2) If temperature exceeds 180°F, the RHR pump must be tripped to prevent seal damage.

C. 1) RHR Hx, RHR pump seal cooler, and RHR pump motor lube oil cooler.
2) If temperature exceeds 180°F, the RHR pumps must be tripped to prevent cavitation.

D. 1) RHR Hx, RHR pump seal cooler, and RHR pump motor lube oil cooler.
2) If temperature exceeds 180°F, the RHR pump must be tripped to prevent seal damage.

Proposed Answer: B.

Justification:

At Point Beach, CCW supplies the RHR Heat Exchangers, 1(2)HX-11A/B, and the RHR Pump Seal Coolers, 1(2)HX-114A/B. The motors are air cooled.
Per the background document for SEP-1 for step 25:

This step directs the operator to check RCS and RHR system temperature indications to ensure decay heat is being removed. RCS temperatures are checked to indicate that RHR cooling flow is sufficient to remove decay heat. RHR differential temperatures are checked to ensure the component cooling and service water systems are functional in removing heat from the RHR heat exchangers.
In this step, the term "RHR differential temperature consistent with heat load" refers to indicated difference between the inlet and outlet temperatures on TR-630. The temperature difference should be proportional to the decay heat load on the system. If the differential temperature is lower than expected, it could indicate that component cooling flow through the RHR heat exchanger is not sufficient to remove the decay heat.

A **INCORRECT:** Plausible because the components are correct. However, per the SEP background, RCS temperature higher than expected is indicative of RHR flow being insufficient for decay heat load.

B **CORRECT:** See above.

C **INCORRECT:** Plausible since many large motor have water cooled heat exchangers. RHR does not. And per the SEP background, RCS temperature higher than expected is indicative of RHR flow being insufficient for decay heat load.

D **INCORRECT:** Plausible the reason for checking differential temperature is correct. However, there is no CCW to the RHR motors.

Learning Objective:

PREDICT the effect of a RHR support system malfunction on the RHR and RCS systems during RHR cooldown.
(051.03.LP0069.011)

8. 2021 NRC 008

Given the following:

- Unit 1 is in EOP-1.3, Transfer to Containment Sump Recirculation – Low Head Injection
- 1P-11B, Component Cooling Pump was isolated for a seal leak
- The crew is establishing Component Cooling Flow to RHR Heat Exchangers

What effect will the Component Cooling lineup have on the actions taken in EOP-1.3?

A. Transition to ECA-1.1, Loss of Containment Sump Recirculation to recover the isolated Component Cooling pump

B.✔ Only one RHR heat exchanger should be aligned and ONLY that train will be used for sump recirc

C. Only one RHR heat exchanger should be aligned and BOTH trains will be used for sump recirc

D. Both RHR heat exchangers should be aligned and BOTH trains will be used for sump recirc

RO Tier 1 Group 1

Source:
New

Question History:
None

K/A:
026AK3.03 Loss of Component Cooling Water
Knowledge of the reasons for the following responses as they apply to the Loss of Component Cooling Water: **Guidance actions contained in EOP for Loss of CCW**
(Imp 4.0/4.2)

Justification for K/A Match:
Matches the K/A by requiring the operator to understand the initial condition and determine what effect on the overall mitigation and lineup being performed by the procedure in effect.

Cognitive Level:
Comprehension 2-RI: The operator must understand the initial conditions, the CCW pump being isolated, determine the effect this will have on the RHR line up and how that will affect the sump recirc lineup.

10 CFR Part 55 Content:
55.41.5
55.41.10
55.45.6
55.45.13

Reference:
EOP-1.3, Transfer to Containment Sump Recirculation – Low Head Injection, Rev 59
BG EOP-1.3, Background Transfer to Containment Sump Recirculation – Low Head Injection, Rev 39

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

With one CCW pump isolated, the ability of CCW to cool RHR has been reduced. Only one RHR heat exchanger should be lined up. With the limit of only one RHR heat exchanger, only that train of sump recirc should be available for sump recirc.

A **INCORRECT:** Plausible because this does affect the recirc capability, but does not stop the use of both trains..

B **CORRECT:** See above.

C **INCORRECT:** .Plausible, if the student thinks only one RHR heat exchanger is required to make both trains of sump recirc available.

D **INCORRECT:** Plausible if the student thinks only one CCW pump is needed, similar to normal system operations which only requires one pump running.

Learning Objective:

Diagnose and respond to the following conditions:
b. Loss of Component Cooling Water
(055.03.LP2444.009)

9. 2021 NRC 009
Given the following:

- Unit 1 is responding to a loss of offsite power
- Both G01 and G03, Emergency Diesel Generators have started and loaded onto their respective buses
- Safety Injection did **NOT** actuate
- Pressurizer level is 25%
- The crew is performing EOP-0.1, Reactor Trip Response, checking pressurizer pressure control per step 5

What is the first action that must be taken to energize 1T-1C, Backup Group C Heaters?

A.✓ Turn the 1T-1C control switch to OFF.

B. Restore power to 1B-01, Non Safeguards 480V Bus.

C. Reset the 1B-03 Non Safeguards Equipment lockout.

D. Place 1HC-431K, Pressurizer Pressure Controller, in **MANUAL** and raise the controller output.

RO Tier 1 Group 1

Source:
Bank

Question History:
2019 PBN Question 8 **PREVIOUS 2 NRC EXAMS**

K/A:
027AA1.04 Pressurizer Pressure Control System (PZR PCS) Malfunction
Ability to operate and / or monitor the following as they apply to the Pressurizer Pressure Control Malfunctions: **Pressure recovery, using emergency-only heaters.**
(Imp 3.9*/3.6*)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall the first action necessary to energize an emergency set of pressurizer heaters while in the emergency operating procedure network.

Cognitive Level:
Knowledge 1-I: Requires the operator to recall the interlocks and actions necessary to energize the emergency pressurizer heaters.

10 CFR Part 55 Content:
55.41 7
55.45 5
55.45 6

Reference:
EOP-0.1, Reactor Trip Response, Rev 48
883D195 Sh 9, Safeguards Sequence Logic Drawing Rev 19
883D195 Sh 5, 480V Bus Schemes Drawing, Rev 11
499B466 Sh 324, Press Htr Back-up GRP 1-TIC, Rev 18

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following:

- *Unit 1 is responding to a loss of offsite power*
- *Both G01 and G03, Emergency Diesel Generators have started and loaded onto their respective buses*
- *Safety Injection did NOT actuate*
- *Pressurizer level is 25%*

What must be done to energize 1T-1C, Backup Group C Heaters?

A. Turn the 1T-1C control switch to OFF.
Then turn the 1T-1C control switch to ON.

B. Reset the 1B-03 Non Safeguards Equipment lockout.
Leave the 1T-1C control switch in AUTO.

C. Restore power to 1B-01, 480V Non-Safeguards bus.
Then turn the 1T-1C control switch to ON.

D. Place 1HC-431K, Pressurizer Pressure Controller, in MANUAL and raise the controller output.
Leave the 1T-1C control switch in AUTO.

Proposed Answer: A.

Justification:

Power is available for the C bank of heaters once the EDGs assume load on 1A-05 and 1A-06 and thus 1B-03 and 1B-04. This heater breaker is stripped, via a lockout, on 1B-03 undervoltage and is controlled per procedure if needed to restore pressure. The control will be reset by taking the associated control switch to off and back to on.

A **CORRECT:** See above.

B **INCORRECT:** Plausible if the operator incorrectly recalls the power supply to the pressurizer heaters. This is the power supply for 1T-1A, which will not have power at this time.

C **INCORRECT:** Plausible if the operator has the misconception that the effect of the under voltage is the same as an SI. 1B-03 has power restored via EDGs. The Equipment lockout does strip loads but is actuated with an SI, which has not occurred. Resetting this lockout is a common task in the EOP network.

D **INCORRECT:** Plausible. This could be done if the breaker for 1T-1C had not stripped on undervoltage.

Learning Objective:

Given access to the Site Specific Simulator or specific plant conditions, RESPOND to the following conditions:
Turbine Generator Voltage Regulator failure
Loss of Main Generator Hydrogen pressure
Total collapse of 345 KV system frequency
Loss of electrical buses
(055.03.LP2440.002)

10. 2021 NRC 010
Given the following:

- Unit 1 was at Rated Thermal Power
- Supply breaker to 1B-03, 480V Safeguards bus trips
- Supply breaker to 1B-04, 480V Safeguards bus trips

- Conditions indicated the need for a manual reactor trip
- After pushing the Reactor trip pushbuttons on 1C04 and C01 the crew transitioned to CSP-S.1, Respond to Nuclear Power Generation / ATWS
- The following indications are noted:
  - 1-52/RTA and 1-52/RTB, Reactor Trip Breakers, indicate closed
  - NI power, on 1NI-41 through 1NI-44, is still 100% power
  - The Main Turbine has not tripped
- The OATC is driving Control Rods in MANUAL

Which of the following describes:
(1) BEFORE the Reactor Trip Breakers are opened, which indication(s) can be used determine Control Rod position?
AND
(2) Reactor trip breakers and ___(2)___ will be used to determine if the reactor has been tripped.

(IRPI, Individual Rod Position Indication)

A. (1) IRPI ONLY
(2) Rod bottom lights

B. (1) Control Rod Group Step Counters ONLY
(2) Rod bottom lights

C. (1) IRPI ONLY
(2) Neutron flux lowering

D.✓ (1) Control Rod Group Step Counters ONLY
(2) Neutron flux lowering

RO Tier 1 Group 1

Source:
New

Question History:
None

K/A:
029EA2.08 Anticipated Transient Without Scram (ATWS)
Ability to determine or interpret the following as they apply to an ATWS: **Rod bank step counters and RPI.**
(Imp 3.4/3.5)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify which Control Rod indications are available after a power failure during an ATW.

Cognitive Level:
Knowledge 1-I: The operator needs to recall the power supply for the rod control system, and determine rod position at power and what is used after trip.

10 CFR Part 55 Content:
55.43 5
55.45 13

Reference:
CSP-S.1, Respond to Nuclear Power Generation / ATWS, Rev 43
MDB 3.2.11 1Y06 Instrument Panels, Rev 18

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

With the power loss, power to the IRPI will be lost. The control rod bank step counters will be the only indication of where the rods are and which direction they are moving, besides the rod speed indicator and rod direction bistable (light). The operator will use the control rod bank step counters until the reactor trip breakers are operated locally. When the trip breakers are open neutron flux will be utilized due to rod bottom lights not having power.

A **INCORRECT:** The first part is wrong, plausible if the operator does not recall the loss of 1B-03 will affect the IRPI indication. The second part is wrong, plausible if the operator does not recall the loss of 1B-03 will affect the rod bottom light indications.

B **INCORRECT:** The first part is correct. The second part is wrong, plausible if the operator does not recall the loss of 1B-03 will affect the rod bottom light indications.

C **INCORRECT:** The first part is wrong, plausible if the operator does not recall the loss of 1B-03 will affect the IRPI indication. The second part is correct, this will be used with the reactor trip breaker indications due to no direct indication of rod height in the control room.

D **CORRECT:** See above
.

Learning Objective:

IDENTIFY the proper Control Board indications for implementing procedural steps in the EOPs.
(031.02.LP0405.011)

11. 2021 NRC 011
Given the following:

- Unit 1 is at Rated Thermal Power when an event occurred
- The crew tripped the reactor and are performing the diagnostic steps of EOP-0, Reactor Trip or Safety Injection
- Critical Safety Function Status Trees are being monitored and implemented
- The following indications are present:
    - 1P-1A and 1P-1B, Reactor Coolant Pumps – RUNNING
    - Containment pressure is 0.4 psig and STABLE
    - Pressurizer pressure and level are LOWERING SLOWLY
    - RCS Subcooling, based on CETs is 45ºF and DEGRADING
    - CETs are 510ºF and STABLE
    - WR Reactor Vessel Level is 45 ft. and STABLE
    - Steam Generator A narrow range level is 38% and RISING
    - Steam Generator B narrow range level is 5% and RISING
    - Steam Generator A and B steam flows are EQUAL
    - SG A Total AF Flow, is 0 gpm
    - SG B Total AF Flow is 200 gpm and STABLE
    - The RMS Server is alarming

Which of the following describes the procedural transition, upon exit of EOP-0, based upon the assessment the indications, including an assessment of the Critical Safety Function Status Trees?

A. CSP-H.1, Response to Loss of Secondary Heat Sink (red path)

B. CSP-C.2, Response to Degraded Core Cooling (orange path)

C. EOP-1, Loss of Reactor or Secondary Coolant

D.✓ EOP-3, Steam Generator Tube Rupture

RO Tier 1 Group 1

Source:
NEW

Question History:
None

K/A:
038EG2.4.21 Steam Generator Tube Rupture
Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.
(Imp 4.0/4.6)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify, from various indications, the Steam Generator Tube Rupture in progress and determine that actions of CSP-H.1, CSP-C.1, and EOP-1 are not required.

Cognitive Level:
Comprehension 3-PEO: The operator must determine, from varied indications, the event in progress and determine a procedure transition.

10 CFR Part 55 Content:
55.41 7
55.43 5
55.45 12

Reference:
EOP-0, Reactor Trip or Safety Injection, Rev 70
CSP-ST.0, Critical Safety Function Status Trees, Rev 12

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

The combination of indications point to a Steam Generator A Tube Rupture (SGTR). Transition to EOP-3 is directed by Step 12 of EOP-0.

A **INCORRECT:** Plausible because Total AF Flow is at the CSP-H.1 trigger with <275 gpm flowrate with B Steam Generator level less than 33%. However, since A Steam Generator is > 33%, CSP-H.1 is not directed as shown in EOP-0, Step 6.c RNO. Also, if Containment was adverse, CSP-H.1 would be triggered.

B **INCORRECT:** Plausible if Containment was adverse, CSP-C.2 would be called for since subcooling would be above the trigger to go to CSP-C.2 with current RCP, CET, and RVLIS conditions.

C **INCORRECT:** Plausible because RCS and Pressurizer response, as well as subcooling, are similar between an RCS leak into or out of containment and a SGTR. However, the diagnostic steps reach, and transition out of EOP-0, first for the Steam Generator Tube Rupture (step 12 versus step 13).

D **CORRECT:** See above.

Learning Objective:

IDENTIFY plant conditions that distinguish between a faulted and ruptured Steam Generator.
(031.02.LP0441.007)

Recall/List the following concerning the Critical Safety Procedures:
a. Entry condition for each RED PATH and ORAGNE PATH CSP
b. Purpose of EACH ESP
c. Major action of each CSP
(043.03.LP1995.012)

12. 2021 NRC 012

Given the following:

- Unit 2 has experienced a total loss of Main Feedwater and Auxiliary Feedwater
- The crew is performing the actions of CSP-H.1, Response to Loss of Secondary Heat Sink
- Bleed and Feed has been initiated
- Both steam generators are "**dry**"
- Core Exit Thermocouples are 555°F, LOWERING SLOWLY

- The capability to feed all steam generators using 2P-53, MDAFW, pump has been restored

Per CSP-H.1 and the associated background document:
(1) What action should be taken?
AND
(2) What is the reason for the action?

A✓ (1) Throttle open ONE MDAFW flow control MOV to establish 50 gpm to one steam generator only
(2) To minimize excessive thermal stresses

B. (1) Throttle open ONE MDAFW flow control MOV to establish 50 gpm to one steam generator only
(2) To minimize the depressurization of the RCS

C. (1) Throttle open BOTH MDAFW flow control MOV to establish 50 gpm to both steam generators
(2) To minimize excessive thermal stresses

D. (1) Throttle open BOTH MDAFW flow control MOV to establish 50 gpm to both steam generators
(2) To minimize the depressurization of the RCS

RO Tier 1 Group 1

Source:
Modified

Question History:
2016 Diablo Canyon 50

K/A:
054AK3.03 Loss of Main Feedwater
Knowledge of the reasons for the following responses as they apply to the Loss of Main Feedwater (MFW): **Manual control of AFW flow control valves**
(Imp 3.8/4.1)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify method and reasoning for feeding Steam Generators, following feed and bleed, based on conditions.

Cognitive Level:
Comprehension 2-RI: The operator must recall the foldout page criteria for feeding the Steam Generators from AFW, including the implications of not performing the correct steps.

10 CFR Part 55 Content:
55.41 5
55.41 10
55.45 6
55.45 13

Reference:
CSP-H.1 Unit 2, Response to Loss of Secondary Heat Sink, Rev 48
BG CSP-H.1, Background Response to Loss of Secondary Heat Sink, Rev 31

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given:
- *A total loss of Main Feedwater and Auxiliary Feedwater occurs*
- *The crew is performing the actions of FR-H.1, Response to Loss of Secondary Heat Sink*
- *Bleed and Feed has been initiated*
- *All steam generators are "dry"*
- *Core Exit Thermocouples are 555°F, rising slowly*

The capability to feed all steam generators using the TDAFW pump has been restored.

Per FR-H.1 and the associated background document, what action should be taken and what is the reason for the action?

A. Fully open one TDAFW LCV to a steam generator to restore a heat sink.

B. Fully open all TDAFW LCVs to the steam generators to restore a heat sink

C. Throttle open one TDAFW LCV to establish approximately 100 gpm to one steam generator to minimize excessive thermal stresses.

D. Throttle open all TDAFW LCVs to establish AFW flow of approximately 100 gpm to each steam generator to minimize excessive thermal stresses.

Proposed Answer: A

Justification:

The procedural direction with all steam generators dry, AND CET not rising is to feed one steam generator at a rate of 50 gpm. The reason for is minimize thermal stress to the Steam Generator, while restoring the heat sink.

A **CORRECT:** See above.

B **INCORRECT:** The first part is correct. The second part is wrong, plausible because the actions given would minimize depressurization of the RCS, but is not the reason for the action.

C **INCORRECT:** The first part is wrong. Plausible because if the generators not dry, this is the limit for one SG and is also used when all SG are faulted, and both SG can be depressurized during the performance of this procedure. The second part is correct.

D **INCORRECT:** The first part is wrong. Plausible because if the generators not dry, this is the limit for one SG and is also used when all SG are faulted, and both SG can be depressurized during the performance of this procedure. The second part is wrong, plausible because the actions given would minimize depressurization of the RCS, but is not the reason for the action.

Learning Objective:

Given a set of plant conditions, DESCRIBE the SG feed flow restrictions following RCS Bleed and Feed IAW CSP-H.1
(043.03.LP1998.008)

13. 2021 NRC 013

Given the following:

- Due to an earthquake a loss of all Offsite Power has occurred
- G01 and G02, Emergency Diesel Generators, will not start
- **NONE** of the output breakers for G03 or G04 will CLOSE
- The crew is responding to the loss of power with ECA-0.0, Loss of All AC Power
- D-06, 125 VDC Station Battery has a discharge rate of 140 amps

Which of the following is the MAXIMUM time that D-02, 125 VDC Distribution Panel is credited with supplying power to its loads if the battery was fully charged initially?
(Assume NO operator action)

A.✔ 1 hour

B. 2 hours

C. 4 hours

D. 8 hours

RO Tier 1 Group 1

Source:
New

Question History:
None

K/A:
055EK1.01 Station Blackout
Knowledge of the operational implications of the following concepts as they apply to the Station Blackout: **Effect of battery discharge rates on capacity** (Imp 3.3/3.7)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the operational implications/progression of an event (time bus will be powered) of a given battery discharge rate on the credited capacity of a battery during a Station Blackout.

Cognitive Level:
Knowledge 1-F: The operator must recall the discharge rate is normal, and the capacity of the battery based on that discharge rate.

10 CFR Part 55 Content:
55.41.8
55.41.10
55.45.3

Reference:
ECA-0.0 Loss of All AC Power Unit 1 Rev 75
BG ECA-0.0, Background Loss of All AC Power Rev 40
FSAR Appendix 1, Version UFSAR 2013

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

Per UFSAR 8.7.3, Safety related station batteries D-05, D-06, D-105, and D-106 have been sized to carry their expected shutdown loads following a plant trip/LOCA and loss of offsite power or following a station blackout for a period of one hour without battery terminal voltage falling below either:
(1) the design minimum battery terminal voltage (equivalent to 1.75 volts per cell for battery considerations), or (2) the minimum battery terminal voltage required to maintain the most limiting component, and therefore all fed components, operable.

The discharge rate on D-06 is the expected initial discharge rate based on a loss of all AC power, based on this discharge rate, the bus would be expected to remain powered for 1 hour.

A **CORRECT:** See above.

B **INCORRECT:** Plausible because a 2-hour coping strategy is one of the industry standard coping times.

C **INCORRECT:** Plausible because a 4-hour coping strategy was the PBNP standard prior to the incorporation of D-03 and D-04 batteries and G-03 and G-04 Diesel Generators.

D **INCORRECT:** Plausible because an 8-hour coping strategy is one of the industry standard coping times.

Learning Objective:

DESCRIBE the function and/or purpose, design bases, and operating characteristics of the Direct Current (DC) Electrical System.
(054.03.LP0121.001)

14. 2021 NRC 014
Given the following:

- Both Units are at Rated Thermal Power
- Annunciator 2C20 A 3-1, WHITE INVERTER TROUBLE alarms
- The AO reports that 1DY-03, White 125V DC/ 120V AC Inverter appears to be failing

(1) Which of the following components is designed to assume the loads supplied by 1DY-03 in case of a failed inverter?
AND
(2) If the above component FAILED to assume the loads supplied by 1DY-03, which procedure would the crew enter?

A. (1) Y-15, 120V Instrument Bus Alt Source Distribution Panel
(2) AOP-0.0, Vital DC System Malfunction

B✔ (1) Y-15, 120V Instrument Bus Alt Source Distribution Panel
(2) AOP-0.2, Loss of Safety Related Instrument Buses

C. (1) 2DY-03, White 125V DC/ 120V AC Inverter
(2) AOP-0.0, Vital DC System Malfunction

D. (1) 2DY-03, White 125V DC/ 120V AC Inverter
(2) AOP-0.2, Loss of Safety Related Instrument Buses

RO Tier 1 Group 1

Source:
New

Question History:
None

K/A:
057AG2.1.28 - Loss of Vital AC Instrument Bus
Knowledge of the purpose and function of major components and controls.
(Imp 4.1/4.1)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the function of major components of the system and the procedure transition based on plant conditons.

Cognitive Level:
Knowledge 1-F: The operator must recall a fact about the components of the 120 VAC Instrument AC system.

10 CFR Part 55 Content:
55.41 7

Reference:
ARP 2C20 A 3-1, White Inverter Trouble, Rev 6
UFSAR 2020, Section 8.6.
AOP-0.2, Loss of Safety Related Instrument Buses, Rev 7

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

Per UFSAR section 8.6.3, “Upon a loss of an inverter, the instrument bus will automatically transfer to a non-safety-related 120 VAC bus (Y-15 or Y-16) if available.”
UFSAR Figure 8.6.2 shows that the White and Yellow Inverters receive their backup supply from Y-15. Fig. 8.6.1 shows Y-16 supplying the Blue and Red Inverters.

A **INCORRECT:** Plausible because 2DY-03 also supplies White Instrument AC power. However, Unit 2 inverters cannot supply Unit 1 and vice versa.

B **CORRECT:** See above.

C **INCORRECT:** Plausible because Y-16 does supply backup power to inverters. However it is the Red and Blue inverters.

D **INCORRECT:** Plausible because DY-0C will be used to assume the loads supplied by 1DY-03 until 1DY-03 can be repaired. However, this is a manual evolution only.

Learning Objective:

DESCRIBE the function and/or purpose, design basis, and operating characteristics of the Instrument Bus Electrical System.
(054.02.LP0123.001)

15. 2021 NRC 015
Given the following:

- Unit 1 is at Rated Thermal Power
- Annunciator C01A 1-9, INSTRUMENT AIR HEADER PRESSURE LOW is LIT

If a ruptured Instrument Air header is causing a continuous lowering of Instrument Air header pressure, which of the following will require a Reactor Trip due to the loss of Instrument Air?

A. Loss of Feedwater Heater Level control

B. Loss of Pressurizer Spray valve control

C. Loss of Letdown Orifice Isolation valve control

D.✓ Loss of Main Feedwater flow control valves control

RO Tier 1 Group 1

Source:
Bank

Question History:
2017 PBNP RO 14 **PREVIOUS 2 NRC EXAMS** (Question's original K/A was 065AA2.05)

K/A:
065AA1.05 Loss of Instrument Air
Ability to operate and / or monitor the following as they apply to the Loss of Instrument Air: **RPS**
(Imp 3.3/3.3)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the loss of Instrument Air condition that would require actuation of RPS (Reactor Trip).

Cognitive Level:
Knowledge 1-B: The operator must understand the initial conditions of the event, and apply the mitigation strategy of the AOP.

10 CFR Part 55 Content:
55.41 5
55.45 5
55.45 6

Reference:
AOP-5B Loss of Instrument Air Rev 49
BG AOP-5B, Background Loss of Instrument Air Rev 24

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following:

Unit 1 is at 100% reactor power.
Annunciator C01A 1-9, INSTRUMENT AIR HEADER PRESSURE LOW is LIT

If a ruptured Instrument Air header is causing a continuous lowering of Instrument Air header pressure, which of the following will require a Reactor Trip per AOP-5B, Loss of Instrument Air?

A. Loss of Feedwater Heater Level control

B. Loss of Pressurizer Spray valve control

C. Loss of Letdown Orifice Isolation valve control

D. Loss of Main Feedwater flow control valves control

Proposed Answer: D

Justification:

Based on system response, the loss of control to the main feedwater flow control valves will cause a lowering of steam generator levels, and manual control of the main feedwater flow control valves will not mitigate the event, so a reactor trip will be required. Also AOP-5B directs the crew to trip the reactor(s) if ‘Main feedwater flow control valves operating as required’ is not met.

A **INCORRECT:** Plausible, as this may cause a feedwater system induced transient on the plant, but is does not require a reactor trip.

B **INCORRECT:** Plausible as a loss of air would cause the spray valves to fail in the closed position, but that would not require the crew to trip the reactor.

C **INCORRECT:** Plausible as a loss if air would cause the orifice isolation valves to fail shut, but that wouldn’t require a reactor trip.

D **CORRECT:** See above.

Learning Objective:

Given access to the Site Specific Simulator or specific plant conditions, APPLY the appropriate guidance provided in the applicable AOPs for various system/component malfunctions.
(055.03.LP2439.005)

16. 2021 NRC 016
Given the following:

- Both Units were at Rated Thermal Power
- Unit 1 experienced a small break LOCA
- The crew has manually tripped and manually initiated Safety Injection and Containment Isolation
- Offsite Grid voltage lowered to the point that **BOTH** Units' buses A-01 through A-06 were reading 3900 VAC
- The crew entered EOP-0, Reactor Trip or Safety Injection

During the electric plant assessment of EOP-0, immediate actions, which of the following describes the condition of the Emergency Diesel Generators (EDGs)?

A. NO EDGs are running or loaded on their buses.

B. G-01 and G-03 EDGs are running and loaded on their buses. G-02 and G-04 EDGs are NOT running or loaded on their buses.

C. G-01 and G-03 EDGs are running and loaded on their buses. G-02 and G-04 EDGs are running but NOT loaded on their buses.

D.✓ ALL four EDGs are running and loaded on their respective buses.

RO Tier 1 Group 1

Source:
New

Question History:
None

K/A:
077AA2.09 Generator Voltage and Electric Grid Disturbances
Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: **Operational status of the emergency diesel generators.**
(Imp 3.9/4.3)

Justification for K/A Match:
Matches the K/A by requiring the operator to make an assessment of the operational status of the Emergency Diesel Generators after a grid disturbance while performing EOP-0.

Cognitive Level:
Comprehension 2-DR: The operator must recall the EDG interlocks with an SI, then also with degraded voltage to determine the status of the EDGs.

10 CFR Part 55 Content:
55.41 5
55.43 5
55.45 5
55.45.7
55.45.8

Reference:
STPT 21.1 Sheet 74, Protective Relay Setpoints Bus 1A05, Rev 12
883D195 Sheet 4, 4160V Bus Schemes, Rev 23
883D195 Sheet 6, Emergency Generator Starting, Rev 12
883D195 Sheet 6A, Emergency Generator Starting, Rev 5
PBE-7033 Electrical Power Distribution Diagram, Rev 14

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

STPT 21.1 Sheet 74, for 1A-05 list the setpoints for degraded voltage relays as required to be =3937V. This is true for all four safeguards buses, per Tech Specs. It also lists the time delay for degraded voltage required to be 39.14 seconds.

Per the logic prints above, degraded voltage has 2 paths for each bus/ EDG. The first is the time delayed version of approximately 3955 VAC for 40 seconds, measure on each bus, will cause a trip of the normal supply to the respective buses 1(2)A-05 and 1(2)A-06. This also sends a signal to start the respective EDG and allow it to load on its bus.

The second path is if an SI signal is generated on either unit along with the degraded voltage condition, the above actions will occur without the 40 second time delay.

A **INCORRECT:** Plausible if the student does not recall the SI link to degraded voltage which eliminates the 40 second time delay.

B **INCORRECT:** Plausible because G-01 and G-03 will be running and loaded. However, G-03 and G-04 will also be running and loaded on their buses. It is plausible if the student does not recall the SI link to degraded voltage which eliminates the 40 second time delay.

C **INCORRECT:** Plausible because G-01 and G-03 will be running and loaded. However, G-03 and G-04 will also be running and loaded on their buses.

D **CORRECT:** See above.

Learning Objective:

Assess interlock permissives and automatic functions associated with operation of the AC electrical distribution system.
(055.03.LP2440.009)

17. 2021 NRC 017

Given the following:

- Unit 1 experienced a LOCA
- ECA-1.1, Loss of Containment Sump Recirculation, is the procedure in effect due to the inability to open either Containment Sump 'B' suction valves which has resulted in a loss of containment sump recirculation
- The following indications are noted:
  - Containment Pressure is 15 psig
  - VCT level is 52%
  - RWST level is 4%
  - RCS Pressure is 26 psig

- The crew has just determined that 100 gpm is the required minimum injection flow

Based on these indications, which of the following actions will the crew take to maintain core cooling?

(1SI-866A/B, SI Pump Discharge Header MOV)
(1RH-625, RHR Heat Exchanger Outlet FCV)

A.✔ Charging Pumps must be aligned to the VCT and started to establish 100 gpm charging flow.

B. One RHR Pump must be started and 100 gpm established by throttling 1RH-625.

C. One Safety Injection Pump must be started and 100 gpm injection flow established by throttling the respective 1SI-866A/B.

D. Both Safety Injection Pumps must be started and 50 gpm each established by throttling both 1SI-866A and B.

RO Tier 1 Group 1

Source:
Bank

Question History:
2003 PBNP RO 17

K/A:
E11EK1.3 Loss of Emergency Coolant Recirculation
Knowledge of the operational implications of the following concepts as they apply to the (Loss of Emergency Coolant Recirculation): **Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Emergency Coolant Recirculation)**
(Imp 3.6/4.0)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify steps to be taken due to indications provided during a loss of Containment Sump Recirculation to recover injection.

Cognitive Level:
Comprehension 3-PEO: The operator must understand the initial conditions, and determine what actions will be necessary to re-establish injection flow.

10 CFR Part 55 Content:
55.41.8
55.41.10
55.45 3

Reference:
ECA-1.1, Loss of Containment Sump Recirculation Rev 45 Step 13 RNO 2)
STPT 11.1, Safety Injection System General Instrumentation Channels, Rev 20
ARB C01 B 3-9, 1T-13 RWST Level Low-Low, Rev 5

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Following a LOCA, the inability to open either Containment Sump 'B' suction valve has resulted in a loss of containment sump recirculation. All other equipment has functioned normally. ECA-1.1, Loss of Containment Sump Recirculation, is the procedure in effect. The following indications are noted:

- Containment Pressure = 15 psig
- VCT level = 52%
- RWST level = 4%
- RCS Pressure = 26 psig

The crew has just determined that 100 gpm is the required minimum injection flow.

Based on these indications, which of the following actions will the crew take to maintain core cooling?

A. Charging Pumps must be aligned to the VCT and started to establish 100 gpm charging flow.

B. One Safety Injection Pump must be started and 100 gpm injection flow established by throttling the respective 1SI-866A/B (SI Pump Discharge Header MOV).

C. Both Safety Injection Pumps must be started and 50 gpm each established by throttling both 1SI-866A and B.

D. One RHR Pump must be started and 100 gpm established by throttling 1RH-625, RHR Hx Outlet Flow Control Valve.

Proposed Answer: A.

Justification:

Once minimum flow has been determined, in ECA-1.1 step 13.b RNO, if less than 140 gpm, it will be established using charging pump with suction lined up to the VCT, with RHR and SI pumps being stopped.

Per ECA-1.1 Foldout page, if RWST is less than 10%, then place the effected pumps in pull-out

• RWST level – LESS THAN 10% for RHR, SI and charging pumps

A **CORRECT:** See above.

B **INCORRECT:** Plausible, as this will provide the minimum required injection of 100 gpm, but is not procedurally allowed unless required minimum flow is 525 gpm using a desired RHR pump.

C **INCORRECT:** Plausible, as this will provide the minimum required injection of 100 gpm, but is not procedurally allowed unless required minimum flow cannot be established using charging, which there is nothing preventing that in the stem.

D **INCORRECT:** Plausible, as this will provide the minimum required injection of 100 gpm, but is not procedurally allowed unless required minimum flow cannot be established using charging, which there is nothing preventing that in the stem

Learning Objective:

Given a set of plant conditions, RESPOND to a Loss of Containment Sump Recirculation in accordance with ECA-1.1 and BG-ECA-1.1. (031.02.LP0465.003)

18. 2021 NRC 018

While attempting to restore cooling using CSP-H.1, Loss of Secondary Heat Sink, of the sources listed below, what is the proper order for attempting to restore cooling (by priority)?

(MFW – Main Feedwater)
(AFW – Auxiliary Feedwater including Standby Steam Generator Feed Pumps)

A. MFW, Condensate, AFW, Bleed and Feed

B. MFW, Bleed and Feed, AFW, Condensate

C✓ AFW, MFW, Condensate, Bleed and Feed

D. AFW, MFW, Bleed and Feed, Condensate

RO Tier 1 Group 1

Source:
Bank

Question History:
2007 PBNP RO 18

K/A:
E05EK2.2 Loss of Secondary Heat Sink
Knowledge of the interrelations between (Loss of Secondary Heat Sink) and the following: **Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal system, and relations between the proper operation of these systems to the operation of the facility**
(Imp 3.9/4.2)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the heat removal systems, and their proper operation for a loss of heat sink.

Cognitive Level:
Knowledge 1-P: The operator must recall the order of procedure steps for preference of systems to mitigate a loss of heat sink.

10 CFR Part 55 Content:
55.41 7
55.45 7

Reference:
CSP-H.1, Response to Loss of Secondary Heat Sink, Rev 47
BG-CSP-H.1, Background Response to Loss of Secondary Heat Sink, Rev 31

Proposed reference to be provided to the applicants during examination:
None

Original Question:

While attempting to restore cooling using CSP-H.1, "Loss of Secondary Heat Sink", what is the proper order for attempting to restore cooling (by priority)?

A. MFW, Condensate, AFW, Bleed and Feed

B. MFW, Bleed and Feed, AFW, Condensate

C. AFW, MFW, Condensate, Bleed and Feed

D. AFW, MFW, Bleed and Feed, Condensate

Proposed Answer: C.

Justification:
AFW is preferred since it is the Safety Related source. CSP-H.1 starts with TDAFW, then MDAFW, then the SSGFPs, then crosstie MDAFW from the opposite Unit. MFW is next, since it may be established with the SGs at a much higher pressure. Condensate requires depressurization of a SG to establish flow. Bleed and Feed is the least desirable due to low efficiency and radiological concerns

A **INCORRECT:** Plausible is the student does not recall the mitigating strategy of CSP-H.1, because it contains all of the sources, but in the wrong order; refer above.

B **INCORRECT:** See A above.

C **CORRECT:** See above

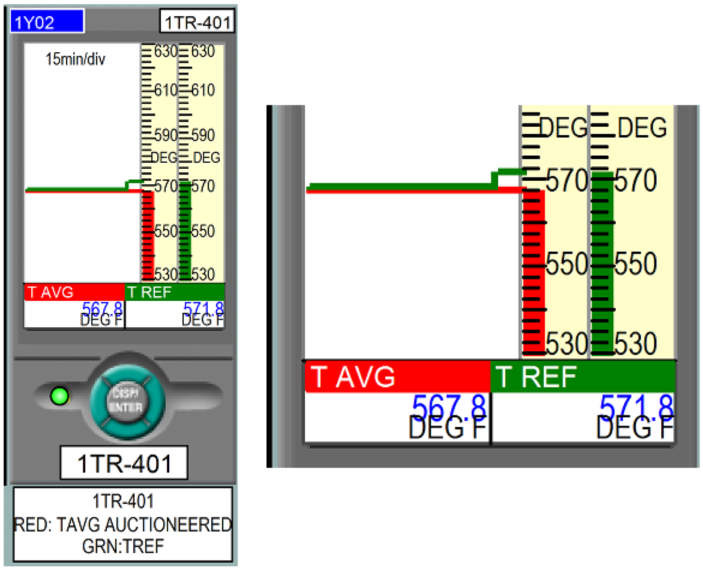
D **INCORRECT:** See A above.

Learning Objective:
Given a set of plant conditions, DIAGNOSE and RESPOND to loss of heat sink in accordance with the Heat Sink Critical Safety Function procedures.
(043.03.LP1998.003)

19. 2021 NRC 019

Given the following:

- Unit 1 is at 75% of Rated Thermal Power
- A malfunction causes the indication below:



- Rods start moving
- Rod control is placed in manual 15 seconds after the failure occurs

Which of the following describes:
(1) What direction were rods moving prior to rod control being placed in manual?
AND
(2) How many steps must rods be moved in order to restore them to their ORIGINAL height prior to the malfunction IAW AOP-6C, Uncontrolled Motion of RCCA(s)?

	(1)	(2)
A.	In	8
B.	In	10
C.	Out	8
D.	Out	10

RO Tier 1 Group 2

Source:
Modified

Question History:
2015 Surry RO 1

K/A:
001AA1.02 Continuous Rod Withdrawal
Ability to operate and / or monitor the following as they apply to the Continuous Rod Withdrawal: **Rod in-out-hold switch.**
(Imp 3.6/3.4)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine the needed movement using the in-hold –out switch after a continuous rod withdrawal.

Cognitive Level:
Comprehension 2-RI: The operator must determine what deviation was caused by the malfunction, how it is going to impact rods, determine direction and rod travel and speed.

10 CFR Part 55 Content:
55.41.7
55.45.5
55.45.6

Reference:
STPT 5.1, Primary Control Systems Rod Speed Control, Rev 13

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Initial Conditions:

- *Reactor at 50% with a ramp to 100% in progress.*
- *Median Tave fails such that Tave is 4.0 °F lower than Tref.*
- *Rod Control is placed in manual 30 seconds after the failure occurs.*

Which ONE of the following states:

1) The direction of rod motion before the rods were placed in manual.

2) The number of steps the control rods must be moved to restore the control rods to their ORIGINAL rod height during failure recovery.

A. 1) Out.
2) 16.

B. 1) Out.
2) 20.

C. 1) In.
2) 16.

D. 1) In.
2) 20.

Proposed Answer: B

Justification:

With Tref > Tave, by greater than 1.5°F, rods will move out.

Rod speed will be dependent on the temperature difference. Rod speed is 8 SPM from 1.5°F to 3°F. From 3°F to 5°F rod speed increases linearly from 32 SPM to 72 SPM, therefore there is an increase of 32 SPM/°F. This temperature deviation is 4°F therefore the rod speed would be 8 SPM + 32 SPM or 40 SPM, and time the rods are able to move is 15 seconds, therefore the amount of steps need to return to the original position is 10.

A **INCORRECT:** The first part is wrong, plausible is the candidate confuses the direction of rod motion caused by the failure. The second part is wrong, plausible if the candidate does not take into consideration the 8 SPM which happen until greater than a 3°F occurs.

B **INCORRECT:** The first part is wrong, plausible is the candidate confuses the direction of rod motion caused by the failure. The second part is correct.

C **INCORRECT:** The first part is correct. The second part is wrong, plausible if the candidate does not take into consideration the 8 SPM which happen until greater than a 3°F occurs.

D **CORRECT:** See above.

Learning Objective:

Describe system response to the following:

f. Failed Reactor Coolant Bypass loop RTD

g. Malfunctioning Turbine First Stage pressure transmitter

(051.01.LP1547.008)

20. 2021 NRC 020

Given the following:

- Unit 1 is at Rated Thermal Power
- Rod D4, Control Bank C, in the N-43 quadrant, drops to the bottom of the core
- During recovery of Rod D4, **30 minutes** later, it becomes stuck at 10 steps, and will not withdrawal or insert

(1) Shutdown Margin must be verified to be within the limits of the COLR within a MAXIMUM of ___(1)___ from the initiating event.

AND

(2) Due to the Xenon transient, N-43, Power Range NI (Blue), READINGS will start to slowly ___(2)___ over the next hour.

(Assume Turbine Load, Reactor Power, and Tave are held constant)

	(1)	(2)
A.	30 minutes	lower
B.	30 minutes	rise
C.✓	1 hour	lower
D.	1 hour	rise

RO Tier 1 Group 2

Source:
Bank

Question History:
2016 Callaway RO 19

K/A:
005AK1.03 Inoperable/Stuck Control Rod
Knowledge of the operational implications of the following concepts as they apply to Inoperable / Stuck Control Rod: **Xenon transient**
(Imp 3.2/3.6)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine the impacts of the dropped rod on xenon, and then determine what impact on the xenon will have on plant instrumentation.

Cognitive Level:
Comprehension 2-RI: The operator must understand the initial condition, determine what effect the dropped rod will have on xenon, then what effect that will have on plant instrumentation.

10 CFR Part 55 Content:
55.41.8
55.41.10
55.45.3

Reference:
TS 3.1.6, Control Bank Insertion Limits, Rev 2

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Reactor Power is 100%.

- *Shutdown Bank A Rod D-14, drops to the bottom of the core.*
- *15 minutes later and during recovery of Rod D-14, it becomes stuck at position 010 and will not withdrawal or insert.*

(1) Shutdown Margin must be verified to be within the limits of the COLR within a MAXIMUM of ……?

And

(2) Due to the Xenon transient, the Reactor Operator should expect SE NI-42B, Power Range Nuclear Instrument 42B, readings to start to slowly __(2)___ over the next hour. (Assume Turbine Load, Reactor Power, and Tave remain constant.)

A. (1) 30 minutes
(2) lower

B. (1) 30 minutes
(2) rise

C. (1) 1 hour
(2) lower

D. (1) 1 hour
(2) rise

Proposed Answer: C

Justification:

Per TS 3.1.6, action A.2.1 states “Verify SDM is within the limits specified in the COLR”, with a completion time of 1 hr. AOP-6A, step 9, also calls out performing SDM for an operating reactor within 1 hour.

Given the dropped rod, and failed recovery, power is being suppressed in the area of N43. This lowers the xenon burnout by absorption but the production from iodine decay is still present and xenon concentration starts to rise which would lower the indication on N43. This is due to less neutrons leaking from the core (more are being absorbed by xenon in this area of the core.

A **INCORRECT:** The first part is wrong, plausible because 30 minutes is less than a 1 hour TS which has to be known from memory, and applies to AFD, and to reducing power <50%, and AFD is not mentioned in the stem. The second part is correct.

B **INCORRECT:** The first part is wrong, plausible because 30 minutes is less than a 1 hour TS which has to be known from memory, and applies to AFD, and to reducing power <50%, and AFD is not mentioned in the stem. The second part is wrong, plausible if the examinee does not understand the relationship between xenon production, depletion, and that relationship with neutron leakage.

C **CORRECT:** See above.

D **INCORRECT:** The first part is correct. The second part is wrong, plausible if the examinee does not understand the relationship between xenon production, depletion, and that relationship with neutron leakage.

Learning Objective:

Diagnose and respond to the following events in accordance with the appropriate procedures

B. Dropped Control Rod

(055.03.LP2444.006)

21. 2021 NRC 021
Given the following:

- RCS dilution is in progress for reactor startup
- Reactor trip breakers are closed
- Shutdown Bank rods have been withdrawn
- N31, Source Range Counts (RED) is reading 3 x 10^3 cps
- N32, Source Range Counts (WHITE) is reading 2 x 10^3 cps
- N35, Intermediate Range (RED) current is reading 1.5 x 10^{-11} amps
- N36, Intermediate Range (WHITE) current is reading 1.0 x 10^{-11} amps
- P-6, Power Above P-6 is not lit
- Suddenly N32 reading drops to < 1 cps

Which of the following is a required action, if any?

A.✓ Immediately suspend the RCS dilution

B. Continue the startup and block SR trips

C. Immediately open the reactor trip breakers

D. Remove N32 from service and continue the startup

RO Tier 1 Group 2

Source:
Bank

Question History:
057.03.02.LP3341.002 003

K/A:
032AK3.01 Loss of Source Range Nuclear Instrumentation
Knowledge of the reasons for the following responses as they apply to the Loss of Source Range Nuclear Instrumentation: **Startup termination on source-range loss.**
(Imp 3.2/3.6)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine the impacts of the loss of SR nuclear instrumentation on the startup from procedures and licensing documents.

Cognitive Level:
Comprehension 3-PEO: The operator must understand the initial condition, determine where in the startup procedure they are, and the actions that are required for the failure that has happened.

10 CFR Part 55 Content:
55.41.5
55.41.10
55.45.6
55.45.13

Reference:
TS 3.3.1, Reactor Protection System (RPS) Instrumentation, Rev 4

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following:

- *RCS dilution is in progress for reactor startup*
- *Reactor trip breakers are closed*
- *Shutdown Bank rods have been withdrawn*
- *N31, Source Range Counts (RED) is reading 3 x 103 cps*
- *N32, Source Range Counts (WHITE) is reading 2 x 103 cps*
- *N35, Intermediate Range (RED) current is reading 1.5 x 10-11 amps*
- *N36, Intermediate Range (WHITE) current is reading 1.0 x 10-11 amps*
- *Suddenly N32 reading drops to < 1 cps*

Which of the following is a required action, if any, based upon the inoperability of N32?

A. Immediately suspend the RCS dilution

B. Continue the startup and block SR trips

C. Immediately open the reactor trip breakers

D. No action required - the LCO is satisfied

Proposed Answer: A

Justification:

Per TS 3.3.1, below the P-6 interlock, the requirement for SR instruments is 2, if not, then immediately stop positive reactivity additions, which in this case is a dilution.

A **CORRECT:** See above.

B **INCORRECT:** Plausible because you are approaching the power level for blocking the SR, and if it fails at or near the time it is to be blocked, then blocking would have the same effect at it failing.

C **INCORRECT:** Plausible because there are several causes/indication where a reactor trip is procedurally directed.

D **INCORRECT:** Plausible as this is the common action for a failed instrument.

Learning Objective:

Given specific plant conditions, ASSESS and APPLY Technical Specification requirements as appropriate. TS 3.3.1
(057.02.LP3341.002)

22. 2021 NRC 022

Which of the following radiation monitors would NOT be a symptom of a fuel handling accident in the spent fuel pool per AOP-8C, Fuel Handling Accident in Primary Auxiliary Building?

A✓ RE-220, Spent Fuel Pool Service Water Liquid Monitor

B. RE-214, Aux. Building Vent Exhaust Gas Monitor

C. RE-221, Drumming Area Vent Gas Monitor

D. SPING 24, Drumming Area Vent SPING

RO Tier 1 Group 2

Source:
Bank

Question History:
055.03.LP2442.008.001

K/A:
036AA2.02 Fuel Handling Incidents
Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: **Occurrence of a fuel handling incident**
(Imp 3.4/4.1)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall the indication of an occurrence of a fuel accident.

Cognitive Level:
Knowledge 1-I: The operator must recall the monitors with direct entry into the procedure.

10 CFR Part 55 Content:
55.43.5
55.45.13

Reference:
AOP-8C, Fuel Handling Accident in Primary Auxiliary Building, Rev 2

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Which of the following radiation monitors would NOT be a symptom of a fuel handling accident in the spent fuel pool per AOP-8C, Fuel Handling Accident in Primary Auxiliary Building?

A. RE-220, Spent Fuel Pool Service Water Liquid Monitor

B. RE-214, Aux. Building Vent Exhaust Gas Monitor

C. RE-221, Drumming Area Vent Gas Monitor

D. SPING 24, Drumming Area Vent SPING

Proposed answer: A

Justification:
AOP-8C symptoms or entry conditions are RE-221, Sping-24, RE-214, RE-105 and RE-135, so RE-220 would not be indicative or entry conditions for a fuel handling accident in the PAB.

A **CORRECT:** See above.

B **INCORRECT:** Plausible as it would be an entry condition.

C **INCORRECT:** Plausible as it would be an entry condition.

D **INCORRECT:** Plausible as it would be an entry condition.

Learning Objective:
Describe the Symptoms and Mitigating Actions for the following Abnormal Operating Procedures:
b. AOP-8C
(055.03.LP2442.008)

23. 2021 NRC 023
Given the following:

- Both units are at Rated Thermal Power
- The crew transitions to AOP-40A, Control Room Abandonment Due to Fire
- Both units have been tripped

Which of the following describes:
Prior to leaving the control room, the crew will ___(1)___ for both units. This is performed to ___(2)___

(CV-200A/B/C, LTDN Orifice A/B/C Outlet CV)
(RC-430, PZR PORV)
(RC-431C, PZR PORV)

A. (1) ensure CV-200A/B/C are shut
(2) prevent spurious operation

B.✓ (1) isolate RC-430 and RC-431C
(2) prevent spurious operation

C. (1) ensure CV-200A/B/C are shut
(2) allow for remote/local operation of these valves

D. (1) isolate RC-430 and RC-431C
(2) allow for remote/local operation of these valves

RO Tier 1 Group 2

Source:
Bank

Question History:
2013 Robinson RO 23

K/A:
067EK1.02 Plant Fire On Site
Knowledge of the operational implications of the following concepts as they apply to Plant Fire on Site: **Fire Fighting**
(Imp 3.1/3.9)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall the operational implications of the actions that are taken when fighting fire which causes the to control room to be evacuated due to inhabitability because of that fire.

Cognitive Level:
Knowledge 1-P: The operator must recall the steps and reason for their performance.

10 CFR Part 55 Content:
55.41 8
55.41.10
55.45.3

Reference:
AOP-40A, Control Room Abandonment due to Fire, Rev 7
BG AOP-40A, Background Document for Control Room Abandonment due to Fire, Rev 0

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following plant conditions:

-A fire breaks out on the RTGB
-The crew has entered AOP-041, RESPONSE TO FIRE EVENT, and subsequently, DSP-OO1, ALTERNATE SHUTDOWN DIAGNOSTIC

-The crew has tripped the reactor

CVC-200 A/B/C, LTDN ORIFICE
PCV-455C, PZR PORV
PCV-456, PZR PORV

Which ONE (1) of the following completes the statements below?

Prior to leaving the control room, the QAC will (1) . This is performed to (2')

A. (1) Verify CVC-200 A/B/C closed
(2) prevent spurious operation

B. (1) Isolate PCV-456 & PCV-455C
(2) prevent spurious operation

C. (1) Verify CVC-200 A/B/C closed
(2) allow for remote operation of these valves

D. (1) Isolate PCV-456 & PCV-455C
(2) allow for remote operation of these valves

Proposed Answer: B

Justification:

These components are a spurious depressurization and inventory loss concern due to direct cable damage, which could cause the valve to fail open is a shot smart short occurs.

A **INCORRECT:** The first part is wrong, plausible because letdown valves are operated using control room abandonment, and could cause a loss of RCS pressure. The second part is correct.

B **CORRECT:** See above.

C **INCORRECT:** The first part is wrong, plausible because letdown valves are operated using control room abandonment, and could cause a loss of RCS pressure. The second part is wrong, plausible as these valves are operated locally.

D **INCORRECT:** The first part is correct. The second part is wrong, plausible as valves in this procedure are set up for local/remote operation.

Learning Objective:

Describe the major action of AOP-10 and the AOP-40 series procedures to include:

a. Actions taken prior to abandoning the control room

(055.03.LP1275.001)

24. 2021 NRC 024
Given the following:

- Unit 1 has a Large Break LOCA in progress
- RCS Cold Leg is 405°F and LOWERING
- RCS pressure is 260 psig and LOWERING
- Highest Core Exit Thermocouple is 510°F and RISING SLOWLY
- Containment pressure is 61 psig and RISING SLOWLY
- 'A' Steam Generator narrow range level is 40% and STABLE
- 'B' Steam Generator narrow range level is 55% and STABLE
- Total Auxiliary Feedwater flow is 200 gpm and STABLE
- Pressurizer level is 0%
- NR RVLIS indicates 12 ft
- EOP-0, Reactor trip and Safety Injection, Attachment A is complete

Which of the following describes the procedural transition upon exit from EOP-0, based upon assessment of the Critical Safety Function Status Trees?

A. CSP-C.2, Respond to Degraded Core Cooling (orange path)

B. CSP-H.1, Response to Loss of Secondary Heat Sink (red path)

C.✓ CSP-Z.1, Response to High Containment Pressure (red path)

D. CSP-I.2, Response to Low Pressurizer Level (yellow path)

RO Tier 1 Group 2

Source:
New

Question History:
None

K/A:
E14G2.4.04 High Containment Pressure
Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.
(Imp 4.5/4.7)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall the entry conditions for containment high pressure procedure.

Cognitive Level:
Comprehension 3-PEO: The operator understand the initial conditions, and determine which conditions warrant actions, and which procedure to enter.

10 CFR Part 55 Content:
55.41 5
55.41.10
55.45.6
55.45.13

Reference:
CSP-ST.0 Critical Safety Function Status Trees, Rev 15

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

This condition is met: Containment pressure > 60 psig

A **INCORRECT:** Plausible, with no RCPs running, narrow range reactor vessel level needs to be greater than 14 feet.

B **INCORRECT:** Plausible, feed and one steam generator meet entry into H.1, but the other steam generator being above the required level negates this.

C **CORRECT:** See above.

D **INCORRECT:** Plausible, the conditions met, but not a required entry condition to transition to.

Learning Objective:

Recall/List the following concerning the Critical Safety Procedures:

a. Entry condition for each RED PATH and ORANGE PATH CSP
b. Purpose of EACH CSP
c. Major action of each CSP

(043.03.LP1995.012)

Evaluate the red path and orange path entry conditions for CSP-Z.1and Z.2
(043.03.LP2000.002)

25. 2021 NRC 025

Given the following:

- The crew has entered CSP-H.2, Response to Steam Generator Overpressure
- Steam Generator pressures are:
  - Steam Generator 'A'; 1050 psig
  - Steam Generator ‘B': 1150 psig

Why does Step 5 of CSP-H.2 direct controlling Steam Generator 'B' pressure to less than 1105 psig?

A. To reduce RCS temperature in order to ensure primary system integrity

B. To prevent lifting the Steam Generator code safety valves and causing a radiological release

C✓ To decrease pressure below the highest steamline safety valve setpoint to ensure secondary integrity

D. To maintain Steam Generator pressure low enough to ensure adequate total auxiliary feedwater flow

RO Tier 1 Group 2

Source:
Bank

Question History:
2011 Seabrook RO 26

K/A:
E13EK3.2 Steam Generator Overpressure
Knowledge of the reasons for the following responses as they apply to the (Steam Generator Overpressure): **Manipulation of controls required to obtain desired operating results during abnormal, and emergency situations.**
(Imp 3.2/3.4)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall knowledge of for the reasons of the control manipulations.

Cognitive Level:
Knowledge 1-B: The operator must recall the reason the actions are being carried out.

10 CFR Part 55 Content:
55.41 5
55.41.10
55.45.6
55.45.13

Reference:
BG CSP-H.2 Response to Steam Generator Overpressure, Rev 15

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following plant conditions:

- *The crew has entered FR-H.2, "Response to Steam Generator Overpressure."*
- *Steam Generator pressures are:*
  - *~ Steam Generator 'A'; 1100 psig.*
  - *~ Steam Generator • B': 1240 psig.*
  - *~ Steam Generator 'C'; 1100 psig.*
  - *~ Steam Generator 'D': 1100 psig.*

Why does Step 5 ofFR-H.2, "Response to Steam Generator Overpressure" direct reducing Steam Generator 'B' pressure to less than 1225 psig?

A. To reduce RCS temperature in order to ensure primary system integrity.

B. To prevent lifting the Steam Generator code safety valves and causing a radiological release.

C. To decrease pressure below the highest steamline safety valve setpoint to ensure secondary integrity.

D. To maintain Steam Generator pressure low enough to ensure adequate total emergency feedwater flow.

Proposed Answer: C

Justification:

The background document states “If pressure is lowering but is not below the highest steamline safety valve setpoint, the operator is direction to return to Step 3 and continue monitoring level and releasing steam. If steam release lowers the affected SG(s) pressure to less than the highest steam line safety valve setpoint, then the steam release is controlled to maintain pressure and the operator is instructed to return to the procedure. In effect.”

A **INCORRECT:** Plausible, part of the overall strategy of CSP-H.2 is to reduce RCS temperature however the purpose of that step is to mitigate any excessive heat transfer that may be causing the overpressure condition in the steam generator.

B **INCORRECT:** Plausible, reducing steam generator pressure is associated with steam generator safety valve performance however it is to ensure that pressure is within the safety valve relieving capacity versus being below the lowest valve actuation point. The concern regarding radiological release is also plausible as the safety valves offer a direct release path, however this concern is associated with the condition where there is elevated radiation as in the case of a steam generator tube rupture.

C **CORRECT:** See above.

D **INCORRECT:** Plausible, CSP-H safety function does take into account the need for adequate feed flow to the steam generators however the generator pressure concern addresses the need to isolate feed flow to the effected generator to remove it as a contributing factor to the over pressurization.

Learning Objective:

From memory, state the purpose of each of the Heat Sink Critical Safety Procedures
(043.03.LP1998.001)

26. 2021 NRC 026

Given the following:

- A small break LOCA has occurred on Unit 1
- Condenser vacuum is 18" Hg
- 1P-30A, Circulating Water pump is running
- Maximum charging has been established
- RCS pressure is 1200 psig and STABLE
- Core Exit TCs are 520°F and RISING
- The crew is performing EOP-1.2, Post LOCA Cooldown and Depressurization

Which describes the method and rate at which the RCS cooldown will occur in accordance with EOP-1.2?

A. Condenser steam dumps will be used at the maximum achievable rate. RCS cooldown rate limits do not apply for this condition.

B. Condenser steam dumps will be used at less than 100°F per hour cooldown rate.

C. SG ADVs will be used at the maximum achievable rate. RCS cooldown rate limits do not apply for this condition.

D.✓ SG ADVs will be used at less than 100°F per hour cooldown rate.

RO Tier 1 Group 2

Source:
Bank

Question History:
2016 Summer RO 25

K/A:
E03EK2.1 LOCA Cooldown and Depressurization
Knowledge of the interrelations between the (LOCA Cooldown and Depressurization) and the following: **Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.**
(Imp 3.6/4.0)

Justification for K/A Match:
Matches the K/A by requiring the operator to evaluate the conditions during an event requiring a post-LOCA cooldown and depressurization determining what actions/components operations are needed.

Cognitive Level:
Comprehension 2-RI: The operator must understand the initial conditions, determine what method of cooldown will be utilized, and to what rate it is required to be performed.

10 CFR Part 55 Content:
55.41 8
55.41.10
55.45.3

Reference:
EOP-1.2, Post LOCA Cooldown and Depressurization, Rev 37
BG EOP-1.2, Post LOCA Cooldown and Depressurization, Rev 26
STPT 14.2 Condensate and Feedwater, Rev 36

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following plant conditions:

- *A small break LOCA has occurred.*
- *Condenser pressure is 6" Hg.*
- *All Circulating Water pumps are running.*
- *RCS pressure is 1100 psig and stable.*
- *"A" Charging pump is running with lower than normal amperage.*
- *"B" Charging pump is OFF.*
- *Core Exit TCs are 570°F and rising.*
- *The crew is performing actions contained in EOP-2.1, ES-1.2 POST-LOCA COOLDOWN AND DEPRESSURIZATION.*

Which ONE of the following describes the method and rate at which the RCS cooldown will occur in accordance with EOP-2.1?

A. Condenser steam dumps will be used at the maximum achievable rate. RCS cooldown rate limits do not apply for this condition.

B. Condenser steam dumps will be used at less than 100°F per hour cooldown rate.

C. S/G PORVs will be used at the maximum achievable rate. RCS cooldown rate limits do not apply for this condition.

D. S/G PORVs will be used at less than 100°F per hour cooldown rate.

Proposed Answer: D

Justification:

SG ADVs will be used to cooldown, due to condenser steam dumps not being available because of vacuum level in the condensers. The cooldown is limited in EOP-1.2 to a rate of < 100°F/hr

A **INCORRECT:** The first part is wrong, plausible because the condenser steam dumps are used to cooldown when available. The second part is wrong, plausible because this is the cooldown rate that is utilized in EOP-3, Steam Generator Tube Rupture.

B **INCORRECT:** The first part is wrong, plausible because the condenser steam dumps are used to cooldown when available. The second part is correct.

C **INCORRECT:** The first part is correct. The second part is wrong, plausible because this is the cooldown rate that is utilized in EOP-3, Steam Generator Tube Rupture

D **CORRECT:** See above.

Learning Objective:

Implement the following procedure for the specified condition(s)

b. EOP-1.2, to cooldown and depressurize the reactor coolant system following a small break LOCA.

(031.02.LP0435.010)

27. 2021 NRC 027

Given the following:

- A Main Steam Line Break occurred inside containment
- Main Steam Isolation Valve (MSIVs) are closed
- The faulted Steam Generator (SG) has been isolated
- RED PATH conditions exist on the Integrity Status Tree
- The actions of CSP-P.1, Response To Imminent Pressurized Thermal Shock Condition, are being performed
- RCS Hot leg temperatures are being maintained stable
- RCS temperature soak is required and has been initiated
- No RCPs are running

Which evolution is allowed during the one hour "soak period"?

A✓ Place Normal Letdown in service.

B. Lower non-faulted SG Atmospheric Dump Valve setpoint by 25 psig.

C. Raise AFW Flow to the non-faulted SG and establish SG Blowdown.

D. Raise RCS pressure to the middle of the pressure band of CSP-P.1, Figure 1.

RO Tier 1 Group 2

Source:
Bank

Question History:
2015 Audit 27

K/A:
E08EA1.2 Pressurized Thermal Shock
Ability to operate and / or monitor the following as they apply to the (Pressurized Thermal Shock): **Operating behavior characteristics of the facility.**
(Imp 3.6/3.9)

Justification for K/A Match:
Matches the K/A by requiring the operator to use knowledge of operating characteristics and behavior of the plant to determine which evolution will be allowed during the soak period.

Cognitive Level:
Comprehension 2-DR: The operator must understand the initial conditions, the soak requirements and precautions of the procedure, then determine which of the listed evolutions can be performed during the soak period based on what effect the evolution will have on the plant

10 CFR Part 55 Content:
55.41 7
55.45.5
55.45.6

Reference:
CSP-P.1, Response To Imminent Pressurized Thermal Shock Condition, Rev 27

Proposed reference to be provided to the applicants during examination:
None

Original Question:
Given the following:

- *A Main Steam Line Break occurred inside containment*
- *Main Steam Isolation Valve (MSIVs) are closed*
- *The faulted Steam Generator (SG) has been isolated*
- *RED PATH conditions exist on the Integrity Status Tree*
- *The actions of CSP-P.1, Response To Imminent Pressurized Thermal Shock Condition, are being performed*
- *RCS Hot leg temperatures are being maintained stable*
- *RCS temperature soak is required and has been initiated*
- *No RCPs are running*

Which evolution can be performed during the one hour "soak period"?

A. Place Normal Letdown in service.

B. Lower non-faulted SG Atmospheric Dump Valve setpoint by 25 psig.

C. Raise AFW Flow to the non-faulted SG and establish SG Blowdown.

D. Raise RCS pressure to the middle of the pressure band allowed by Figure 1 of CSP-P.1.

Proposed Answer: A

Justification:

CSP-P.1 calls out requirements for the one our soak period. Placing letdown in service will not cause a change in RCS pressure nor a change in RCS temperature.

A **CORRECT:** See above.

B **INCORRECT:** Plausible because after the one hour soak, a change of 50°F per hour is allowed, and changing the ADV setpoint will change RCS temperature.

C **INCORRECT:** Plausible because after the one hour soak, a change of 50°F per hour is allowed raising AFW and establishing blowdown both will cause RCS temperatures to lower.

D **INCORRECT:** Plausible because after the one hour soak, you are directed to maintain pressure and temperature per Figure 1.

Learning Objective:

APPRAISE each operator-initiated recovery technique in its ability to restore the Integrity Critical Safety Function.
(043.03.LP1999.002)

28. 2021 NRC 028
Given the following:

- Unit 2 is at 30% Reactor Power
- Feedwater control is in MANUAL
- 2P-1B, Reactor Coolant Pump trips

Immediately (directly) following the trip of 2P-1B, an automatic Reactor Trip will . . .
(Assume no operator actions)

A. occur, and the 'B' SG water level will swell.

B. occur, and the 'B' SG water level will shrink.

C. NOT occur, but the 'B' SG water level will swell.

D✓ NOT occur, but the 'B' SG water level will shrink.

RO Tier 2 Group 1

Source:
Bank

Question History:
2013 Comanche Peak 42 (Question's original K/A was 015/017AK1.04)

K/A:
003K3.02 Reactor Coolant Pump System (RCPS)
Knowledge of the effect that a loss or malfunction of the RCPS will have on the following: **S/G**
(IMP 3.5/3.8)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify how a Reactor Coolant Pump Trip will affect a Steam Generator.

Cognitive Level:
Comprehension 3-PEO: The operator must take the information provided and deduce the event will have on the status of the reactor trip breakers, and the Steam Generator(s) system.

10 CFR Part 55 Content:
55.41 7
55.45 6

Reference:
PBN LP2461 FSAR Primary Transient Analysis Rev 12
PBN LP0131 Feedwater Letdown Control, Slide 17 Rev 15

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following conditions:

- Unit 2 is at 35% power.
- Reactor Coolant Pump (RCP) 2-02 trips.

In the 30 seconds following the trip of RCP 2-02, and assuming NO operator action, an automatic Reactor Trip will ...

A. ...occur, and the affected SG water level will shrink.

B. ...NOT occur, but the affected SG water level will shrink.

C. ...occur, and the affected SG water level will swell.

D. ...NOT occur, but the affected SG water level will swell.

Proposed answer: B

Justification:

SG level will shrink due to loss of heat input to SG; and, the Reactor will not automatically trip unless power level is greater than 35%.

A **INCORRECT:** Plausible if thought that power is above the P-8 setpoint. Steam Generator water level will initially shrink due to loss of heat input to SG.

B **INCORRECT:** Plausible if thought that power is above the P-8 setpoint. A Reactor Trip will occur when one Reactor Coolant Pump trips with Reactor power greater than 35%. When the RCP trips, SG shrink due to loss of heat input to SG.

C **INCORRECT:** Plausible because power is below P-8 permissive blocking the reactor trip. SG level will shrink due to loss of heat input to the steam generator.

D **CORRECT:** See above.

Learning Objective:

Predict the effects of a loss of Reactor Coolant Flow.
(043.02.LP2461.009)

29. 2021 NRC 029

Given the following:

- Unit 1 is cooling down in MODE 5
- The Pressurizer is SOLID
- Reactor Coolant System (RCS) pressure is 300 psig
- LTOP is in service
- Steam Generator secondary side metal temperature is 275°F
- No Reactor Coolant Pumps (RCPs) are running
- Both Trains of Residual Heat Removal (RHR) are aligned for cooldown
- The 'B' RHR Pump, 1P-10B, is running

Which of the following actions or failures would cause an RCS overpressure transient?

A.✓ The crew starts 'A' RCP, 1P-1A

B. The crew starts 'A' RHR Pump, 1P-10A

C. LP Letdown Line Pressure Transmitter, 1PT-135, fails high

D. RC Loop A Hot Leg Pressure Transmitter, 1PT-420, fails high

RO Tier 2 Group 1

Source:
Bank

Question History:
2018 Millstone RO 28

K/A:
003A1.07 Reactor Coolant Pump System (RCPS)
Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RCPS controls including: **RCS temperature and pressure.**
(Imp 3.7)

Justification for K/A Match:
Matches the K/A by requiring the operator to predict which transient negatively impacts RCS pressure.

Cognitive Level:
Comprehension 3-PEO: The operator must use knowledge of the plant systems and procedures to predict the outcome, or cause, of a plant transient.

10 CFR Part 55 Content:
55.41.5

Reference:

OP 4B, Reactor Coolant Pump Operation, Rev 65
883D195 Sht. 18, Logic Diagram Pressurizer Pressure and Level Control, Rev 13
684J741 Sht. 2, P&ID Chemical and Volume Control, Rev. 84

Proposed reference to be provided to the applicants during examination:

Steam Tables

Original Question:

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

- *The Pressurizer is solid*
- *COPPs is blocked*
- *RCS is 280 psia*
- *SG secondary side temperatures are 250 op*
- *No RCPs are running*
- *Both trains of RHR are aligned for cooldown*
- *The "B" RHR pump is running*

What action/failure would cause an RCS overpressure transient?

a) The crew starts the "A" Residual Heat Removal pump.

b) The crew starts the "A" Reactor Coolant Pump.

*c) RCS Wide Range pressure instrument 3RCS*PT405 fails high.*

*d) Letdown Pressure Instrument 3CHS*PTI31 fails high.*

Proposed Answer: B.

Justification:

Per OP 4B Caution, If SG metal temperature is greater than Reactor metal temperature, upon an initial start of an RCP, then an RCS pressure spike will occur.

A **CORRECT:** See above.

B **INCORRECT:** Due to control of flow from RHR system to RCS, RCS pressure is not impacted.

C **INCORRECT:** In the current plant condition, 1HC-135, Letdown Line Pressure Controller would be in MANUAL, in which case no actual change in RCS pressure is encountered. If the hand controller is in AUTOMATIC, then RCS pressure would drop due to 1CV-135 opening from the failed pressure signal.

D **INCORRECT:** 1PT-420 failing high will open 1RC-430, PORV, on LTOP signal, causing a pressure drop.

Learning Objective:

ANALYZE the effect of the Pressurizer Pressure Control System caused by temperature variation during solid plant operations.
(055.02.LP0162.013)

30. 2021 NRC 030

Given the following:

- Unit 1 was operating at Rated Thermal Power
- A failure occurred causing Letdown temperature to rise

Which of the following describes:
1) At what temperature will the Letdown Divert Temp Control Valve, 1CV-145, divert to the VCT?
AND
2) What is the reason for this action?

A.✓ 1) 145°F
2) Protect Demineralizer resin from damage due to high Letdown line temp

B. 1) 145°F
2) Mitigate positive reactivity caused by boron absorption by Demineralizers

C. 1) 130°F
2) Protect Demineralizer resin from damage due to high Letdown line temp

D. 1) 130°F
2) Mitigate positive reactivity caused by boron absorption by Demineralizers

RO Tier 2 Group 1

Source:
Bank

Question History:
2015 Surry RO 4

K/A:
004K4.03 Chemical and Volume Control System (CVCS)
Knowledge of CVCS design feature(s) and/or interlock(s) which provide for the following: **Protection of ion exchangers (high letdown temperature will isolate ion exchangers)**
(Imp 3.2)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the CVCS system features that prevent damage to ion exchangers.

Cognitive Level:
Knowledge 1-B: The operator must the setpoint of the system automatic function and the purpose for that interlock.

10 CFR Part 55 Content:
55.41.7

Reference:

ARB 1C04 1C 4-7, 1HX-3A AND B NONREGEN HX LETDOWN OUTLET TEMPERATURE HIGH Rev 5
DBD-04, Chemical and Volume Control Sytem, Rev 12

Proposed reference to be provided to the applicants during examination:

None

Original Question:

Unit 1 was operating at 100% operation when a failure occurred causing Letdown temperature to rise.

Which of the following describes:

1) At what temperature will the Letdown divert valve, 1-CH-TCV-1143 divert to the VCT?
2) What is the reason for this action?

A.1) 145 °F.
2) Protect Ion Exchanger resin from damage due to high Letdown line temp.

B.1) 145 °F.
2) Mitigate positive reactivity caused by boron absorption from Demins.

C.1) 130 °F.
2) Protect Ion Exchanger resin from damage due to high Letdown line temp.

D.1) 130 °F.
2) Mitigate positive reactivity caused by boron absorption from Demins.

Proposed Answer: A

Justification:

Letdown Line temperatures and VCT temperatures are rising slowly. Once Letdown line temperature reaches 145 °F, 1CV-145, Letdown Divert Temp Control Valve, will divert to the VCT which bypasses the Demins. The reason for this is to protect the Ion exchangers from high temperatures. 130 °F is the high temperature alarm setpoint for the VCT.

A **CORRECT:** 1) 145 °F. Correct.
2) Protect Ion Exchanger resin from damage due to high Letdown line temp.

B **INCORRECT:** 1) 145 °F. Correct.
2) Mitigate positive reactivity caused by boron absorption from Demins. Incorrect, 1CV-145 provides protection to the Demins. Plausible because letdown temperature changes will cause a change to boron. In this case Letdown temperatures are rising which would tend to release boron adding negative reactivity which is the opposite effect.

C **INCORRECT:** 1) 130 °F. Incorrect, because the divert valve diverts at 145 °F. Plausible because this is the setpoint for ARP 1C04 1C 3-7, 1T-4 VOLUME CONTROL TANK TEMPERATURE HIGH, therefore this choice could be selected if candidate confused between VCT hi temp and Letdown Hi temp/divert setpoint.
2) Protect Ion Exchanger resin from damage due to high Letdown line temp. This is correct.

D **CORRECT:** 1) 130 °F. Incorrect, because the divert valve diverts at 145 °F. Plausible because this is the setpoint for ARP 1C04 1C 3-7, 1T-4 VOLUME CONTROL TANK TEMPERATURE HIGH, therefore this choice could be selected if candidate confused between VCT hi temp and Letdown Hi temp/divert setpoint
2) Mitigate positive reactivity caused by boron absorption from Demins. Incorrect, 1CV-145 provides protection to the Demins. Plausible because letdown temperature changes will cause a change to boron. In this case Letdown temperatures are rising which would tend to release boron adding negative reactivity which is the opposite effect.

Learning Objective:

DESCRIBE the interlocks associated with the Chemical and Volume Controls (include administrative limitations).
c. Divert Valve
(051.02.LP0079.004)

31. 2021 NRC 031
Given the following:

- Unit 2 reactor tripped
- Trip and Bypass breakers are open
- Neutron flux is lowering
- Control rod K5 indicates 100 steps with the rod bottom light NOT lit
- Control rod E9 indicates 25 steps with the rod bottom light NOT lit
- The crew is responding to the event in EOP-0.1, Reactor Trip Response

Is normal/emergency boration required for the current conditions and if so from where?

A. Emergency boration is not required at this time for shutdown margin

B.✔ Borate via 2CV-350, Emergency Boration valve, until 2825 gallons per stuck rod is achieved

C. Borate via 2CV-112B, RWST to Chg Pump Suction valve, until 2825 gallons per stuck rod is achieved

D. Borate via 2CV-112B, RWST to Chg Pump Suction valve, until Intermediate Range Current is <1.0E-10 amps

RO Tier 2 Group 1

Source:
New

Question History:
None

K/A:
004A4.18 Chemical and Volume Control System (CVCS)
Ability to manually operate and/or monitor in the control room: **Emergency borate valve**
(Imp 4.3/4.1)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine that emergency boration is required and the flowpath to be used.

Cognitive Level:
Comprehension 2-RI: The operator must determine the number of stuck rods, recall the requirements of the EOP network and determine the appropriate volume of boric acid to be injected and via which flowpath.

10 CFR Part 55 Content:
55.41 7
55.45 5
55.45 6
55.45 7
55.45 8

Reference:
EOP-0.1 Response to Reactor Trip Step 3, Rev 47
BG EOP-0.1 Background Document Response to Reactor Trip, Rev 32

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

Per EOP-0.1 Unit 2, Step 3, if two or more control rods are not fully inserted the operators are required to emergency borate, via 2CV-350, with one Boric Acid Pump, to a volume of 2825 gallons for each rod that is not fully inserted.
The background document for EOP-0.1, Step 3, states that control rods are considered inserted when IRPI indicates less than 20 steps with Reactor Trip Breakers OPEN and the Rod Bottom Light LIT.

A **INCORRECT:** Plausible if the examinee does not recall that EOP-0.1 requires 2825 gallons for EACH stuck rod and incorrectly determines that one rod does not meet the stuck rod criteria.

B **CORRECT:** See above

C **INCORRECT:** Plausible if the examinee does not recall the flowpath required by procedure is via the emergency boration valve.

D **INCORRECT:** Plausible, if the student determines the rods are stuck, but does not recall the fowpath or endpoint.

Learning Objective:

Within the CVC Boration and Dilution Control System, IDENTIFY and Discuss flowpaths/flow ratings, major components, and interfaces with other major systems for the following operations:
g. Emergency Boration
(051.02.LP0082.003)

32. 2021 NRC 032

Given the following:

- Unit 1 has experienced a Loss of Coolant Accident from Rated Thermal Power
- The crew is implementing EOP-1.2, Post LOCA Cooldown and Depressurization
- Maximum charging is established
- 1P-1B, Reactor Coolant Pump is running
- Both SI pumps are running
- Both RHR pumps are stopped and in AUTO
- RCS Hot Leg temperature is 300°F

When evaluating conditions to stop the first SI pump, there is less subcooling than required. In accordance with the RNO step in EOP-1.2, the operator starts an RHR pump and then stops the SI pump.

What is accomplished by starting an RHR pump prior to stopping the SI pump?

A.✓ Ensures the RCS will remain subcooled

B. Prevents void formation in the reactor vessel head

C. Prevents a challenge to the Core Cooling critical safety function

D. Ensures conditions are maintained for continued RCP operation

RO Tier 2 Group 1

Source:
Bank

Question History:
2009 Diablo Canyon RO 4

K/A:
005K5.02 Residual Heat Removal System (RHRS)
Knowledge of the operational implications of the following concepts as they apply to RHRS: **Need for adequate subcooling**
(Imp 3.4/3.5)

Justification for K/A Match:
Matches the K/A by requiring the operator to know why the RHR system should be restarted for current plant conditions.

Cognitive Level:
Knowledge 1-P: The operator must recall a procedure step/ fold-out page step requiring reinitiating of RHR if subcooling requirements are not met.

10 CFR Part 55 Content:
55.41 5
55.45 7

Reference:
EOP-1.2, Post-LOCA Cooldown and Depressurization Rev. 37
BG-EOP-1.2, Post LOCA Cooldown and Depressurization Rev 28

Proposed reference to be provided to the applicants during examination:
None

Original Question:

GIVEN:

- *The crew is performing the actions of E-1.2, Post-LOCA Cooldown and Depressurization.*
- *One RCP is running*
- *Both ECCS CCPs are running*
- *Both SI pumps are running*
- *Both RHR pumps are stopped*
- *RCS temperature is 300°F*

When evaluating conditions to stop the first SI pump, there is less subcooling than required. In accordance with the RNO step in E-1.2, the operator starts an RHR pump and then stops the SI pump.

What is accomplished by starting an RHR pump prior to stopping the SI pump?

A. Prevents void formation in the reactor vessel head.

B. Ensures the RCS will remain subcooled.

C. Prevents a challenge to the Core Cooling critical safety function.

D. Ensures conditions are maintained for continued RCP operation.

Proposed Answer: B

Justification:

BG-EOP-1.2 states: If the RCS subcooling criterion is not satisfied, but the RCS hot leg temperatures are less than the saturation temperature corresponding to the low-head (RHR) SI pump head at minimum pump recirculation flow, the charging/SI pump can be stopped if a low-head SI pump is running or can be started. Starting a low-head SI pump for this case ensures that RCS subcooling will be maintained after the charging/SI pump is stopped.

A **CORRECT:** See above

B **INCORRECT:** Plausible because LOCA size (small or large) was not provided, and subcooling requirements are not met as stated in the question, and without a pressure and temperature, you cannot calculate the value of subcooling, so voiding is the head could be possible, but should not occur with RCP running.

C **INCORRECT:** Plausible if the student understanding of ECCS flow and subcooling requirements not being met is flawed.

D IN**CORRECT:** RCP operation is not required for current conditions.

Learning Objective:

DESCRIBE the procedures which govern operation of the Residual Heat Removal System. Description should include significant prerequisites, precautions, and notes associated with startup and operation of the Residual Heat Removal system by Licensed or Non-Licensed Operators. (051.03.LP0069.009)

33. 2021 NRC 033
Given the following:

- Unit 2 has experienced a large break Loss of Coolant Accident (LOCA) from Rated Thermal Power

Which of the following would present the greatest challenge to long term core cooling?

A. Only one SI Accumulator injects

B. Loss of Safety Injection Pumps

C. Loss of Containment Spray Pumps

D.✓ Loss of Residual Heat Removal Pumps

RO Tier 2 Group 1

Source:
Bank

Question History:
2009 Diablo Canyon RO 5

K/A:
006K6.13 Emergency Core Cooling System (ECCS)
Knowledge of the effect of a loss or malfunction of the following will have on the ECCS**: Pumps**
(IMP 2.8/3.1)

Justification for K/A Match:
Matches the K/A by requiring the operator to understand the effect of a loss of the various ECCS pumps on the plant.

Cognitive Level:
Comprehension 2-RI: The operator must recall the interaction between systems and how a malfunction can impact those systems and the plant.

10 CFR Part 55 Content:
55.41 7
55.45 7

Reference:
FSAR 2020, Section 6.2

Proposed reference to be provided to the applicants during examination:
None

Original Question:

A large break LOCA has occurred.

Which of the following would present the greatest challenge to long term core cooling?

A. Loss of ECCS CCPs.

B. Loss of SI pumps.

C. Loss of RHR pumps.

D. Only 2 Accumulators inject.

Proposed Answer: C

Justification:

After successful initial operation of the ECCS, the reactor core is once again covered with borated water. This water has enough boron concentration to maintain the core in a shutdown condition. Decay heat is removed by a continuous supply of water from the ECCS. This supply initially comes from the refueling water storage tank (RWST). When the RWST level reaches the switchover setpoint the ECCS pumps are transferred into the recirculation mode (using ES 1.3, TRANSFER TO COLD LEG RECIRCULATION) wherein water is drawn from the containment sump and is cooled in the residual heat removal heat exchangers. Thus, long term cooling of the core is maintained by the ECCS in sump recirculation mode. The core is maintained in a shutdown state by borated water.

A **INCORRECT:** Without being given the location of the break, the student could assume only one accumulator injects during the blowdown and reflood phase of a LOCA, thus challenging long term due to only half of the borated water from the accumulators reflooding the core. But they do not contribute to the long term cooling requirements of 10CFR 50.46, though their water volume is credited as part of the long term cooling inventory.

B **INCORRECT:** Without RHR pumps, Safety Injection pumps do not have a suction source during long-term cooling (sump recirculation). And during a large break LOCA, the SI pumps are not needed to inject into the RCS, since RCS pressure is below the shut-off head of the RHR pumps.

C **INCORRECT:** Without RHR pumps, Containment Spray pumps do not have a suction source during long-term cooling (sump recirculation).

D **CORRECT:** There is adequate ECCS flow with Charging pumps and both SI pumps to prevent any challenge to core cooling.

Learning Objective:

DESCRIBE the procedures which govern operation of the Residual Heat Removal System. Description should include significant prerequisites, precautions, and notes associated with startup and operation of the Residual Heat Removal system by Licensed or Non-Licensed Operators. (051.03.LP0069.009)

34. 2021 NRC 034
Given the following:

- Unit 1 is in MODE 2
- SI Accumulator parameters are as follows:

  - ‘A’ SI Accumulator
    - Boron concentration - 3050 ppm
    - Level - 43%
    - Pressure - 810 psig

  - ‘B’ SI Accumulator
    - Boron concentration - 2690 ppm
    - Level - 9%
    - Pressure - 730 psig

Which of the following describes the impact, if any, on LCO 3.5.1 Accumulators?

A. LCO 3.5.1 is NOT MET due to ‘A’ SI Accumulator, ONLY

B. LCO 3.5.1 is NOT MET due to ‘B’ SI Accumulator, ONLY

C.✓ LCO 3.5.1 is NOT MET due to ‘A’ and ‘B’ SI Accumulators

D. LCO 3.5.1 is MET

RO Tier 2 Group 1

Source:
Bank

Question History:
2015 PBNP RO 31

K/A:
006G2.2.22 Emergency Core Cooling
Knowledge of limiting conditions for operations and safety limits.
(IMP 4.0/4.7)

Justification for K/A Match:
This question tests the candidate's knowledge of the Tech Spec ECCS Accumulator concentration, pressure, and level limits.

Cognitive Level:
Knowledge 1-F: The operator must recall the requirements concerning tech specs for the SI accumulators, and apply those requirements.

10 CFR Part 55 Content:
55.41 5
55.43 2
55.45 2

Reference:
TS 3.5.1, Tech Specs for Accumulators, Rev 4
TLB 17, Tank Level Book Safety Injection Accumulators, Rev 9

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following:

- *Unit 1 is in Mode 3 preparing to enter Mode 2*
- *SI Accumulator parameters are as follows:*
    - *'A' SI Accumulator*
        - *Boron concentration - 3050 ppm*
        - *Level - 43%*
        - *Pressure - 810 psig*
    - *'B' SI Accumulator*
        - *Boron concentration - 2690 ppm*
        - *Level - 9%*
        - *Pressure - 730 psig*

Which of the following describes the impact, if any, on LCO 3.5.1 Accumulators?

A. Only 'A' SI Accumulator is Inoperable and LCO 3.5.1 is NOT MET.

B. Only 'B' SI Accumulator is Inoperable and LCO 3.5.1 is NOT MET.

C. Both 'A' and 'B' SI Accumulators are Inoperable and LCO 3.5.1 is NOT MET.

D. Both 'A' and 'B' SI Accumulators are OPERABLE and LCO 3.5.1 is MET.

Proposed Answer C

Justification:

Tech Specs 3.5.1 requires the following for SI Accumulators:

- Boron Concentration between 2700 ppm and 3100 ppm
- Level between 1100 ft^3 (6%) and 1136 ft^3
- Pressure between 700 psig and 800 psig

'A' Accumulator pressure is > 800 psig
'B' Accumulator boron concentration is < 2700 ppm

Both 'A' and 'B' SI Accumulators are inoperable as listed above. LCO 3.0.3 is required to be entered immediately.

A **INCORRECT**: True, 'A' SI Accumulator is inoperable due to pressure exceeding technical specification values. Plausible if the student cannot correctly recall the required level or boron concentrations.

B **INCORRECT**: True, 'B' SI Accumulator is inoperable due to boron concentration lower than technical specification values. Plausible if the student cannot correctly recall the required level or pressure.

C **CORRECT**: See above

D **INCORRECT**: 'A' SI Accumulator is inoperable due to pressure exceeding technical specification values and, 'B' SI Accumulator is inoperable due to boron concentration lower than technical specification values. Plausible if the student cannot correctly recall the required pressure or boron concentrations.

Learning Objective:

IDENTIFY and DISCUSS Technical Specifications associated with Emergency Core Cooling System components, parameters, and operation including Limiting Condition for Operation (LCO), LCO applicability, Action Conditions and required actions as they pertain to the following requirements:
- Accumulators
(057.02.LP3340.001)

35. 2021 NRC 035

Which of the following describes the adverse effects of NOT maintaining the Pressurizer Relief Tank (PRT) within its design level band?

A✓ If the level is too low, there would be insufficient water volume to absorb and condense a design discharge of PZR safety leading to possible over temperature and overpressure of the PRT.

B. If the level is too low the radioactive gases that leak from the top of the PZR would not be adequately scrubbed, thus causing subsequent elevated gaseous activity levels inside containment.

C. If the level is too high, the sparger pipe will be too far underwater rendering the cooling effect of makeup water ineffective.

D. If the level is too high, the tank will overflow to the RCDT causing possible false indications of RCS leakage.

RO Tier 2 Group 1

Source:
Bank

Question History:
2011 PBNP RO 34

K/A:
007A1.01 Pressurizer Relief/Quench Tank
Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRTS controls including:
Maintaining quench tank water level within limits
(Imp 2.9/3.1)

Justification for K/A Match:
Matches the K/A by requiring the operator to predict the consequences of not maintaining PRT parameters in their established bands.

Cognitive Level:
Knowledge 1-B: The operator must recall the bases/function of the system.

10 CFR Part 55 Content:
55.41 5
55.45 5

Reference:
DBD-09 Reactor Coolant System, Rev 18

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Which of the following describes the adverse effects of NOT maintaining the Pressurizer Relief Tank (PRT) within its design level band?

A. If the level is too low, there would be insufficient water volume to absorb and condense a design discharge of PZR safety leading to possible over temperature and overpressure of the PRT.

B. If the level is too high, the tank will overflow to the RCDT causing possible false indications of RCS leakage.

C. If the level is too low the radioactive gases that leak from the top of the PZR would not be adequately scrubbed, thus causing subsequent elevated gaseous activity levels inside containment.

D. If the level is too high, the sparger pipe will be too far underwater rendering the cooling affect of makeup water ineffective.

Proposed Answer: A.

Justification:

Per the DBD a minimum volume of water (600 cu. Ft.) below a certain temperature (120°F) is needed to prevent over pressurization leading to rupture disc failure following a design discharge to the PRT.

A **CORRECT:** See above.

B **INCORRECT:** The design of the PRT system does not consider scrubbing activity levels. Plausible as this is a similar reason why we maintain S/G level for a tube rupture.

C **INCORRECT:** Too much water over the sparger is not true; it is based on the volume and temperature of the quench volume. Plausible if the candidate does not understand the principles behind the coolding effect of the makeup water

D **INCORRECT:** There is no overflow. Rupture disc designed to protect against over pressure. Plausible as the PRT can be drained to the RCDT.

Learning Objective:

IDENTIFY and DESCRIBE the Control Room controls, alarms, and indications associated with the Pressurizer, Level Control, Pressure Control, and Relief System, including:

- Location and function of components and/or operating controls and control stations
- Alarming indications and response to major system and component alarms
- Plant, system, and component conditions or permissives required for Control Room operation
- Setpoints associated with major system alarms and/or interlocks

(051.01.LP0078.006)

36. 2021 NRC 036
Given the following:

- Unit 1 is at Rated Thermal Power
- 1RE-217, Component Cooling Water Monitor, is in HIGH ALARM
- Annunciator 1C03 1D 3-6, 1T-12 CC SURGE TANK LEVEL HIGH OR LOW is LIT

Which answers the following:
(1) What is the status of 1CC-17, 1T-12 CC Surge Tank Vent?
AND
(2) What actions of AOP-9B, Component Cooling Water Malfunction will mitigate this event?

A. (1) Open
(2) Seal Return Heat Exchanger is leaking, and will be isolated and bypassed

B. (1) Closed
(2) Seal Return Heat Exchanger is leaking, and will be isolated and bypassed

C✓ (1) Closed
(2) Non-Regenerative Heat Exchanger is leaking, and Letdown will be isolated

D. (1) Open
(2) Non-Regenerative Heat Exchanger is leaking, and Letdown will be isolated

RO Tier 2 Group 1

Source:
New

Question History:
None

K/A:
008A2.04 Component Cooling Water
Ability to (a) predict the impacts of the following malfunctions or operations on CCWS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: **PRMS alarm**

(Imp 3.3/3.5)

Justification for K/A Match:
Matches the K/A by requiring the operator to predict the effect of an PRMS alarm, and using procedures, mitigate the event.

Cognitive Level:
Comprehension 3-PEO: The operator must understand the initial conditions, predicts the result of the high alarm, and determine what the source of the leak is.

10 CFR Part 55 Content:
55.41 5
55.43 5
55.45 3
55.45 13

Reference:
AOP-9B, Component Cooling System Malfunction, Rev 26
RMSASRB CI 1RE-217, CC Water Liquid Monitor, Rev 10

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

With 1RE-217 in high alarm combined with the surge tank level annunciator, means there is a leak into the CCW System.

Per the RMSASRB, a high alarm on 1RE-217, will cause 1CC-17 to shut.

AOP-9B will address leaks though isolation, and since this is a leak into the system, the cause would be NRHX

A **INCORRECT:** The first part is wrong, plausible if the student does not recall the valve closure on high alarm, since the valve is designed to keep the surge tank vented. The second part is wrong, but plausible because if this water leaked into the CCW system, an RMS alarm would be expected.

B **INCORRECT:** The first part is correct. The second part is wrong, but plausible because if this water leaked into the CCW system, an RMS alarm would be expected.

C **CORRECT:** See above.

D **INCORRECT:** The first part is wrong, plausible if the student does not recall the valve closure on high alarm, since the valve is designed to keep the surge tank vented The second part is correct.

Learning Objective:

- DIAGNOSE and RESPOND to indications of a leak into or out of the system in accordance with AOP-9B.

(055.03.LP2444.002)

37. 2021 NRC 037

Given the following:

- Unit 2 is at Rated Thermal Power
- Two banks of Backup Heaters are on to recirc the Pressurizer volume
- Pressure has stabilized and is not changing
- 2RC-431A and 2RC-431B PZR Spray Valves, indicate cracked open
- Pressurizer Pressure indicates 2235 psig
- 2HC-431K, Pressurizer Pressure controller is in AUTO and the deviation meter is approximately nulled

Which of the following statements is correct concerning the indications on the OUTPUT meter of 2HC-431K, Pressurizer Pressure Controller?

A. Approximately 37%.

B. Approximately 42%.

C. Approximately 50%.

D✓ Approximately 63%.

RO Tier 2 Group 1

Source:
Bank

Question History:
051.01.LP0457.001 002

K/A:
010A3.02 Pressurizer Pressure Control System (PZR PCS)
Ability to monitor automatic operation of the PZR PCS, including: **PZR pressure**
(Imp 3.6/3.5)

Justification for K/A Match:
Matches the K/A by requiring the operator to controller indications and current conditions to determine proper operation of the Pressurizer Pressure Control System.

Cognitive Level:
Comprehension 2-DR: The operator must understand and apply the initial conditions to determine the output of the controller.

10 CFR Part 55 Content:
55.41 7
55.45 5

Reference:
STPT 5.3, Pressurizer Pressure and Level Control, Rev 11
PBN LP0457, Pressurizer Pressure and Level Control, Rev 15 Change 1

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following:

- *Unit 2 is operating at Rated Thermal Power*
- *Two banks of Backup Heaters are on in order to recirc the Pressurizer volume*
- *Pressure has stabilized and is not changing*
- *2RC-431A and 2RC-431B PZR Spray Valves, indicate cracked open*
- *Pressurizer Pressure indicates 2235 psig*
- *2HC-431K, Pressurizer Pressure controller is in AUTO*

Which of the following statements is correct concerning the indications on the 2HC-431K, Pressurizer Pressure Controller?

A. The deviation meter indicates approximately +5%. The output meter indicates approximately 50%.

B. The deviation meter is approximately Nulled. The output meter indicates approximately 63%.

C. The deviation meter indicates approximately -5%. The output meter indicates approximately 50%.

D. The deviation meter could be anywhere on scale. The output meter indicates approximately 63%.

Proposed Answer: B

Justification:

Pressurizer Pressure 2HC-431K controller will initially show a positive deviation (~+5%) and an output to ~70% as pressure rises until the spray valves open. After the Spray Valves open the deviation slowly returns to Null (a stable 2235 psig). The Spray Valve(s) stay 'cracked' open to maintain Controller setpoint of 2235 psig. Cracked Open is ~ 63% deviation on the controller.

A **INCORRECT:** Plausible as this is the valve backup heater groups in auto will turn on.

B **INCORRECT:** Plausible as this is the valve backup heater groups in auto will turn off.

C IN**CORRECT:** Plausible as this is Normal deviation, no Spray Demand

D **CORRECT:** See above.

Learning Objective:

DESCRIBE the automatic functions and interlocks associated with the Pressurizer, Level Control, Pressure Control, and Relief System and its major components:

- Pressurizer Pressure
- Pressurizer Level
- Low Temperature Over Pressure Protection

(051.01.LP0457.001)

38. 2021 NRC 038

Which one of the following failures would cause a loop 'A' OPΔT reactor trip SETPOINT to LOWER?

A. Tavg failing LOW

B.✓ Tavg failing HIGH

C. ΔI (delta-flux) failing LOW

D. ΔI (delta-flux) failing HIGH

RO Tier 2 Group 1

Source:
Bank

Question History:
2012 Ginna Retake RO 37

K/A:
012K6.11 Reactor Protection
Knowledge of the effect of a loss or malfunction of the following will have on the RPS: **Trip setpoint calculators**
(Imp 2.9/2.9)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine the effect on RPS trip setpoints due to an impact on OPΔT.

Cognitive Level:
Knowledge 1-I: The operator must recall inputs and the penalty for high temperature.

10 CFR Part 55 Content:
55.41 7
55.45 7

Reference:

STPT 1.3 Unit 1, Reactor Trip OPΔT Unit 1, Rev 22
TS B 3.3.1, Basis Reactor Protection System (RPS) Instrumentation Rev 9

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Which one of the following failures would cause the LOOP 1A-1 OP Delta-T reactor trip SETPOINT to LOWER?

A. Tavg failing LOW

B. Tavg failing HIGH

C. Delta-I failing LOW

D. Delta-I failing HIGH

Proposed Answer: B.

Justification:

Overpower ΔT

$$\Delta T\,sp2 = \Delta To\left[K_4 - K_5\left(\frac{\tau_5 s}{\tau_5 s+1}\right)\left(\frac{1}{1+\tau_4 s}\right)T - K_6\left[T\left(\frac{1}{1+\tau_4 s}\right) - T'\right]\right]$$

See STPT 1.3 U1 for definitions of terms
Tavg failing high will lower the trip setpoint

A **INCORRECT:** Plausible because candidate may not understand the correct OPΔT calculation and not realize the K5 penalty coefficient is 0°F for any temperature less than full power resulting in no change of the setpoint.

B **CORRECT:** See above.

C **INCORRECT:** Plausible is the student has a misconception of the inputs to OP delta T which have an effect.

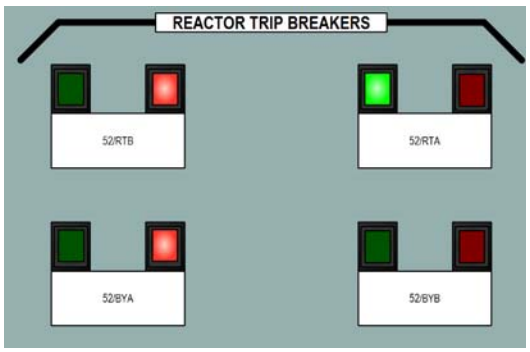
D **INCORRECT:** Plausible is the student has a misconception of the inputs to OP delta T which have an effect.

Learning Objective:

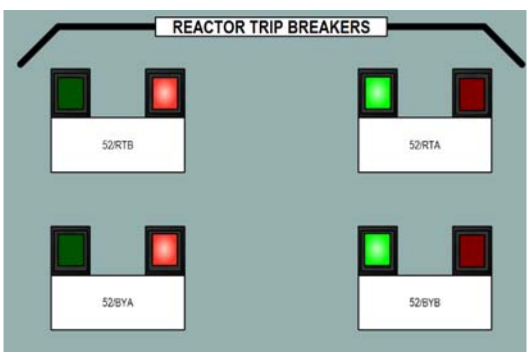
State the equation and describe each term in the equation for Overtemperature and Overpower trips in accordance with design basis documents (053.02.LP0361.007)

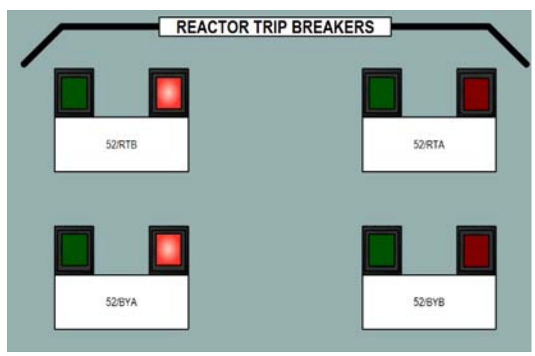
39. 2021 NRC 039
Given the following:

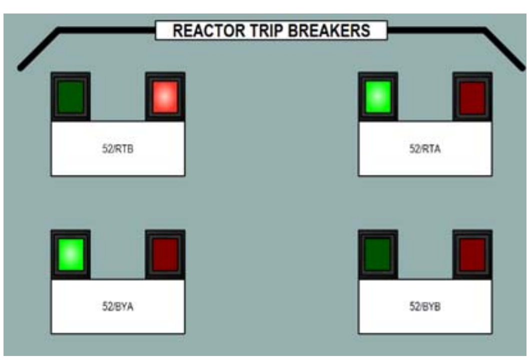
- Unit 1 is at 100% power
- I&C and Operations are performing 1ICP 02.003A, Reactor Protection System Logic Train A 31 Day Surveillance Test, resulting in the current reactor trip breaker configuration shown below:

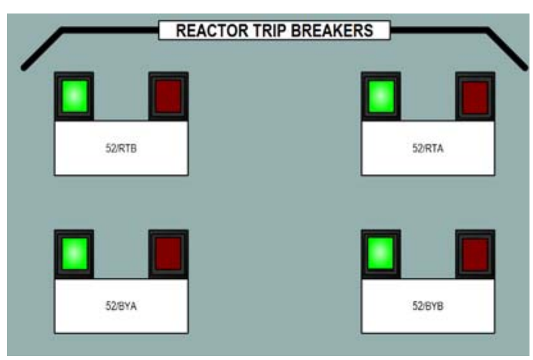


Given the above configuration, if 52/BYB, Bypass Breaker 'B' was racked in, which of the choices below shows the status of the Reactor Trip and Bypass Breakers after one minute?

A. 

B. 

C. 

D.✓ 

RO Tier 2 Group 1

Source:
New

Question History:
None

K/A:
012A4.06 Reactor Protection
Ability to manually operate and/or monitor in the control room: **Reactor trip breakers**
(Imp 4.3/4.3)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the indications for the Reactor Trip Breaker after a manipulation by the Operator in the field.

Cognitive Level:
Comprehension 3-PEO: The operator must recall the information that having both Bypass Breakers racked in at the same time will cause a trip, and determine the indications available in the Control Room of that event.

10 CFR Part 55 Content:
55.41 7
55.45 5 to 8

Reference:
FSAR 7.2.2.3.c.2, page 7.2-14, Version UFSAR 2020
617F354 Sheet 5A, Reactor Trip Breaker Switchgear Train A, Rev 8
617F354 Sheet 5B, Reactor Trip Breaker Switchgear Train B, Rev 9
617F354 Sheet 5C, Reactor Trip Breaker Switchgear Train A & B, Rev 0
6118 E-61 Sheet 2, Turbine Generator Control Turbine Trips, Rev 32

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

Per FSAR 7.2.2.3.c.2 “Bypass breakers are provided to prevent an inadvertent reactor trip when the reactor trip breaker being tested is tripped; however, a valid reactor trip will still occur, if required, by tripping the reactor trip breaker not under test. During normal operation, the bypass breakers are open. Administrative control is used to minimize the amount of time these breakers are closed, and to prevent the simultaneous closure of both bypass breakers. Indication of a closed bypass breaker is provided locally, on the test panel, and on the main control board. Also, ***if both bypass breakers are simultaneously racked in, with one being used for the bypass function, a reactor trip will result***.

A **INCORRECT:** Plausible because this would be correct if there was no interlock between the Bypass Breakers.

B **INCORRECT:** Plausible if the examinee assumes that the interlock which prevents the racking of one Bypass Breaker would not cause a reactor trip.

C **INCORRECT:** Plausible if the examinee assumes the interlock will only cause the other bypass breaker to open.

D **CORRECT:** See above.

Learning Objective:

DESCRIBE the function and/or purpose, design basis, and operation characteristics for the Reactor Protection System in accordance with design basis documents. Description should include

- Major components and their physical construction/ location
    1. Nuclear Instrumentation
    2. Process Protection Instrumentation
    3. Protection Logic Relay Racks
    4. Reactor Trip Switchgear

(053.02.LP0273.001)

40. 2021 NRC 040

Given the following:

- A Unit startup is in progress in accordance with OP 1A, Cold Shutdown to Hot Standby
- RCS Tcold is 170°F and RISING
- RCS pressure is 350 psig and STABLE
- RCS heatup rate is 50°F per hour
- 'A' and 'B' RCS Loops are OPERABLE
- 'B' RCP is running
- The 'A' train of RHR system is running, aligned for shutdown cooling
- The 'B' train of RHR is aligned for injection and OPERABLE
- 'A' and 'B' SI pumps are OPERABLE with control switches in AUTO
- 'A' and 'B' Charging Pumps are FUNCTIONAL and providing normal charging flow

The conditions described above are IMPROPER because . . .

A✓ if the SI pumps were to start, it would overpressurize the RCS.

B. the heatup rate is too high for the RCS temperature and pressure.

C. the number of running charging pumps is a concern due to inadvertent dilution.

D. running one RCP and a RHR pump from opposite trains produces non-uniform core cooling.

RO Tier 2 Group 1

Source:
Bank

Question History:

K/A:
013K4.19 Engineered Safety Features Actuation
Knowledge of ESFAS design feature(s) and/or interlock(s) which provide for the following: **Reason for opening breaker on high-head injection pump.**
(Imp 3.0/3.4)

Justification for K/A Match:
Matches the K/A by requiring the operator identify the reasons the SI pump breaker needs to remain open.

Cognitive Level:
Knowledge 1-B: The operator must determine what makes the lineup improper.

10 CFR Part 55 Content:
55.41 7

Reference:

OP 1A, Cold Shutdown to Hot Standby, Rev 21

Proposed reference to be provided to the applicants during examination:

None

Original Question:

Given the following:

- *A unit startup is in progress in accordance with OP 1A, Cold Shutdown to Hot Standby*
- *RCS Tcold is 120°F and RISING*
- *RCS pressure is 350 psig and STABLE*
- *RCS heatup rate is 50°F per hour*
- *'A' and 'B' RCS Loops are OPERABLE*
- *Only 'B' RCP is running*
- *The 'A' train of RHR system is running, aligned for shutdown cooling*
- *The 'B' train of RHR is aligned for injection and OPERABLE*
- *'A' and 'B' SI pumps are OPERABLE with control switches in AUTO*
- *'A' and 'B' Charging Pumps are FUNCTIONAL and providing normal charging flow*

The conditions described above are IMPROPER because . . .

A. if the SI pumps were to start, it would overpressurize the RCS.

B. the heatup rate is too high for the RCS temperature and pressure.

C. the number of running charging pumps is a concern due to inadvertent dilution.

D. running one RCP and a RHR pump from opposite trains produces non-uniform core cooling.

Proposed Answer: A.

Justification:

Per OP 1A,

IF in MODE 4 with RCS Cold Leg Temperature less than the LTOP enabling temperature in the PTLR OR in MODE 5 OR in MODE 6 with the Reactor Vessel Head ON, THEN ENSURE the LTOP System is OPERABLE per LCO 3.4.12: and 1P-15A, Safety Injection Pump, is rendered INOPERABLE with: Its 4160 volt breaker racked out; OR Its discharge valve shut with operator power removed, its discharge cross-connect shut, and the pump control switch in Pullout.

This is to prevent a mass transient which the LTOP overpressure protection cannot handle.

A **CORRECT:** See above.

B **INCORRECT:** Plausible if the examinee does not recall the maximum allowed heat up rate.

C **INCORRECT:** Plausible because OP 1A limits the number of available charging pumps, but to no more than 2.

D **INCORRECT:** Plausible if the examinee has misconceptions about RCS flowpaths or heatup characteristics.

Learning Objective:

Describe the procedures which govern the operations associated with taking the plant from cold shutdown to hot standby. Description should include significant prerequisites, precautions, and notes associated with each operating procedure requiring consideration by licensed operators.
(055.02.LP0162.001)

41. 2021 NRC 041
Given the following:

- Unit 1 has experienced a Loss of Coolant Accident
- The crew has performed the actions of EOP-0, Reactor Trip or Safety Injection, and has transitioned to EOP-1, Loss of Reactor or Secondary Coolant
- The following conditions exist:
    - Reactor Coolant Pumps are both RUNNING
    - RHR Pumps are both SECURED and in AUTO
    - SI Pumps are both RUNNING
    - RCS pressure is 350 psig and LOWERING
    - Containment pressure is 6 psig and RISING
    - RCS Subcooling is 45 °F and LOWERING SLOWLY
    - Total Aux Feed flow to the Steam Generators is 300 gpm
    - Pressurizer level is 0%
    - RWST level is 70% and LOWERING SLOWLY

Which of the following describes next action that is required by the crew IAW EOP-1?

A. Trip Reactor Coolant Pumps

B.✓ Manually start the RHR Pumps

C. Transition to EOP-1.1, SI Termination

D. Transition to EOP-1.3, Transfer to Containment Sump Recirculation – Low Head Injection

RO Tier 2 Group 1

Source:
New

Question History:
None

K/A:
013G2.1.20 Engineered Safety Features Actuation Systems - ESFAS
Ability to interpret and execute procedure steps.
(Imp 4.6/4.6)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify plant conditions requiring actions and implement those actions.

Cognitive Level:
Comprehension 3-PEO: The operator must analyze the initial condition to determine the actions which are required next.

10 CFR Part 55 Content:
55.41 10
55.43 5
55.45.12

Reference:
EOP-1, Loss of Reactor or Secondary Coolant, Rev 47, Caution for step 13

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

The student must analyze the initial conditions to determine that SI reinitiation criteria is met due to subcooling, and that the RHR pumps need to be manually started, as they will not auto cycle on, per the caution prior to step 13.

A **INCORRECT:** Plausible – SI pumps are running delivering flow, but subcooling is not low enough for the criteria.

B **CORRECT:** See above.

C **INCORRECT:** Plausible if student misinterprets RCS pressure requirement for sump recirc transition.

D **INCORRECT:** Plausible if student misinterprets RWST level requirement for transition to Sump Recirc.

Learning Objective:

Implement the following procedures for the specified condition(s):
a. EOP-1 to determine the proper recovery procedure for a loss of Primary or Secondary Coolant
(031.02.LP0435.010)

42. 2021 NRC 042
Given the following:

- Unit 2 tripped from 100% power
- RCS pressure is 1825 psig and LOWERING
- Containment pressure is 6 psig and RISING
- The crew is performing the actions of EOP-0, Reactor Trip and Safety Injection
- The fourth license is performing Attachment A of EOP-0 and notes the following conditions:
    - 2SW-2907, Cont Vent Coolers Outlet Emer FCV, is full OPEN
    - 2SW-2908, Cont Vent Coolers Outlet Emer FCV, is full CLOSED and can NOT be opened
    - All four Containment Accident Fans (2W-1A1 through 2W-1D1) are running

What is the status of Containment Cooling for Unit 2?

A. The Containment Accident Fans are running without Service Water cooling

B. The Containment Accident Fans are running with half the required Service Water cooling flow for the listed conditions

C.✓ The Containment Accident Fans ONLY are running with the required amount of Service Water cooling flow for the listed conditions

D. The Containment Accident Fans AND Cooling Fans (2W-1A2 through 2W-1D2) are running with the required amount of Service Water cooling flow for the listed conditions

RO Tier 2 Group 1

Source:
New

Question History:
None

K/A:
022K1.01 Containment Cooling
Knowledge of the physical connections and/or cause-effect relationships between the CCS and the following systems: **SWS/cooling system**
(Imp 3.5/3.7)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine Containment Cooling and Service Water System status, given plant conditions.

Cognitive Level:
Comprehension 2-RI: The operator must determine the interaction between Containment Cooling and Service Water, including the consequences or a failure of one or the other.

10 CFR Part 55 Content:
55.41 2 to 9
55.45 7 & 8

Reference:
M-2207 SH 2, Service Water System, Rev 19
UFSAR Section 9.6.2, Updated 2020
MDB 3.2.6 2B31, 480V AC Motor Control Centers, Rev 18
883D195 SH 7, Safeguards Actuation Signal Logic, Rev 25
883D195 SH 8, Safeguards Sequence Logic, Rev 19
883D195 SH 9, Safeguards Sequence Logic, Rev 19

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

2SW-2907 or 2SW-2908, CONT VENT COOLERS OUTLET EMER FCVs, are each 100% capacity, in order to ensure that sufficient containment cooling can be achieved with a single failure.

A **INCORRECT:** Plausible if the student does not remember that the Service Water emergency lines are in parallel, so full flow can be achieved through either valve.

B **INCORRECT:** Plausible if the student does not recall that the 2SW-2907 or 2SW-2908, CONT VENT COOLERS OUTLET EMER FCVs, are each 100% capacity, in order to ensure that sufficient containment cooling can be achieved with a single failure.

C **CORRECT:** See above.

D **INCORRECT:** Plausible if student does not remember that the Containment Cooling Fans trip on 2B03 SI lockout.

Learning Objective:

For the Containment Ventilation System, IDENTIFY and DISCUSS flowpaths, major components, and their physical locations, and interfaces with other major systems.
(051.05.LP0057.002)

43. 2021 NRC 043

Which of the following lists the power supplies for Containment Spray pumps 1P-14A and 2P-14B?

A. 1P-14A – MCC 1B-32; 2P-14B – MCC 2B-42

B.✔ 1P-14A – Bus 1B03; 2P-14B – Bus 2B04

C. 1P-14A – Bus 2B03; 2P-14B – Bus 1B04

D. 1P-14A – MCC 2B-32; 2P-14B – MCC 1B-42

RO Tier 2 Group 1

Source:
Bank

Question History:
2009 Diablo Canyon RO 16

K/A:
026K2.01 Containment Spray System (CSS)
Knowledge of the bus power supplies to the following: **Containment spray pumps**
(Imp 3.4/3.6)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify which set of power supplies is correct.

Cognitive Level:
Knowledge 1-F: The operator must recall the power supplies for the Containment Spray Pumps.

10 CFR Part 55 Content:
55.41 7

Reference:
MDB 3.2.3 Panel 1B03, Rev 19
MDB 3.2.4 Panel 2B04, Rev 14

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Which of the following lists the power supplies for Containment Spray pumps 11 and 12?

A. 11 – Bus G
12 – Bus H

B. 11 – Bus F
12 – Bus G

C. 11 – Bus F
12 – Bus H

D. 11 – Bus H
12 – Bus G

Proposed Answer: A.

Justification:

Containment Spray Pumps are powered from their associated Unit's Train specific bus, unlike other systems which are powered from cross unit busses such as standby steam generator feed pumps, service water pumps, and both service and instrument air. Both B charging pumps can also be alternately powered from the opposite unit as well.

A **INCORRECT:** The Containment Spray Pumps are powered from the safety related 480 VAC busses, not MCCs, plausible if the student incorrectly associates these MCCs with safeguards buses.

B **CORRECT:** See above.

C **INCORRECT:** Containment Spray Pumps are powered from their associated Unit's Train specific bus, plausible is the student incorrectly recalls power supply.

D **INCORRECT:** The Containment Spray Pumps are powered from the safety related 480 VAC busses, not MCCs, plausible if the student incorrectly associates these MCCs with safeguards buses.

Learning Objective:

STATE the power supplies for the Containment Spray System and its major components.
(051.03.LP0064.003)

44. 2021 NRC 044

Given the following:

- A steam line break in Unit 1 Containment caused a Containment Spray actuation

What is the status of the Unit 1 Containment Spray System components THIRTY (30) seconds after the spray actuation signal?

A. Both spray pumps running
All four pump discharge valves shut
Both spray eductor valves shut

B. Both spray pumps running
All four pump discharge valves open
Both spray eductor valves open

C.✓ Both spray pumps running
All four pump discharge valves open
Both spray eductor valves shut

D. Both spray pumps NOT running
All four pump discharge valves open
Both spray eductor valves shut

RO Tier 2 Group 1

Source:
Bank

Question History:
2009 PBNP RO 41

K/A:
026A3.01 Containment Spray System (CSS)
Ability to monitor automatic operation of the CSS, including: **Pump starts and correct MOV positioning**
(Imp 4.3/4.5)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine the component status following an actuation signal.

Cognitive Level:
Knowledge 1-I: The operator must recall the system response to an actuation signal and timing relays.

10 CFR Part 55 Content:
55.41 7
55.45 5

Reference:
883D195 SH 8, Safeguards Sequence Logic, Rev 19
883D195 SH 9, Safeguards Sequence Logic, Rev 19

Proposed reference to be provided to the applicants during examination:
None

Original Question:

GIVEN:

A steam line break in Unit 1 Containment caused a Containment Spray actuation. All equipment responded as required.

What is the status of the Unit 1 Containment Spray System components thirty(30) seconds after the spray actuation?

*A. Both spray pumps running.
All four pump discharge valves shut.
Both spray eductor valves shut.*

*B. Both spray pumps running.
All four pump discharge valves open.
Both spray eductor valves open.*

*C. Both spray pumps running.
All four pump discharge valves open.
Both spray eductor valves shut.*

*D. Both spray pumps secured.
All four pump discharge valves open.
Both spray eductor valves shut.*

Proposed Answer: C.

Justification:

Spray Valves open on spray signal. 10 seconds later, Pumps start. 2 minutes after spray signal, Spray Eductor Valves open

A **INCORRECT:** Plausible. Discharge valves get an open signal from the spray signal.

B **INCORRECT:** Plausible. Spray Eductor valves open 2 minutes after spray signal.

C **CORRECT:** See above.

D **INCORRECT:** Plausible. Spray pumps start 10 seconds after spray signal.

Learning Objective:

STATE the actuation setpoints and EXPLAIN effects of automatic actuations for the following components:

a. Containment Spray Pumps
b. Spray additive valves
c. Containment Spray Valves

(051.03.LP0064.010)

45. 2021 NRC 045

Given the following:

- Unit 1 is performing a startup at middle of life (MOL) per OP 1B, Reactor Startup, following a forced outage
- SHUTDOWN BANKS have been withdrawn
- CONTROL BANKS are being withdrawn
- Atmospheric Dump Valves are being controlled in MANUAL

Which of the following would cause the reactor to go critical PRIOR to the value determined in the Estimated Critical Position (ECP)?
(Assume **no** other operator action)

A. 1MS-2015, SG ‘B’ Atmos Steam Dump fails closed.

B. Steam Generator operating level is reduced from 60% to 50%.

C.✓ A steam leak develops upsteam of 1MS-228, Main Steam Trap isolation.

D. Fifteen (15) gallons of boric acid is added to the Reactor Coolant System.

RO Tier 2 Group 1

Source:
Bank

Question History:
2019 Audit 43

K/A:
039K3.05 Main and Reheat Steam System (MRSS)
Knowledge of the effect that a loss or malfunction of the MRSS will have on the following: **RCS**
(Imp 3.6/3.7)

Justification for K/A Match:
Matches the K/A by requiring the operator to use predict using knowledge which one MRSS events will have a specific effect on the RCS

Cognitive Level:
Comprehension 3-PEO: The operator must understand the initial conditions, and then determine how the distractors will effect the plant / core, and determine which one will cause the reactor to go critical prior to the calculated value

10 CFR Part 55 Content:
55.41 7
55.45.6

Reference:
OP 1B, Reactor Startup, Rev 81 P&L 3.5

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following:

- *The unit is performing a startup at middle of life (MOL) per OP 1B, Reactor Startup, following a forced outage*
- *The SHUTDOWN BANKS have been withdrawn*
- *The CONTROL BANKS are being withdrawn*
- *Atmospheric Dump Valves are being controlled in MANUAL*

Which of the following plant evolutions would cause the reactor to go critical PRIOR to the value determined in the Estimated Critical Position (ECP)? (Assume no other operator action)

A. One Atmospheric Dump Valve fails closed.

B. The Main Steam Isolation Valve Bypass valves are opened.

C. Steam Generator operating level is reduced from 60% to 50%.

D. Fifteen (15) gallons of boric acid is added to the Reactor Coolant System.

Proposed Answer: B

Justification:

A steam leak developing upstream of the trap isolation will not be isolable, and will cause an increase in steam flow which will cause Tave to lower, and since this is MOL the MTC is negative, so that will insert positive reactivity.

A **INCORRECT:** Plausible because this will effect steam flow, and cause Tave to rise, which will insert negative reactivity due to MTC.

B **INCORRECT:** Plausible because a change in steam generator level will cause a change in the RCS, but it will cause a rise in temp which will cause negative reactivity addition due to MTC.

C **CORRECT:** See above.

D **INCORRECT:** Plausible because the addition of boric acid will cause a change in reactivity, but a negative addition, not positive one.

Learning Objective:

RECOGNIZE factors which have contributed to past premature criticality events and DETERMINE how these problems can be avoided.
(055.01.LP0183.001)

46. 2021 NRC 046

What is one of the functions of MFIVs CS-3124/3125, Steam Generator A/B Feedwater Isolation Valves?

To automatically close . . .

A. on Rx Trip to prevent excessive cooldown of the RCS.

B. on high steam generator water level to prevent water carryover into main steam piping.

C.✓ upon receipt of a Safety Injection signal to isolate main feedwater flow to a faulted steam generator.

D. upon receipt of a Containment Isolation signal to limit radiological release from containment during a LOCA.

RO Tier 2 Group 1

Source:
Bank

Question History:
052.02.LP0128.001 005

K/A:
059K4.19 Main Feedwater
Knowledge of MFW design feature(s) and/or interlock(s) which provide for the following: **Automatic feedwater isolation of MFW**
(Imp 3.2/3.4)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify which signal causes a Main Feedwater Isolation.

Cognitive Level:
Knowledge 1-I: The operator must recall which signal causes a MFIV isolation.

10 CFR Part 55 Content:
55.41 7

Reference:

883D195 SH 10, Feedwater Control and Isol Logic, Rev 17
FSAR Section 10.1, Rev UFSAR 2020

Proposed reference to be provided to the applicants during examination:

None

Original Question:

What is the function of CS-3124/3125, Steam Generator A/B Feedwater Isolation Valves?

A. To automatically close on Rx Trip to prevent excessive cooldown of the RCS

B. To automatically close on high steam genetrator water level to prevent water carryover into main steam piping

C. To automatically close upon receipt of a Safety Injection signal to limit feedwater into containment during a steam line break

D. To automatically close upon receipt of a Containment Isolation signal to limit radiological release from containment during a LOCA

Proposed Answer: C.

Justification:

According to FSAR section 10.1, “The MFIVs are pneumatically operated and each have two redundant solenoid valves which energize to close the associated MFIV on a safety injection signal.”

A **INCORRECT:** MFIVs close on an SI signal. Rx Trip causes Main Feed Reg Valves to close.

B **INCORRECT:** MFIVs close on an SI signal. High S/G level causes the Main Feed Reg Valves and the Bypass Feed Control Valves to close.

C **CORRECT:** See above.

D **INCORRECT:** MFIVs close on an SI signal. Containment Isolation does not impact the Main Feedwater System.

Learning Objective:

DESCRIBE the interlocks, automatic actuations, and permissives associated with major components of the Feedwater System.
(052.05.LP0128.004)

47. 2021 NRC 047

Given the following:

- Unit 2 is in MODE 3 following a loss of Feedwater and Condensate 3 minutes ago
- 2P-29, Turbine Driven Auxiliary Feedwater (AFW) Pump is running
- 2P-53, Motor Driven AFW Pump is running
- Both AFW pumps automatically started on Low Steam Generator level

Which one of the below correctly describes the AFW flow response one minute after taking 2AF-4001, 2P-29 AFP DISCH SG A INLET MOV, to FULL CLOSED?

A. 2P-29 Discharge Flow remains the same
2P-53 Discharge Flow remains the same
SG A Total AF Flow remains the same
SG B Total AF Flow remains the same

B✓ 2P-29 Discharge Flow lowers
2P-53 Discharge Flow remains the same
SG A Total AF Flow lowers
SG B Total AF Flow rises

C. 2P-29 Discharge Flow lowers
2P-53 Discharge Flow rises
SG A Total AF Flow remains the same
SG B Total AF Flow remains the same

D. 2P-29 Discharge Flow remains the same
2P-53 Discharge Flow remains the same
SG A Total AF Flow lowers
SG B Total AF Flow rises

RO Tier 2 Group 1

Source:
Bank

Question History:
2011 South Texas RO 6

K/A:
061K5.03 Auxiliary Feedwater
Knowledge of the operational implications of the following concepts as they apply to AFW: **Pump head effects when control valve is shut**
(Imp 2.6/2.9)

Justification for K/A Match:
Matches the K/A by requiring the operator to understand the effect of shutting one AFW valve feeding one Steam Generator and the impact that has on the rest of the system.

Cognitive Level:
Comprehension 3-PEO: The operator must predict what will happen when AFW valves are manipulated.

10 CFR Part 55 Content:
55.41 5
55.45 7

Reference:

M-217 SH 1, Auxiliary Feedwater Sys, Rev 105
M-2217, Auxiliary Feedwater System, Rev 7
DBD-01, Auxiliary Feedwater System Rev 22
FSAR Section 10.2, Rev UFSAR 2020

Proposed reference to be provided to the applicants during examination:

None

Original Question:

GIVEN:

- *AFW Pump 11 is running with a total flowrate of 540 gpm and a discharge pressure of 1550 psig.*
- *AFW Pump 11 is providing equal amounts of AFW flow to Steam Generators (SG) 1A, 1B, and 1C.*

Which one of the below correctly describes the AFW System response as the AFW Regulating Valve for SG 1A is fully closed?

AFW flow to SG 1B and 1C will…

A. rise because the discharge pressure of AFW Pump 11 has gone up.

B. lower because the Auto Recirc Valve for AFW Pump 11 has opened fully.

C. remain the same because the Auto Recirc Valve for AFW Pump 11 has opened to pass 180 gpm.

D. remain the same because QDPS has opened the AFW Reg. Valves for SG 1B and 1C.

Proposed Answer: A

Justification:

Closing 2AF-4001 causes flow to A SG to lower by the amount set by the valve's throttle setting. The closing of the valve causes 2P-29 discharge pressure to rise. This, in turn, will force more flow through the still-throttled 2AF-4000. 2P-53 discharge FCVs, 2AF-4074A & B, are in Automatic, set for ~145 gpm. As flow drops in A SG from 2P-29, backpressure from A SG lowers in the discharge line, causing flow from 2P-53 to rise to the A SG. 2AF-4074A will throttle to maintain flow through that line to 145 gpm. This causes the 2P-53 discharge pressure to rise. But here, 2AF-4074B will throttle to maintain flow to B SG at 145 gpm.

A **INCORRECT:** Plausible if trainee assumes that the flow controls for the remaining AFW lines to the SGs adjust to compensate for the reduction in flow to A SG.

B **CORRECT:** See above.

C **INCORRECT:** Plausible if trainee assumes 2P-53 flow control will compensate for reduction in flow to A SG.

D **INCORRECT:** Plausible if trainee assumes all 2P-29 flow, reduced from A SG, is redirected to B SG

Learning Objective:

DESCRIBE the function and/or purpose, design bases, and operating characteristics of the Auxiliary Feedwater System and major components. (052.05.LP0169.001)

48. 2021 NRC 048

Given the following:

- You are the Third License performing TS 81, Emergency Diesel Generator G-01 Monthly test
- G01, Emergency Diesel Generator (EDG) has just been synchronized to the grid with conditions established for the required 60-minute test run
- The following G01 conditions are noted:
  - KW loading is 3050 KW
  - KVAR loading is 475 KVAR out
  - Amps are 380 A
  - Speed is 900 RPM
  - Voltage is 4150 V

Based on these indications, what actions are you required to take IAW TS 81?

A. Trip the EDG to prevent exceeding the maximum voltage ratings of the supplied loads.

B. Raise diesel speed by going to raise on the governor control switch.

C.✓ Lower KW load by going to lower on the governor control switch.

D. Continue monitoring G01 until the required test run is satisfied.

RO Tier 2 Group 1

Source:
Bank

Question History:
2012 PBNP RO 45

K/A:
062.A1.01 AC Electrical Distribution
Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the AC Distribution System controls including: **Significance of D/G load limits.**
(Imp 3.4/3.8)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify parameters, their limits, and actions to prevent exceeding limits.

Cognitive Level:
Knowledge 1-P: The operator must recall a procedure note and steps concerning EDG limits and determine what action to take.

10 CFR Part 55 Content:
55.41 5
55.45 5

Reference:

TS-81 Emergency Diesel Generator G-01 Monthly test, Rev 95

Proposed reference to be provided to the applicants during examination:

None

Original Question:

You are the Third License performing TS 81, 'Emergency Diesel Generator G-01 Monthly test'. G01 EDG has just been synchronized to the grid with conditions established for the required 60 minute test run. The following G01 conditions are then noted:

KW loading is 2850
KVAR loading is 475 out
Amps are 380
Speed is 900 rpm
Voltage is 4150

Based on these indications, what actions are you going to take?

A. Reduce VARS by going to lower on the voltage regulator control switch.

B. Trip the EDG to prevent exceeding the maximum voltage ratings of the supplied loads.

C. Lower KW load by going to lower on the governor control switch.

D. Continue monitoring G01 until the required test run is satisfied.

Proposed Answer: C.

Justification:

Per TS-81 page 31 for the 60 minute run KW loading should be 2600-2700 kW, 300-800 KVARS and amp are not to exceed 450. Going to lower on the governor will lower KW loading.

A **INCORRECT:** Tripping the diesel can protect it but the given voltage ratings are in the normal band.

B **INCORRECT:** Plausible the examinee must realize the diesel is paralleled and not islanded. This action is correct if speed was not within limits and performed prior to loading the diesel.

C **CORRECT:** See above.

D **INCORRECT:** This would be correct if all the EDG parameters were within specifications.

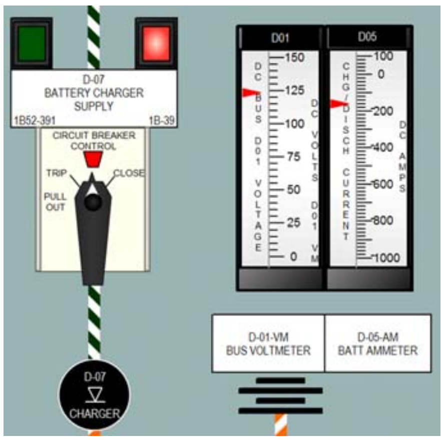
Learning Objective:

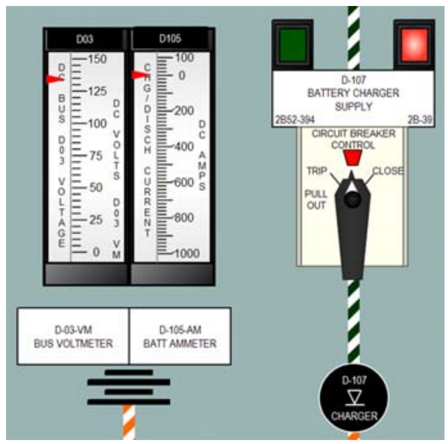
DESCRIBE the procedures which govern the operation of the Diesel Generator System. Description should include significant prerequisites, precautions, and notes associated with each operating procedure requiring consideration by Licensed and Auxiliary Operators.
(054.02.LP0133.006)

49. 2021 NRC 049

Given the following:

- Both Units are at Rated Thermal Power
- Annunciator 2C20 A 1-1, D-07 BATTERY CHARGER TROUBLE alarms
- Annunciator 2C20 A 2-2, D-01/D-03 125V DC BUS UNDER/OVER VOLTAGE alarms
- The AO reports the GROUND light is lit on D-07
- Below is the panel indication from 2C20:





Which of the following answers:
(1) What protective function is the cause for the indications?
AND
(2) What actions are required by the alarm response procedure?

A.✓ (1) D-07 Battery Charger DC Breaker has tripped open
(2) Line up D-09, Battery Charger to D-05, Battery

B. (1) D72-01-01, Feed to D-01 from D-05 Station Battery fuses blown
(2) Line up D-09, Battery Charger to D-05, Battery

C. (1) D-07 Battery Charger DC Breaker has tripped open
(2) Line up D-07, Battery Charger to D-305, Swing Battery

D. (1) D72-01-01, Feed to D-01 from D-05 Station Battery fuses blown
(2) Line up D-07, Battery Charger to D-305, Swing Battery

RO Tier 2 Group 1

Source:
Bank

Question History:
2019 PBNP RO 48 **PREVIOUS 2 EXAMS**

K/A:
063A2.01 DC Distribution
Ability to (a) predict the impacts of the following malfunctions or operations on the DC distribution system, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: **Grounds**
(Imp 2.5/3.2)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine what automatic actions were caused by the ground based on given indications, and what procedural actions will be needed to mitigate the ground.

Cognitive Level:
Comprehension 3-SPK: The operator must understand the initial conditions and determine was automatic action has been caused, and how to restore the system.

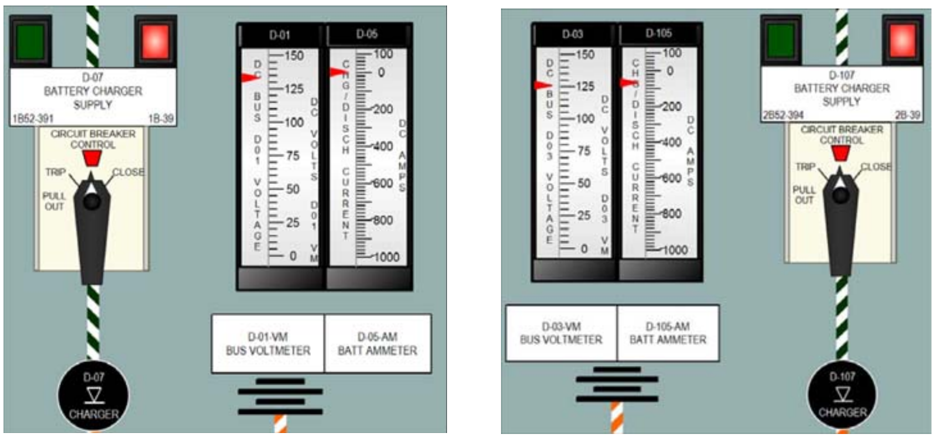
10 CFR Part 55 Content:
55.41 5
55.43 5
55.45 3
55.45 13

Reference:
ARP 2C20 A 1-1, D-07 Battery Charger Trouble Rev 5
ARP 2C20 A 2-2, D-01/D-03 125V DC Bus Under/Over Voltage Rev 6
0-TS-EP-001, Weekly Power Availability Verification, Attachment F Electrical Breaker Alignment and Power Availability Checks 125 V DC Buses, Rev 24 (drawings with breaker numbers)
0-SOP-DC-001, 125VDC System, Bus D-01 & Components, Rev 26

Proposed reference to be provided to the applicants during examination:
None

Original Question:
Given the following:

- *Both units are at Rated Thermal Power*
- *Annunciator 2C20 A 1-3, D-107 BATTERY CHARGER TROUBLE alarms*
- *Annunciator 2C20 A 2-2, D-01/D-03 125V DC BUS UNDER/OVER VOLTAGE alarms*
- *The AO reports the GROUND light is lit on D-107*
- *Below is the panel indication from 2C20:*



Which of the following answers:
(1) What protective function is the cause for the indications?
AND
(2) What actions are required by the alarm response procedure?

A. (1) D-107 Battery Charger DC Breaker has tripped open
(2) Line up D-109, Battery Charger to D-105, Battery

B. (1) D72-03-03, Feed to D-03 from D-105 Station Battery fuses blown
(2) Line up D-109, Battery Charger to D-105, Battery

C. (1) D-107 Battery Charger DC Breaker has tripped open
(2) Line up D-107, Battery Charger to D-305, Swing Battery

D. (1) D72-03-03, Feed to D-03 from D-105 Station Battery fuses blown
(2) Line up D-107, Battery Charger to D-305, Swing Battery

Proposed answer: A

Justification:

With a possible ground indicated on D-07 charger, as indicated by annunciator 2C20 A 1-1, and confirmed by the AO's report, followed by the next annunciator 2C20 A 2-2 and panel readings, indicates that the output breaker from charger D-07 has tripped open. Actions required to restore or line up a charger to the D-01, would be to line up D-09 Battery charger to supply the bus and battery.

A **CORRECT:** See above.

B **INCORRECT:** The first part in incorrect, plausible if the operator has the misconception of the charger powering the bus directly, and this breaker will cause one of the two annunciators (undervoltage), but will not cause the other (charger trouble). The second part is correct.

C **INCORRECT:** The first part is correct. The second part is incorrect, plausible if the operator has a misconception that the ground is located on the battery, this is a physically possible lineup which would line up a battery to D-01.

D **INCORRECT:** The first part in incorrect, plausible if the operator has the misconception of the charger powering the bus directly, and this breaker will cause one of the two annunciators (undervoltage), but will not cause the other (charger trouble).The second part is incorrect, plausible if the operator has a misconception that the ground is located on the battery, this is a physically possible lineup which would line up a battery to D-01.

Learning Objective:

Given access to the site specific simulator or specific plant conditions, RESPOND to the following:

- Loss of a DC bus
- Loss of an Instrumentation Bus

(055.03.LP3456.002)

50. 2021 NRC 050

Given the following:

- G-02, Emergency Diesel Generator is running, supplying 2A-05, 4160 VAC Safeguards Bus
- T-31B, Diesel Generator Day Tank has just completed auto makeup from T-175A, EDG Fuel Oil Storage Tank
- Upon completion of the Day Tank fill, the breaker for P-207A, Fuel Oil Transfer Pump, tripped and will not reset

With no Operator action, how long can G-02 run at 100% load?

A. less than 30 minutes

B. between 30 and 60 minutes

C.✓ between 120 and 300 minutes

D. greater than 7 days

RO Tier 2 Group 1

Source:
New

Question History:
None

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

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the impact of a failure in the fuel oil storage system on EDG operation.

Cognitive Level:
Comprehension 2-DR: The operator must recall the sizes of the fuel tank, and the impact of the tripped pumpt to determine the amount of time the diesel can run.

10 CFR Part 55 Content:
55.41 7
55.45 7

Reference:
FSAR Section 8.8, Rev UFSAR 2017
M-219 SH 1, Unit 1 Fuel Oil System, Rev 51
M-219 SH 2, Fuel Oil System - DG BLDG, Rev 16

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

P-207A feeds T-31B, Day Tank from T-175A. Per FSAR Section 8.8, “A 550 gallon day tank is located near each diesel generator. The capacity of each day tank will allow its associated EDG to run continuously at 100% rated load for at least 120 minutes without makeup.: Also, “An additional 550 gallon storage tank is located in the base of each of the Train A diesels.”

A **INCORRECT:** Plausible if the student cannot recall the effect on the system, diesel fuel consumption and capacity of the tanks.

B **INCORRECT:** Plausible if the student cannot recall the effect on the system, diesel fuel consumption and capacity of the tanks.

C **CORRECT:** See above.

D **INCORRECT:** Plausible as this is the amount of time one EDG can run off of T-175A and T-175B from minimum Tech Spec level.

Learning Objective:

Analyze the effects of component malfunctions on operation of the fuel oil system.
(052.07.LP0374.006)

51. 2021 NRC 051

Given the following:

- G-04, Emergency Diesel Generator is being paralleled to 2A-06, Safeguards 4160V Bus
- 2A52-93, G-04 Diesel Generator to Bus 2A-06 Breaker, is closed with G-04 voltage (INCOMING) slightly greater than Bus 2A-06 (RUNNING)
- The Operating Supervisor has directed that zero (0) KVARs be maintained following paralleling G-04 with 2A-06

Which of the following identifies:
(1) The response of G-04 output voltage after the breaker is closed?
AND
(2) What action should be taken?

A.✔ (1) EDG VAR meter will indicate in the positive (+) VAR (OUT) direction.
(2) Place the G-04 Voltage Control Switch in the LOWER position to adjust VAR load.

B. (1) EDG VAR meter will indicate in the positive (+) VAR (OUT) direction.
(2) Place the G-04 Voltage Control Switch in the RAISE position to adjust VAR load.

C. (1) EDG VAR meter will indicate in the negative (-) VAR (IN) direction.
(2) Place the G-04 Voltage Control Switch in the RAISE position to adjust VAR load.

D. (1) EDG VAR meter will indicate in the negative (-) VAR (IN) direction.
(2) Place the G-04 Voltage Control Switch in the LOWER position to adjust VAR load.

RO Tier 2 Group 1

Source:
Bank

Question History:
2011 Comanche Peak RO 24

K/A:
064A3.05 Emergency Diesel Generators (ED/G)
Ability to monitor automatic operation of the ED/G system, including: **Operation of the governor control of frequency and voltage control in parallel operation**
(Imp 4.2/4.2)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify system conditions and determining proper actions to take.

Cognitive Level:
Comprehension 3-PEO: The operator must predict the outcome of the event.

10 CFR Part 55 Content:
55.41 7
55.45 5

Reference:
TS 84, Emergency Diesel Generator G-04 Monthly, Rev 44

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following conditions:

- *Emergency Diesel Generator (EDG) 1-01 is being paralleled to Safeguards Bus 1EA1.*
- *EDG Breaker 1EG1 is closed with EDG voltage (INCOMING) slightly greater than Safeguards Bus 1EA1 voltage (RUNNING).*
- *The Unit Supervisor has directed that zero (0) KVARs OUT be maintained following paralleling the EDG with the Safeguards Bus.*

Based on the above conditions, which of the following identifies the response of the Emergency Diesel output voltage and what action should be taken?

A. 1.) EDG VAR meter will move in the positive (+) VAR (LAG-OUT) direction.
2.) Place the EDG Voltage Control Switch in the LOWER position to adjust VAR load.

B. 1.) EDG VAR meter will move in the positive (+) VAR (LAG-OUT) direction.
2.) Place the EDG Voltage Control Switch in the RAISE position to adjust VAR load.

C. 1.) EDG VAR meter will move in the negative (-) VAR (LEAD-IN) direction.
2.) Place the EDG Voltage Control Switch in the RAISE position to adjust VAR load.

D. 1.) EDG VAR meter will move in the negative (-) VAR (LEAD-IN) direction.
2.) Place the EDG Voltage Control Switch in the LOWER position to adjust VAR load.

Proposed Answer: A.

Justification:

With EDG voltage greater than bus voltage when the breaker is closed, a positive VAR load will be “supplied by” the G-04. The Voltage Control Switch is placed in LOWER to decrease generator terminal voltage and zero out the VAR load.

A **CORRECT:** See above.

B **INCORRECT:** Plausible because the VAR response is correct, however, this action would only serve to increase the VAR load.

C **INCORRECT:** Plausible because this would be the correct action if generator voltage were lower than Bus 2A-06 voltage when the breaker was closed and it was desired to zero out the VAR load.

D **INCORRECT:** Plausible because the action is correct, however, this VAR response would occur if G-04 voltage were less than Bus 2A-06 voltage.

Learning Objective:

STATE and DESCRIBE the actions necessary for the following conditions/ operations:

c. Establish Diesel Generator Control following a Fast Start

(054.02.LP0133.014)

52. 2021 NRC 052

Given the following:

- Both Units are at Rated Thermal Power
- Service Water Overboard is aligned to Unit 1
- 'A' Waste Distillate Tank is going to be discharged
- Discharge permit has been initiated by Chemistry and an extra CO has been assigned to do detector source checks IAW OI 140B, Standard Radioactive Batch Release
- 1RE-229, Unit 1 SW Overboard Monitor is designated as the release point monitor
- RE-223, Waste Distillate Tank Overboard Monitor is the "At Tank" Monitor

- When the CO arrives at the RMS System Server, he notes that 1RE-229 and RE-223 both indicate “Fail External”

Are these indications expected?

A. No, neither radiation monitor should indicate Fail External.

B. No, 1RE-229 should indicate Fail External until the tank discharge commences but RE-223 should NOT indicate Fail External.

C.✓ No, RE-223 should be indicating Fail External until the tank discharge commences but 1RE-229 should NOT indicate Fail External.

D. Yes, both radiation monitors should indicate Fail External until tank discharge commences.

RO Tier 2 Group 1

Source:
Bank

Question History:
2005 PBNP RO 51

K/A:
073A4.02 Process Radiation Monitoring
Ability to manually operate and/or monitor in the control room: **Radiation monitoring system control panel**
(Imp 3.7/3.7)

Justification for K/A Match:
Matches the K/A by requiring the operator to indicate expected indications being monitored at the RMS Systems Server.

Cognitive Level:
Comprehension 2-DI: The operator must understand the initial condtions, determine what effects the "at tank" position will have on both RE-223 and 229, and determine if that matches the current indications.

10 CFR Part 55 Content:
55.41 7
55.45 5 - 8

Reference:

OI 140B, Standard Radioactive Batch Liquid Release - Waste Distillate Tanks, Rev 13
RMSASRB CI 1RE-229, Service Water Overboard Monitor, Rev 6
RMSASRB CI RE-223, Waste Distillate Tank Overboard Monitor, Rev 6

Proposed reference to be provided to the applicants during examination:

None

Original Question:

Consider the following plant conditions:

- *Both Units are at 100% reactor power.*
- *Service Water Overboard is aligned to Unit 1.*
- *'A' Waste Distillate Tank is going to be discharged.*
- *Discharge permit has been initiated by Chemistry and an extra CO has been assigned to do monitor checks IAW OI-140, Standard Radioactive Batch Release.*
- *1RE-229, Unit 1 SW Overboard Monitor is designated as the release point monitor.*
- *RE-223, Waste Distillate Tank Overboard Monitor is the "At Tank" Monitor.*
- *When the CO arrives at the RMS System Server, he notes that 1RE-229 and RE-223 both indicate “Fail External”.*

Are these indications expected?

A. Yes, Both radiation monitors should indicate Fail External until tank discharge commences.

B. No, neither radiation monitor should indicate Fail External.

C. No, 1RE-229 should indicate Fail External until the tank discharge commences but RE-223 should NOT indicate Fail External.

D. No, RE-223 should be indicating Fail External until the tank discharge commences but 1RE-229 should NOT indicate Fail External.

Proposed Answer: D.

Justification:

RE-223 should be in Fail Ex with no flow, 1RE-229 should indicate normal.

A **INCORRECT:** Plausible, tests student RMS knowledge as RE-232 should be in Fail Ex until discharge starts, since Fail Ex indicates no flow.

B **INCORRECT:** Plausible because it is opposite of the correct answer.

C **CORRECT:** See above.

D **INCORRECT:** Plausible, as 1RE-229 should not indicate Fail Ex with flow going through it, tests the student knowledge of RMS expected conditions and SW alignments.

Learning Objective:

IDENTIFY and DESCRIBE the controls, alarms, and indications associated with RMS Operation.
(053.05.LP0286.006)

53. 2021 NRC 053

Given the following:

- Both Units are at Rated Thermal Power
- A large fish intrusion occurs
- Circ Water Pump Bay levels for **BOTH** units stabilize at -13 feet

Which of the following components are required to be declared inoperable per TLCO 3.7.7, Service Water (SW) System based on Circ Water Pump Bay level?

A. PAB Battery Room Vent Coolers

B.✓ 66' EL Containment Accident Fan Coolers

C. Component Cooling Water Heat Exchangers

D. G01 and G02, Emergency Diesel Generators

RO Tier 2 Group 2

Source:

Bank (Stem was reworded to relate that the Service Water Tech Specs/Operability is affected by the Circ Water Pump Bay level, as that is where the SW pump take a suction. K/A was changed to make the question applicable to the SW system. Question is modified, but not significantly.)

Question History:

2019 PBNP RO 65 **PREVIOUS 2 NRC EXAMS** (Question's original K/A was 075K3.07)

K/A:

076G2.2.39 Service Water
Knowledge of less than or equal to one hour Technical Specification action statements for systems.
(Imp 3.9/4.5)

Justification for K/A Match:

Matches the K/A by requiring the operator to identify the condition that requires a one-hour TS Action.

Cognitive Level:

Knowledge 1-F: The operator must recall the facts of the one-hour TS actions for the Service Water System.

10 CFR Part 55 Content:

55.41 7
55.41.10
55.43.2
55.45.13

Reference:
TRM 3.7.7, Service Water (SW) System Rev 17

Proposed reference to be provided to the applicants during examination:
None

Original Question:
Given the following:

- *Both Units are at Rated Thermal Power*
- *A large fish intrusion occurs*
- *Circ Water Pump Bay levels for BOTH units stabilize at -13 feet*

Which of the following components will cause TLCO 3.7.7, Service Water (SW) System to no longer be met with Circ Water Pump Bay level at -13 Feet?

A. PAB Battery Room Vent Coolers

B. 66' EL Containment Accident Fan Coolers

C. Component Cooling Water Heat Exchangers

D. G01 and G02, Emergency Diesel Generators

Proposed answer:.

Justification:

With Circ Water Pump Bay level being at -13 feet means that 66' EL containment accident fan cooler units need to be declared inoperable immediately (TRMAC 3.7.7.B), which is required to be done at a level of less than -11.5 feet. This is due to loss of suction to the SW pumps

A **INCORRECT:** Plausible, because PAB Battery Room Vent Cooler will be declared inoperable if the forebay temperature is greater than 85°F.

B **CORRECT:** See above.

C **INCORRECT:** Plausible, because Component Cooling Water Heat Exchanges are declared inoperable if the forebay temperature is greater than 85°F.

D **INCORRECT:** Plausible, because G01 and G02 will be declared inoperable if the Circ Water Pump Bay level is less -15 feet.

Learning Objective:

Given specific plant conditions, ASSESS and APPLY Technical Specification Technical Requirements Manual requirements as appropriate. (057.02.LP3410.003)

54. 2021 NRC 054

Given the following:

- Both Units are at Rated Thermal Power
- K2A, Instrument Air (IA) compressor is in CONSTANT
- K2B, Instrument Air (IA) compressor is in AUTO

- An Instrument Air leak develops on the North Air Header in the TDAFW Pump Room
- The supply breaker for 2B-04, 480 V Bus tripped
- Instrument Air Pressure lowers to 82 psig

With no operator action, which of the following describes the Air System (IA and SA) response to this event?

A. K-2A is NOT running
K-2B is RUNNING loaded
Service Air to Instrument Air Backup valves, IA-3014 and IA-3019, are OPEN
Instrument Air Dryer Bypass valves, IA-3000S and IA-3094S, are CLOSED

B. K-2A is NOT running
K-2B is RUNNING loaded
Service Air to Instrument Air Backup valves, IA-3014 and IA-3019, are CLOSED
Instrument Air Dryer Bypass valves, IA-3000S and IA-3094S, are OPEN

C.✓ K-2A is RUNNING loaded
K-2B is NOT running
Service Air to Instrument Air Backup valves, IA-3014 and IA-3019, are OPEN
Instrument Air Dryer Bypass valves, IA-3000S and IA-3094S, are CLOSED

D. K-2A is RUNNING loaded
K-2B is NOT running
Service Air to Instrument Air Backup valves, IA-3014 and IA-3019, are CLOSED
Instrument Air Dryer Bypass valves, IA-3000S and IA-3094S, are OPEN

RO Tier 2 Group 1

Source:
New

Question History:
None

K/A:
078K2.01 Instrument Air System (IAS)
Knowledge of bus power supplies to the following: **Instrument air compressor.**
(Imp 2.7/2.9)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the components that have lost power.

Cognitive Level:
Comprehension 3-PEO: The operator must interpret the impact of the loss of power on the Air systems and then determine system response to the leak.

10 CFR Part 55 Content:
55.41 10
55.43 5

Reference:
MDB 3.2.4 PANEL 2B04, 480 V AC Unit 2, Rev 14
MDB 3.2.5 PANEL 1B32, 480 V AC Motor Control Centers Unit 1, Rev 24
MDB 3.2.6 PANEL 2B42, 480 V AC Motor Control Centers Unit 2, Rev 22
STPT 14.7, Secondary Systems Instrument and Service Air, Rev 23

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

From STPT 14.7 and the listed MDBs, the following are true:

- K-2A power supply – 1B32
- K-2B power supply – 2B42
- At 90 psig (dec) IA pressure - AUTO IA compressor starts
- At 88 psig (dec) SA pressure – STBY SA compressor starts
- At 85 psig (dec) IA pressure - STBY SA compressor starts
- At 85 psig (dec) IA pressure - SA to IA Backup valves OPEN
- At 80 psig (dec) IA pressure – IA Dryer Bypass valves OPEN

2B04 supplies power to 2B42

K-2B is OFF due to loss of power. IA Dryer Bypass valves have not met their OPEN setpoint.

A **INCORRECT:** The first part is wrong, plausible if the student doesn't recall the power supply. The second part is correct.

B **INCORRECT:** The first part is wrong, plausible if the student doesn't recall the power supply.

C **CORRECT:** See above.

D **INCORRECT:** The first part is correct. The second part is wrong, plausible that the instrument air dryer valves would open before the service air backup valves open causing the systems to be cross connected.

Learning Objective:

STATE the power supply for the following Instrument and Service Air components:

a. Instrument and Service Air Compressors
b. Instrument Air Dryers and Dryer Bypass Solenoid valves

(052.06.LP0338.003)

55. 2021 NRC 055

Given the following:

- Unit 2 is at Rated Thermal Power
- Containment Forced Vent is in progress IAW OP-9C, Containment Venting and Purging
- 2P-707B, Containment Forced Vent pump is running
- 2RE-212, Unit 2 Containment Noble Gas Monitor fails to the HIGH ALARM condition

Which of the following automatic actions will occur and what actions will the Unit 2 operators take?

(CVI – Containment Ventilation Isolation)
(CI – Containment Isolation)

A. NO automatic actions will occur.
Operators will compare 2RE-212 readings to other Containment radiation monitors and decide whether forced vent may continue.

B. ONLY CVI will automatically occur.
Operators will need to manually secure 2P-707B, Containment Forced Vent pump, to prevent it from running without a discharge path.

C.✓ ONLY CVI will automatically occur.
Operators will verify that 2P-707B, Containment Forced Vent pump, is off and that 2RM-3200H, Containment Forced Vent pump discharge valve, is closed.

D. BOTH CI and CVI will automatically occur.
Operators will verify 2P-707B, Containment Forced Vent pump, is off, 2RM-3200H, Containment Forced Vent pump discharge valve is closed and that all Containment Isolation Valves repositioned as required.

RO Tier 2 Group 1

Source:
Bank

Question History:
2005 PBNP RO 73 (Question's original K/A was G2.3.9)

K/A:
103K1.02 Containment
Knowledge of the physical connections and/or cause-effect relationships between the containment system and the following systems: **Containment isolation/containment integrity**
(Imp 3.9/4.1)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify consequences of a Rad Monitor impact on CVI and CI.

Cognitive Level:
Comprehension 2-RI: The operator must recognize the interaction between RMS and CVI and CI, including consequences.

10 CFR Part 55 Content:
55.41 2 to 9
55.45 7
55.45 8

Reference:

RMSASRB CI 2RE-212 Contyainment Noble Gas Monitor Unit 2, Rev 11
ARB C01 C 2-8 Containment Ventilation Isolation, Rev 5

Proposed reference to be provided to the applicants during examination:

None

Original Question:

Consider the following Unit 2 conditions:

- Unit 2 is at 100% reactor power.
- Containment Forced Vent is in progress IAW OP-9C, Containment Venting and Purging.
- 2P-707B, Containment Forced Vent pump is running.

IF 2RE-212, Unit 2 Containment Noble Gas Monitor fails to the HIGH ALARM condition, which of the following automatic actions will occur and what actions will the Unit 2 operators take?

NOTE: CVI – Containment Ventilation Isolation
CI – Containment Isolation

A. No automatic actions will occur. Operators will compare 2RE-212 readings to other Containment radiation monitors and decide whether forced vent may continue.

B. CVI will automatically occur. Operators will need to manually secure 2P-707B, Containment Forced Vent pump, to prevent it from running without a discharge path.

C. CVI will automatically occur. Operators will verify that 2P-707B, Containment Forced Vent pump, is off and that 2RM-3200H, Containment Forced Vent pump discharge valve, is closed.

D. CI and CVI will automatically occur. Operators will verify 2P-707B, Containment Forced Vent pump, is off, 2RM-3200H, Containment Forced Vent pump discharge valve is closed and that all Containment Isolation Valves repositioned as required.

Proposed Answer: C.

Justification:

CVI will occur, pump will stop and 3200H will shut.

A **INCORRECT:** Plausible, CVI will automatically occur when RE-212 reaches the HIGH alarm, additionally, the pump will automatically stop on CVI.

B **INCORRECT:** Plausible, CVI will occur, pump will automatically stop and RM-3200H will shut.

C **CORRECT:** See above.

D **INCORRECT:** Plausible, CI does not have an input from RE212.

Learning Objective:

ASSESS the causes of Interlocks, Permissives, and Automatic Functions associated with operation of the Safeguards Actuation System. (053.06.LP0486.020)

56. 2021 NRC 056

Given the following:

- Unit 1 is at Rated Thermal Power
- Control Rods are in AUTOMATIC with Bank D at 220 steps
- The following occurs:
    - N-42, Power Range NI (White) RAPIDLY fails HIGH
    - Control Bank D rods start to drive in

Which answers the following?

Automatic inward rod motion will ___(1)___. Prior to switch operation at the NIS cabinet, rods ___(2)___ be withdrawn manually at 1C04
(Assuming no operator action)

	(1)	(2)
A.✓	stop as the power mismatch signal decays	CANNOT
B.	stop as the power mismatch signal decays	CAN
C.	continue until rods are fully inserted	CANNOT
D.	continue until rods are fully inserted	CAN

RO Tier 2 Group 2

Source:
Bank

Question History:
2018 Millstone RO 64

K/A:
001K1.05 Control Rod Drive
Knowledge of the physical connections and/or cause-effect relationships between the CRDS and the following systems: **NIS and RPS**
(Imp 4.5/4.4)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the cause and effect on CRDs from NI System malfunction.

Cognitive Level:
Comprehension 3-PEO: The operator must predict the outcome of the failure of an NI channel failure, and consequences on the Control Rod System.

10 CFR Part 55 Content:
55.41 2 to 9
55.45 7
55.45 8

Reference:
AOP-6C Unit 1, Uncontrolled Motion of RCCAs, Rev 19
ARB 1C04 1A 4-2, Power Range High Setpoint Channel Alert, Rev 2

Proposed reference to be provided to the applicants during examination:
None

Original Question:

With power initially at 100% power, the following sequence of events occurs:
1. *Power Range NI Channel N44 rapidly fails high.*
2. *Control Bank "D" rods start to drive in.*

Assuming no operator action is taken, complete the following statements about how the Rod Control System responds to this event.

Automatic inward rod motion will (1) . Prior to switch operation at the NIS cabinet, rods (2) be withdrawn manually at MB4.

	(1)	(2)
A.	*stop as the power mismatch signal decays*	*CANNOT*
B.	*stop as the power mismatch signal decays*	*CAN*
C.	*continue until rods are fully inserted*	*CANNOT*
D.	*continue until rods are fully inserted*	*CAN*

Proposed Answer: A.

Justification:

The power mismatch signal (difference in the rate of change between reactor and turbine load) will initially cause rods to drive in due to a rapid increase in auctioneered high NIS power. As rods drive in, Tave decreases. Temperature error will start to offset the inward rod motion signal, and the and the power mismatch signal will decay, since it is not a primary to secondary power mismatch signal ("C" and "D" wrong), but a rate of change signal. This would result in inward rod motion stopping. The overpower rod stop coincidence is 1 of 4 channels, so outward rod motion is blocked until the failed channel is defeated at the NIS cabinets ("A" correct and "B" wrong). "C" and "D" are plausible, since this would be true if a temperature instrument failed high, since temperature error is based on difference between Tave and Tref, not a rate of change between the two. "B" is plausible, since most of the RPS coincidences are 2 of 4 channels, not 1 of 4.

A **CORRECT:** See above

B **INCORRECT:** Plausible since Control Rods will stop moving. However, since coincidence for rod stop is 1 of 4 instead of the normal 2 of 4, the examinee may choose this answer.

C **INCORRECT:** Plausible, since rods cannot be withdrawn prior to switch operations. However, Control Rods will stop when power mismatch decays.

D **INCORRECT:** Plausible since the examinee may assume Control Rods will be able to move since the normal coincidenses are 2 out of 4 and rod stops is a 1 out of 4 coincidense.

Learning Objective:

DESCRIBE system response to the following:
e. Failed NIS Power Range Channel
(053.01.LP1547.008)

57. 2021 NRC 057

Given the following:

- Unit 1 is in MODE 3, cooling down to MODE 5 for a forced outage
- An electrical fault has locked out 345 KV Bus Sections BS1 and BS2
- The crew is responding to the loss of offsite power to Unit 1

Which of the following statements describes the Pressurizer Heater Group(s) that will be available to maintain Pressurizer pressure?

A. All Control and Backup Heater Groups

B. Backup Heater Groups A and B ONLY

C. Control Group E and Backup Heater Group D ONLY

D✓ Control Group E and Backup Heater Groups C and D ONLY

RO Tier 2 Group 2

Source:
Bank

Question History:
2016 South Texas Project RO 9

K/A:
011K2.02 Pressurizer Level Control
Knowledge of the bus power supplies to the following: **PZR heaters**
(Imp 3.1/3.2)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine which Pzr Heaters are without power.

Cognitive Level:
Comprehension 2-RI: The operator must determine the impact on the electric plant from the loss of offsite power and then correlate the impact on the Pressurizer Heaters.

10 CFR Part 55 Content:
55.41 7

Reference:

MDB 3.2.3 Panel 1B01, 480V AC, Rev 14
MDB 3.2.3 Panel 1B02, 480V AC, Rev 15
MDB 3.2.3 Panel 1B03, 480V AC, Rev 19
MDB 3.2.3 Panel 1B04, 480V AC, Rev 15
PBE-7033, Simplified Electrical Power Distribution System, Rev 14

Proposed reference to be provided to the applicants during examination:

None

Original Question:

Following a Loss of Offsite Power (LOOP), which ONE of the following statements describes the Pressurizer heater groups that will be available to maintain Pressurizer pressure?

A. Backup heater groups A and B ONLY

B. Backup heater groups D and E ONLY

C. All Backup heater groups EXCEPT control heater group C

D. All Backup heater groups

Proposed Answer: A.

Justification:

Heater Control Group E is powered from 1B-04, 480 V Safeguards bus.
Heater Backup Group A is powered from 1B-01, 480 V Non-Safeguards bus.
Heater Backup Group B is powered from 1B-02, 480 V Non-Safeguards bus.
Heater Backup Group C is powered from 1B-03, 480 V Safeguards bus.
Heater Backup Group D is powered from 1B-04, 480 V Safeguards bus.
Fast Bus Transfer of 13.8 KV busses should keep 1B-03 and 1B-04 powered.
If not, EDGs G-01 and G-03 will power 1A05 and 1A06, which in turn power 1B-03 and 1B-04, respectively.

A **INCORRECT:** Plausible if Busses 1B-01 and 1B-02 remained energized.

B **INCORRECT:** Plausible but opposite. Heater Groups A & B are non-safeguards power, which is lost on a loss of offsite power.

C **INCORRECT:** Plausible if examine believes only Bus 1B-04 is energized or does not recall the power supplies to the Pzr Heater groups.

D **CORRECT:** See above.

Learning Objective:

STATE the power supplies for the Pressurizer, Level Control, Pressure Control, and Relief System components:

- Pressurizer Heaters

(051.01.LP0078.003)

58. 2021 NRC 058

Given the following:

- Unit 1 is operating at Rated Thermal Power
- Subsequently 1N-41, Power Range failed LOW
- The Shift Manager has directed 1N-41 (Red) be removed from service per 0-SOP-IC-001-RED, Routine Maintenance Procedure Removal of Safeguards or Protection Sensor From Service - Red Channels

Power Range NI RPS actuation coincidence logic will change from __(before removal)__ to __(after removal)__

	Before Removal	After Removal
A.	1 of 3	1 of 3
B.	1 of 3	2 of 3
C.✓	2 of 3	1 of 3
D.	2 of 3	2 of 3

RO Tier 2 Group 2

Source:
New

Question History:
None

K/A:
015K3.02 Nuclear Instrumentation
Knowledge of the effect that a loss or malfunction of the NIS will have on the following: **RPS**
(Imp 4.1/4.2)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine the effect on the RPS system both before and after instrument removal of a failure in the Nuclear Instrumentation System.

Cognitive Level:
Comprehension 3-PEO: Analyze plant conditions and determine system/plant response to the conditions, predicting the outcome.

10 CFR Part 55 Content:
55.41 7
55.45 6

Reference:
883D195 Sh 11 Nuclear Instrument Trip Signals
0-SOP-IC-001-RED, Routine Maintenance Procedure Removal of Safeguards or Protection Sensor From Service - Red Channels

Proposed reference to be provided to the applicants during examination:
None

Justification:

Normal RPS actuation is 2 of 4. With the instrument failing low, the actuation will change to 2 of 3 operable channels, during removal of the instrument from service, the relays are opened, therefore the actuation will be 1 of 3 operable channels after removal.

A **INCORRECT:** The first part is wrong, plausible if the student applies the effect of the NI failing high. The second part is correct.

B **INCORRECT:** The first part is wrong, plausible if the student applies the effect of the NI failing high. The second part is wrong, plausible if the student assumes the low power trips would be reinstated due to the instrument failing low.

C **CORRECT:** See above.

D **INCORRECT:** The first part is correct. The second part is wrong, plausible if the student assumes the low power trips would be reinstated due to the instrument failing low.

Learning Objective:

Assess the effect a loss of Nuclear Instrumentation would have on the Reactor Protection System.
(053.03.LP2416.010)

59. 2021 NRC 059

Given the following:

- Unit 1 has experienced a small break LOCA
- EOP-1.1, SI Termination, is in progress
- The following indications are noted:
    - 1TI-970, Subcooling Monitor 60°F and STABLE
    - 1TI-971, Subcooling Monitor 25°F and STABLE
    - RCS Wide Range Pressure 1210 psig
    - Core Exit Thermocouple avg 545°F

Complete the following:
(1) After comparing the subcooling readings with RCS pressure and CETs, the crew will determine that 1TI-970 is reading . . .
AND
(2) The range of indication of 1TI-970 is from . . .

A. (1) accurately.
(2) -25°F (Superheat) to 150°F Subcooling.

B. (1) **in**accurately.
(2) -25°F (Superheat) to 150°F Subcooling.

C. (1) accurately.
(2) -50°F (Superheat) to 200°F Subcooling.

D✓ (1) **in**accurately.
(2) -50°F (Superheat) to 200°F Subcooling.

RO Tier 2 Group 2

Source:
Modified, based on new second half of question.

Question History:
None

K/A:
017K4.03 In-Core Temperature Monitor System (ITM)
Knowledge of ITM system design feature(s) and/or interlock(s) which provide for the following: **Range of temperature indication**
(Imp 3.1/3.3)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the range of subcooling, which receives input from the core exit thermocouples and is a digital display.

Cognitive Level:
Comprehension 3-SPK: The operator must determine the actual subcooling based on current plant conditions, then recall the indication range of subcooling.

10 CFR Part 55 Content:
55.41 7

Reference:

LP0583, RVLIS/SCM/CET Systems, Rev 8 Slide 87

Proposed reference to be provided to the applicants during examination:

Steam Tables

Original Question:

A small break LOCA has occurred on Unit 1.

- EOP-1.1, SI Termination, is in progress.
- Safety Injection Pump 1P-15A has just been stopped.
- Safety Injection Pump 1P-15B is running.

The following conditions are noted:

- 1TI-970, Subcooling Monitor 200 °F and stable
- 1TI-971, Subcooling Monitor 25 °F and stable
- RCS Wide Range Pressure 1210 psig
- Core Exit Thermocouple avg 545 °F
- Containment pressure 5 psig
- Containment rad levels 4 R/hr

After comparing the subcooling readings with RCS pressure and CETs, the crew will determine that:

A. 1TI-970 is reading accurately, Safety Injection Pump 1P-15A will NOT be started, the crew will continue in EOP-1.1.

B. 1TI-970 is reading inaccurately, Safety Injection Pump 1P-15A will be started to restore subcooling.

C. 1TI-971 is reading accurately, Safety Injection Pump 1P-15A will NOT be re-started, the crew will continue in EOP-1.1.

D. 1TI-971 is reading inaccurately, Safety Injection Pump 1P-15B will be stopped since adequate subcooling exists.

Proposed answer: B

Justification:

Saturation temperature for the current plant pressure is 570°F, with CETs at 545°F, that would make subcooling 25°, and therefore the subcooling monitor is indicating inaccurately.
Being a digital display, the studen should know the range of the indication is 50°F superheated to 200°F Subcooled to determine if it is functioning correctly.

A **INCORRECT:** The first part is wrong, plausible if the student confuses the instrument numbers, or makes an error calculating subcooling. The second part is wrong, plausible as this range will provide all indications required by the EOP network.

B **INCORRECT:** The first part is correct. The second part is wrong, plausible as this range will provide all indications required by the EOP network.

C **INCORRECT:** The first part is wrong, plausible if the student confuses the instrument numbers, or makes an error calculating subcooling. The second part is correct.

D **CORRECT:** See above.

Learning Objective:

Describe the function and or purpose, design bases, theory of operation, and operating characteristics of the Reactor Vessel Level Indication, Subcooling Monitor, and Core Exit Thermocouple System and the major components. (053.07.LP0583.001)

60. 2021 NRC 060

A flammable containment hydrogen concentration could be created...

A.✔ ONLY by an inadequate core cooling situation.

B. ONLY by a pressurizer steam space break.

C. by ANY loss of coolant accident.

D. by EXTENDED operation of the Containment Spray system.

RO Tier 2 Group 2

Source:
New

Question History:
None

K/A:
028K5.03 Hydrogen Recombiner and Purge Control
Knowledge of the operational implications of the following concepts as they apply to HRPS: **Sources of hydrogen within containment**
(Imp 2.9/3.6)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall the sources of hydrogen in containment during an accident.

Cognitive Level:
Knowledge 1-F: The operator must recall the sources of hydrogen in containment during an accident.

10 CFR Part 55 Content:
55.41 5
55.45 7

Reference:
BG EOP-1, Background Loss of Reactor or Secondary Coolant, Rev 37

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

In accordance with BG EOP-1, for step 23, "Note that in order to have the potential for flammable hydrogen concentrations, an inadequate core cooling situation must have already existed."

A **CORRECT:** See above.

B **INCORRECT:** Credible because non-condensible gasses (like hydrogen) can accumulate in the PZR steam space. But there is not enough hydrogen here to create a flammable concentration in containment.

C **INCORRECT:** Credible because any loss of coolant will cause the release of hydrogen gas that is dissolved in the reactor coolant. But there is not enough hydrogen here to create a flammable concentration in containment.

D **INCORRECT:** Credible becuase of the potential for spray chemicals to interact with containment metals, creating hydrogen. But chemical/metal interaction cannot produce this much hydrogen.

Learning Objective:

Describe hydrogen production mechanics during an accident leading to core damage.
(043.03.LP3821.005)

61. 2021 NRC 061
Given the following:

- Both Units are at Rated Thermal Power
- The last refueling outage was one year ago

- A malfunction resulted in level lowering in the Spent Fuel Pool to the lowest edge of the Spent Fuel Pool Gates

Which of the following will go to High Alarm FIRST as a result of the lowering Spent Fuel Pool level?

A.✓ RE-105, Spent Fuel Pool Low Range Monitor

B. RE-214, Auxiliary Building Vent Exhaust Gas Monitor

C. 1RE-216, Containment Fan Cooler Return Monitor

D. RE-220, Spent Fuel Cooling Liquid Monitor

RO Tier 2 Group 2

Source:
New

Question History:
None

K/A:
033A1.02 Spent Fuel Pool Cooling
Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the Spent Fuel Pool Cooling System controls including: **Radiation monitoring systems**
(Imp 2.8/3.3)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine the impact on the RMS system for a malfunction in the Spent Fuel Pool Cooling System.

Cognitive Level:
Comprehension 3-PEO: The operator must recall the location of the radiation monitors, their type and monitored parameter, and the impact of lowering SFP level on those rad monitors.

10 CFR Part 55 Content:
55.41 5
55.45 5

Reference:
STPT 13.1, Area Monitors, Rev 7
STPT 13.4, Effluent Monitors, Rev 17
DBD-13 Fuel Pool Cooling and Filtration Design Basis Document Figure 2-6, Rev 12

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

Normal level in the Spent Fuel Pool (SFP) is 63’ 8”. This is 25 feet above the active fuel. The bottom of the SFP gates is 40’ 8”. This is a loss of 23 feet of water shielding, and leaves only 2’ 11” of water shielding above the fuel. The 10^{th} thickness of water is 24”. This calculates out to a reduction in shielding, measured at RE-105 and RE-135 of 11.5 10^{th}s, or a factor of $10^{-11.5}$.

High alarm for RE-105 is 10 mR/hr and is located next to the SFP. It will alarm due to loss of shielding.

A **CORRECT:** See above.

B **INCORRECT:** Plausible because this rad monitor would alarm if contents of the SFP went airborne. (failed fuel or loose surface contamination)

C **INCORRECT:** Plausible if the student has the misconception that shine will cause the alarm, but the location is PAB 26’east of pipeway #2.

D **INCORRECT:** Plausible if examinee doesn’t realize this is a process monitor on the Service Water System coming out of the SFP HXs and is located PAB 46’ North of Unit 2 Boric acid gas stripper tower.

Learning Objective:

Recognize and Analyze the effects on the Spent Fuel Pool and Spent Fuel Pool Cooling System in the event of:

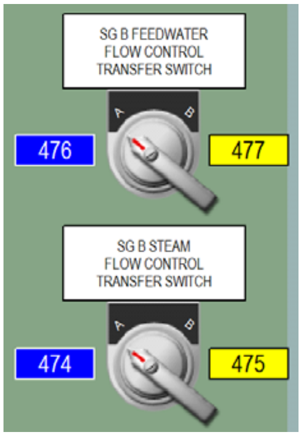
- Loss of Service Water
- Fuel Pool liner leakage
- Interconnecting piping failure

(112.01.LP0110.006)

62. 2021 NRC 062

Given the following:

- Unit 1 is at Rated Thermal Power
- The B Steam Generator (SG) Steam Flow and Feedwater Flow Control Transfer Switches are aligned as follows:



Subsequently:

- 1FT-476, Feedwater Flow Loop B, fails LOW SLOWLY
- Annunciator 1C03 1E2 3-5, STEAM GENERATOR B FEED WATER CHANNEL ALERT, is lit

Which completes the following?

Immediately after the failure, 1CS-476, Steam Generator B FW Regulator CV, will start to go ___(1)___.
AND
In order to restore B SG level control to AUTOMATIC, the Operator will select ___(2)___ in accordance with the ARP 1C03 1E2 3-5?

A. (1) OPEN
(2) SG B Feedwater Flow Control Transfer Switch ONLY to 477 (Yellow)

B✓ (1) OPEN
(2) SG B Feedwater Flow Control Transfer Switch to 477 (Yellow), and SG B Steam Flow Control Transfer Switch to 475 (Yellow)

C. (1) CLOSED
(2) SG B Feedwater Flow Control Transfer Switch ONLY to 477 (Yellow)

D. (1) CLOSED
(2) SG B Feedwater Flow Control Transfer Switch to 477 (Yellow), and SG B Steam Flow Control Transfer Switch to 475 (Yellow)

62. 2021 NRC 062

RO Tier 2 Group 2

Source:
Bank

Question History:
2014 Harris RO 59

K/A:
035A2.04 Steam Generator
Ability to (a) predict the impacts of the following malfunctions or operations on the S/G system, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:
Steam flow/feed mismatch
(Imp 3.6/3.8)

Justification for K/A Match:
Matches the K/A by requiring the operator predict the system response to the malfunction and determine actions based on the governing procedure.

Cognitive Level:
Comprehension 2-RI: The operator must recognize the interaction between the SG level control system and Feed Reg Valves and the implication of this failure on procedural steps to take to correct the plant conditions.

10 CFR Part 55 Content:
55.41 5
55.43 5
55.45 3
55.45 5

Subsequently:

- The controlling 'B' SG Feed Flow channel fails high

- Annunciator ALB-014-4-1B, SG B FW > STM Flow Mismatch, alarms

Which ONE of the following completes the statements below?
Immediately after the failure the 'B' SG FRV will start to go ___(1)___ .
Once 'B' SG level is under operator control, in order to restore 'B' SG automatic water level control the operator will select ___(2)___ in accordance with OWP-RP, Reactor Protection.

A. (1) OPEN
(2) STM GEN B FW Flow Chan 486 ONLY

B. (1) OPEN
(2) STM GEN B FW Flow Chan 486 AND STM GEN B STM Flow Chan 485

C. (1) CLOSED
(2) STM GEN B FW Flow Chan 486 ONLY

D. (1) CLOSED
(2) STM GEN B FW Flow Chan 486 AND STM GEN B STM Flow Chan 485

Proposed Answer: D.

Justification:

Failure of the BLUE Feed Flow Transmitter will cause a false steam flow greater than feed flow condition. This will cause the feedwater control system to open the Feed Reg Valve more, to make up for the perceived reduction in feed flow for the given steam flow.
Per ARP 1C03 1E2, 3-5, for a failure of 1FT-476, the Operator is to place both the feed flow selector and the steam flow selector to the opposite channel

A **INCORRECT:** Plausible. The Feed Reg Valve will go OPEN. But both selectors, not just the failed transmitter's selector, are shifted to the other channel.

B **CORRECT:** See above

C **INCORRECT:** Plausible if the trainee assumes only the failed channel selector is shifted to the opposite channel. However, the Feed Reg Valve will OPEN, not CLOSE.

D **INCORRECT:** Plausible. Both selectors are directed to be shifted to the opposite channel. However, the Feed Reg Valve will OPEN, not CLOSE.

Learning Objective:

IDENTIFY and RESPOND to the following failures/transients:
- Feedwater Control System Malfunctions
- Steam Generator Level Control System Malfunctions

(052.02.LP0131.006)

63. 2021 NRC 063

Given the following:

- Unit 2 is at 16% power following startup
- Turbine is latched and rolling at 1800 RPM
- Main Generator output breaker is open
- Subsequently, the Reactor trips
- Both Circ Water pumps are running
- Condenser Vacuum is 26” Hg
- Tavg is 530°F and LOWERING
- Turbine is still operating

- EOP-0, Reactor Trip or Safety Injection, is in progress and CO2 is carrying out Immediate Actions

Are plant conditions as expected? Why or why not?

A. Conditions as expected, turbine does not automatically trip if <P-9.

B. Conditions **NOT** as expected, turbine should have tripped due to low vacuum.

C.✓ Conditions **NOT** as expected, turbine should have tripped when reactor tripped.

D. Conditions **NOT** as expected, turbine should have tripped when Tavg lowered to 543ºF.

RO Tier 2 Group 2

Source:
Bank

Question History:
2007 PBNP RO 39 (Question's original K/A was 012K1.06)

K/A:
045A3.04 Main Turbine Generator System (MT/G)
Ability to monitor automatic operation of the MT/G system, including: **T/G trip**
(Imp 3.4/3.6)

Justification for K/A Match:
Matches the K/A by requiring the analyze plant condition, including turbine status and determine if automatic actions should have occurred.

Cognitive Level:
Comprehension 3-SPK: The operator must analyze plant conditions, determining if they are normal for the parameters given, and if not, why they are not expected..

10 CFR Part 55 Content:
55.41.7
55.45.5

Reference:
883D195 SH 2, Reactor Trips Rev 9
883D195 SH 3, Turbine Trips Rev 3

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Consider the following Unit 2 conditions:

- *Unit 2 is at 16% power following startup*
- *Turbine is latched and rolling at 1800 RPM.*
- *Main Generator output breaker is open.*
- *Subsequently, Unit 2 Reactor trips.*
- *Both Circ Water pumps are running.*
- *Condenser Vacuum is 26" Hg.*
- *Tavg is 530ºF and lowering.*
- *Turbine is still operating.*

EOP-0, "Reactor Trip or Safety Injection", is in progress and C02 is carrying out Immediate Action steps.

Are plant conditions as expected? Why or why not?

A. Conditions as expected, turbine does not automatically trip if <P-9.

B. Conditions NOT as expected, turbine should have tripped due to low vacuum.

C. Conditions NOT as expected, turbine should have tripped when reactor tripped.

D. Conditions NOT as expected, turbine should have tripped when Tavg lowered to 547ºF.

Proposed answer C

Justification:

The turbine should have tripped with the reactor trip signal, regardless of cause.

A **INCORRECT:** Plausible if the student misapplies the P-9 permissive from the reactor causing a turbine trip.

B **INCORRECT:** Plausible if the student applies the vacuum trip not being met causing the turbine not to have been tripped.

C **CORRECT:** See above.

D **INCORRECT:** Plausible if the student misapplies the respective MSIV isolation signal which if any MSIV is not fully open, will cause the turbine to trip. This signal requires an SI, high steam flow and low tave. Based on the current plant conditions, there is steam flow and low tave, but no SI.

Learning Objective:

Describe the interlocks, actuation setpoints, and permissives associated with major components and operations associated with the Turbine Protection Trip System.
(052.03.LP0021.003)

64. 2021 NRC 064

Given the following:

- A discharge of the 'A' Monitor Tank is in progress

Which of the following would provide the Control Operator indication that WL-18, Waste Condensate Overboard Discharge to SW Header Control Valve, should have automatically closed?

A. The COMMON AREA RADIATION MONITOR HIGH annunciator alarms.

B.✓ RE-218, Waste Disposal System Liquid Monitor, status indication on PPCS changes from green to red.

C. RE-223, Waste Distillate Tank Overboard Monitor, status indication on PPCS server changes from green to blue.

D. The status light for WL-18, Waste Condensate Overboard to SW header control valve is lit on the Containment Isolation Panel.

RO Tier 2 Group 2

Source:
Bank

Question History:
2015 PBNP RO 63 (Question's original K/A was 068A4.04)

K/A:
068A4.03 Liquid Radwaste System (LRS)
Ability to manually operate and/or monitor in the control room: **Stoppage of release if limits exceeded**
(Imp 3.9/3.8)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall what control room indications will cause the stoppage of a release if limits are exceeded.

Cognitive Level:
Knowledge 1-I: The operator must recall the control room indications for liquid Radwaste system.

10 CFR Part 55 Content:
55.41 7
55.45 5 - 8

Reference:
RMSASRB CI RE-218, Waste Disposal System Liquid Monitor, Rev 5

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following:

- *A discharge of the 'A' Monitor Tank is in progress*

Which of the following would provide the Control Operator indication that WL-18, Waste Condensate Overboard Discharge to SW Header Control Valve, should have automatically closed?

A. The COMMON PROCESS RADIATION MONITOR HIGH annunciator alarms.

B. RE-218, Waste Disposal System Liquid Monitor, status indication on the RMS server changes from green to red.

C. RE-223, Waste Distillate Tank Overboard Monitor, status indication on the RMS server changes from green to blue.

D. The status light for WL-18, Waste Condensate Overboard to SW header control valve is lit on the Containment Isolation Panel.

Proposed answer: B

Justification:

The control room indication is that RE-218 status on the RMS server will change from green to read. Automatic actions will stop the discharge.

A **INCORRECT:** This is incorrect due to this alarm can be caused by a number of monitors, but not RE-218. Plausible is the operator asumes this alarm will be caused by RE-218 as it is a process monitor.

B **CORRECT:** See above.

C **INCORRECT:** RE-223 will cause an automatic operation if a high alarm condition exists, the indication on RMS server indicated that the point has gone bad. Plausible if the student expects a bad input to cause a closure signal, and does not understand the system layout.

D **INCORRECT:** There are Liquid Waste system valve indications on the Containment Isolation panel, but WL-18 is not one of them. Plausible if the student assumes the isolation panels will indicate for overboard discharges.

Learning Objective:

Identify and describe the controls, alarms, and indications associated with the Liquid Waste Disposal System (WL) including:
a Location and function of components and/or system operating controls and (051.04.LP0063.005)

65. 2021 NRC 065
Given the following:

- Both units are at Rated Thermal Power
- Unit 2 is aligned for ice melt
- 1P-30A and 2P-30B, Circulating Water Pumps, are currently in service

- Subsequently 1P-30A has developed a severe motor bearing failure requiring the pump to be secured immediately

Which of the following is negatively impacted, or potentially impacted, directly by the loss of 1P-30A?

A. Supply to the fire system header

B. Supply to the Water Treatment system

C.✓ Discharge path and dilution water for radioactive releases

D. Cooling supply to the Steam Generator Blowdown system

RO Tier 2 Group 2

Source:
Bank

Question History:
052.01.LP0151.001 003

K/A:
075G2.1.27 Circulating Water
Knowledge of system purpose and/or function.
(Imp 3.9/4.0)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall the purposes/ functions of the Circulating Water System.

Cognitive Level:
Knowledge 1-B: The operator must recall function/purpose of the Circ Water System.

10 CFR Part 55 Content:
55.41 7

Reference:
FSAR 1.2.4, Summary Plant Description, version UFSAR 2020
FSAR Section 10.1, Steam and Power Conversion System, version UFSAR 2020

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Which of the following functions is normally supported by the Circulating Water System?

A. Supply to the fire system header

B. Supply to the Water Treatment system

C. Condense steam in the Steam Generator Blowdown system

D. Provide a discharge path and dilution water for radioactive releases

Proposed Answer: D.

Justification:
Circulating Water provides for dilution of liquid Radwaste discharges.

A **INCORRECT:** This is a function of both the Fire Protection System and Service Water System.

B **INCORRECT:** This is a function of the Service Water System.

C **CORRECT:** See above.

D **INCORRECT:** This is a function of the Condensate System.

Learning Objective:
DESCRIBE the function and/or purpose, design bases, and operating characteristics of the Circulating Water System.
(052.01.LP0151.001)

66. 2021 NRC 066
Given the following:

- You are a licensed Reactor Operator that was assigned to the Work Control Center (Staff CO) on 9/1/2020
- Both Units have remained at RTP while assigned to the Work Control Center
- You are current in maintaining qualification in the Licensed Operator Requalification Training Program
- The date is February 23, 2021 and you are preparing to return to shift duties

The times you were on shift since this assignment is as follows:
- 8 hours on September 18, 2020 as Unit 1 CO
- 8 hours on September 19, 2020 as Unit 1 CO
- 8 hours on October 27, 2020 as Unit 2 CO
- 8 hours on October 28, 2020 as Unit 2 CO
- 8 hours on November 23, 2020 as Third CO
- 8 hours on November 22, 2020 as Third CO
- 8 hours on December 24, 2020 as Third CO

Which of the following describes the status of your license in accordance with OM 3.10, Operations Personnel Assignments and Scheduling?

A. You may stand watch with no restrictions.

B. You must regain qualification as RO by standing three (3) additional 8-hour shifts in the Unit 1 or Unit 2 CO position.

C. You must reactivate your license by standing two (2) additional 8-hour shifts in any CO position.

D.✓ You must reactivate your license by standing forty (40) hours on shift under instruction in any CO position.

RO Tier 3

Source:
Bank

Question History:
2009 PBNP RO 66

K/A:
G2.1.1 Conduct of Operations
Knowledge of conduct of operations requirements.
(Imp 3.8/4.2)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the status of their license, which is part of the conduct of operations.

Cognitive Level:
Comprehension 3-SPK: The operator must determine the number of watches stood in the current quarter, and then recall the requirement and compare the two.

10 CFR Part 55 Content:
55.41 10
55.45 13

Reference:
OM 3.10 operator Personnel Assignments and Scheduling section 4.4 and 4.5, Rev 43

Proposed reference to be provided to the applicants during examination:
None

Original Question:

You are a licensed Reactor Operator and were assigned to the Work Control Center on 9/1/08. Both Units have remained at RTP while assigned to the Work Control Center.

You are current in maintaining qualification in the Licensed Operator Requalification Training Program.

The date is February 23, 2009 and you are preparing to return to shift duties.

The time you were on shift since this assignment is as follows:
- *8 hours on September 18, 2008 as Unit 1 CO*
- *8 hours on September 19, 2008 as Unit 1 CO*
- *8 hours on October 27, 2008 as Unit 2 CO*
- *8 hours on October 28, 2008 as Unit 2 CO*
- *8 hours on November 23, 2008 as Third CO*
- *8 hours on November 22, 2008 as Third CO*
- *8 hours on December 24, 2008 as Third CO*

Which of the following describes the status of your license in accordance with OM 3.10, "Operations Personnel Assignments and Scheduling"?

A. Your license is active. You may stand watch with no restrictions.

B. Your license is active. You must regain qualification as RO by standing three (3) additional 8-hour shifts in the Unit 1 or Unit 2 CO position.

C. Your license is inactive. You must reactivate your license by standing two (2) additional 8-hour shifts in any CO position.

D. Your license is inactive. You must reactivate your license by standing forty (40) hours on shift under instruction in any CO position.

Proposed Answer: D.

Justification:

Watchstanders are required to maintain qualification and know the requirements necessary to maintain qualifications. Per OM 3.10, section 4.4.1.a, Staff COs maintain their licenses active by standing Operator-At-The-Controls watches only. Seven 8-hour watches or 5 12-hour watches.

Last calendar quarter did not stand 7 OATC watches.

A **INCORRECT:** License is inactive due to insufficient hours last quarter.

B **INCORRECT:** Plausible; while the proficiency watches must be either CO1 or CO2, re-activation requires 40 hours of activation watches.

C **INCORRECT:** Re-activation requires 40 hours of activation watches in the OATC positions (CO1 or CO2).

D **CORRECT:** See above.

Learning Objective:

Knowledge of conduct of operations requirements
(SD 86.1.2.1.1)

67. 2021 NRC 067

Which of the following components would require double isolation while creating a clearance boundary?

A. P-87, Lube Oil Storage Tank Pump

B. P-207A, G02 Fuel Oil Transfer Pump

C. T-33B, Instrument Air Receiver

D.✓ P-313A, Sodium Hypochlorite Pump

RO Tier 3

Source:
Bank

Question History:
2012 PBNP RO 67

K/A:
G2.1 .26 Conduct of Operations
Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen).
(Imp 3.4/3.6)

Justification for K/A Match:
Matches K/A by requiring the operator to recall procedure requirement for double valve isolation as it applies to industrial safety.

Cognitive Level:
Knowledge 1-P: The operator must recall the requirements of double valve isolation when tagging.

10 CFR Part 55 Content:
55.41 10
55.45 12

Reference:
OP-AA-101-1000 Fleet Clearance and Tagging, Rev 30
AOP-12A, Oil, Hazardous Material and Radioactive Materials Spill, Rev 45

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Which of the following components would require double isolation while creating a clearance boundary?

A. P-87, Lube Oil Storage Tank Pump

B. P-207A, G02 Fuel Oil Transfer Pump

C. T-33B, Instrument Air Receiver

D. P-42A, Water Treatment Acid Pump

Proposed Answer: D.

Justification:
Per OP-AA-101-1000 Fleet Clearance and Tagging high energy or hazardous systems require double isolation whenever possible. AOP-12A considers this a hazardous substance.

A **INCORRECT:** Plausible as lube Oil is flammable and an environmental hazard but not considered hazardous for double isolation.

B **INCORRECT:** Plausible as fuel oil is flammable but not considered hazardous requiring double isolation.

C **INCORRECT:** Plausible as Air pressure is high than other system, but does not get high enough to be considered high energy.

D **CORRECT:** See above.

Learning Objective:
Knowledge of industrial safety procedures (such as rotating equipment, electrical, hi-hi temperature, high pressure, caustic, chlorine, oxygen and hydrogen).
(SD 86.1.2.1.26)

68. 2021 NRC 068
Given the following:

- Unit 2 is at Rated Thermal Power
- The Unit 2 OATC is preparing to perform a normal dilution to the RCS to lower boron concentration, in accordance with OP 5B, Blender Operation/Dilution/Boration, Attachment B, DILUTE

Which completes the following?

A second licensed operator will ___(1)___ the performance of Attachment B, DILUTE, which ___(2)___ be waived during ABNORMAL operations.

A.✓ (1) peer check
(2) can

B. (1) peer check
(2) can **NOT**

C. (1) independently verify
(2) can

D. (1) independently verify
(2) can **NOT**

RO Tier 3

Source:
Bank

Question History:
2019 South Texas Project RO 2

K/A:
G2.1.37 Conduct of Operations
Knowledge of procedures, guidelines, or limitations associated with reactivity management.
(Imp 4.3/4.6)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the guidelines for reactivity management as concerns peer checks.

Cognitive Level:
Knowledge 1-P: The operator must recall procedure steps directing peer checks for reactivity manipulations and when peer checks can be waived.

10 CFR Part 55 Content:
55.41 1
55.43 6
55.45 6

Reference:
OP-AA-103-1000, Reactivity Management, Rev 13

Proposed reference to be provided to the applicants during examination:
None

Original Question:

The Primary RO has just completed a routine dilution and is aligning the Makeup system for automatic operation in accordance with 0POP02-CV-0001, Makeup to the Reactor Coolant System.

A second RO will (1) the performance of Form 4, Modes 1-2 Automatic Operation Checklist, which (2) be waived during abnormal operations.

A. (1) peer check
(2) can

B. (1) peer check
(2) can NOT

C. (1) independently verify
(2) can

D. (1) independently verify
(2) can NOT

Proposed Answer: A.

Justification:

Per OP-AA-103-1000, Section 3.7, .14.d and 19, state the following, respectively:

- If the manipulation involves rod movement, turbine adjustment, or for PWR, and **RCS dilution**, boration, or makeup, obtain a **peer check**.

- Each licensed operator shall be responsible for reducing power or initiating a manual reactor scram if a key safety parameter deviates from an expected condition or if it is believed necessary to assure nuclear safety. Due to time considerations, **peer checking is desired, but NOT required in these conditions**.

A **CORRECT:** See above

B **INCORRECT:** Plausible because a peer check is required for reactivity manipulations. However, during abnormal conditions, peer checks are not required.

C **INCORRECT:** Plausible because peer checks can be waived in abnormal conditions. However, peer check is required, not independent verification.

D **INCORRECT:** Plausible however, peer check is required. Not independent verification. And the peer check can be waived for abnormal conditions.

Learning Objective:

Knowledge of procedures, guidelines, or limitations associated with reactivity management.
(SD 86.1 2.1.37)

69. 2021 NRC 069

Given the following:

- 1P-27A, Heater Drain Tank pump, needs to have its internals replaced due to a manufacturer recall notice.

In what order are the components tagged for hanging the Clearance of 1P-27A?

A. Suction Valve, Discharge Valve, Motor Breaker

B. Motor Breaker, Suction Valve, Discharge Valve

C.✓ Motor Breaker, Discharge Valve, Suction Valve

D. Discharge Valve, Suction Valve, Motor Breaker

RO Tier 3

Source:
Bank

Question History:
2012 Byron RO 69

K/A:
G2.2.13 Equipment Control
Knowledge of clearance and tagging procedures.
(Imp 4.1/4.3)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall requirements of the Clearance and Tagging procedure.

Cognitive Level:
Knowledge 1-P: The operator must recall the procedure step describing isolation sequence while tagging a piece of equipment.

10 CFR Part 55 Content:
55.41 10
55.45 13

Reference:
OP-AA-101-1000, Clearance and Tagging, Attachment 4 Section 8.3.1, Rev 30

Proposed reference to be provided to the applicants during examination:
None

Original Question:

In what order are the components tagged during a pump Clearance Order placement?

A. Discharge Valve, Suction Valve, Control Switch, Motor Breaker

B. Control Switch, Motor Breaker, Suction Valve, Discharge Valve

C. Control Switch, Motor Breaker, Discharge Valve, Suction Valve

D. Discharge Valve, Suction Valve, Motor Breaker, Control Switch

Proposed Answer: C.

Justification:
The breaker is first tagged to prevent starting the motor before the valves are closed. Discharge, then suction valve to protect pump and lower pressure-rated equipment.
The distractors are commonly confused variations on the correct answer.

A **INCORRECT:** Plausible because the order will isolate the pump. However, electrical isolation must come first.

B **INCORRECT:** Plausible because electrical isolation is first. However, the discharge valve is shut before the suction valve

C **CORRECT:** See above.

D **INCORRECT:** Both the valve order and the electrical isolation order are backwards.

Learning Objective:
Knowledge of clearance and tagging procedures.
(PBN SD 86.2 2.2.13)

70. 2021 NRC 070

In accordance with EN-AA-205-1102, Temporary Configuration Changes, which one of the following situations would require the use of the temporary modification process?

A. Using non-intrusive test instruments to monitor and take amperage readings of a Turbine Building Supply fan.

B. Installation of a ladder to access valves during performance of an Ops service water flushing call up.

C. A temporary hose is connected to a system drain and directed to a floor drain.

D.✓ A temporary power supply is aligned to a non-safeguards component.

RO Tier 3

Source:
Bank

Question History:
02.02.11.01 003

K/A:
G2.2.14 Equipment Control
Knowledge of the process for controlling equipment configuration or status.
(Imp 3.9/4.3)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall requirement to control temporary configuration changes.

Cognitive Level:
Knowledge 1-P: The operator must recall the procedural requirements for temporary configuration changes.

10 CFR Part 55 Content:
55.41 10
55.43 3
55.45 13

Reference:
EN-AA-205-1102, Temporary Configuration Changes, Attachment 1, Rev 17

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:
EN-AA-205-1102, Attachment 1 specifies what are TCCs. A temporary power supply is considered a TCC per attachment 1 step 18.

A **INCORRECT:** Plausible because this is an example that is listed in the procedure, but is an example of an activity where a TCC is not required.

B **INCORRECT:** Plausible if the examinee considered this as test equipment.

C **INCORRECT:** Plausible because this is an example that is listed in the procedure, but is an example of an activity where a TCC is not required.

D **CORRECT:** See above

Learning Objective:
Knowledge of the process for controlling equipment configuration or status. (PBN SD 86.2 2.2.14)

71. 2021 NRC 071
Given the following:

- Both Units are at Rated Thermal Power
- While performing an Operating Procedure (OP) the current procedure step requires the use of a Level 2 Assigned Operator for a normally locked shut containment isolation valve (CIV) that will be opened.

Which completes the following:
The CIV (and associated containment penetration) are ___(1)___ while the CIV is open.
AND
The Level 2 Assigned Operator ___(2)____ required to remain at the CIV while it is open.

	(1)	(2)
A.✓	OPERABLE	is
B.	inoperable	is
C.	OPERABLE	is not
D.	inoperable	is not

RO Tier 3

Source:
New

Question History:
None

K/A:
G2.2.37 Equipment Control
Ability to determine operability and/or availability of safety related equipment.
(Imp 3.6/4.6)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine is a generic safety related valve (CIV) is considered operable based on a change in valve position.

Cognitive Level:
Knowledge 1-P: The operator must recall the is the valve is operable based on the change in position from locked shut to open, and if the level 2 operator is required to remain on station while the valve is not in the required position.

10 CFR Part 55 Content:
55.41 7
55.43 5
55.45 12

Reference:
OM 3.26, Use of Dedicated / Assigned Operators, Rev 16

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

Per OM 3.26, the use of the individual is required when containment operability is required, and is responsible for restoring the valve/penetration to its required lineup position, this is the purpose for stationing an level 2 assigned operator. The operator shall remain stationed at the valve or valve controls.

A **CORRECT:** See above.

B **INCORRECT:** The first part is wrong, the valve and penetration will not be considered inoperable since it is procedurally allowed, and this is the purpose of the Level 2 Dedicated Operator. The second part is correct.

C **INCORRECT:** The first part is correct. Plausible is the examinee makes the assumption that since the valve is still capable of being shut, it is still operable. The second part is wrong, plausible is the examinee applied the containment closure requirement during refueling which do not require the operator to remain on station, but be able to operate the required components with a required time frame.

D **INCORRECT:** The first part is wrong, the valve and penetration will not be considered inoperable since it is procedurally allowed, and this is the purpose of the Level 2 Dedicated Operator. The second part is wrong, plausible is the examinee applied the containment closure requirement during refueling which do not require the operator to remain on station, but be able to operate the required components with a required time frame.

Learning Objective:

Ability to determine operability and/or availability of safety related equipment. (PBN SD86.2 2.2.37)

72. 2021 NRC 072

Given the following:

You are required to make one or more entries into the Unit 2 Containment

- Dose rates at the work site are 150 mrem/hour
- Your current TEDE dose for the year is 1525 mRem

What is the maximum time you can spend in that area without exceeding your NextEraEnergy Administrative dose limits?

A. 1 hour

B.✔ 3 hours

C. 10 hours

D. 23 hours

RO Tier 3

Source:
New

Question History:
None

K/A:
G2.3.4 Radiation Control
Knowledge of radiation exposure limits under normal or emergency conditions.
(Imp 3.2/3.7)

Justification for K/A Match:
Matches the K/A by requiring the operator to determine stay time before exposure limits will be exceeded.

Cognitive Level:
Comprehension 3-SPK: The operator must solve a problem using their knowledge of radiation exposure limits and personal and plant conditions.

10 CFR Part 55 Content:
55.41 12
55.43 4
55.45 10

Reference:
NP 4.2.14, Administrative Dose Levels/ Dose Level Extension Procedure, Rev 11

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:
Per NP 4.2.14, the annual TEDE limit is 2 Rem/yr (2000 mRem/yr).
Since the individual already has 1525 mRem dose, they have 475 mRem left for the year.
475 mRem divided by 150 mRem/hr = 3.16 hours

A **INCORRECT:** Plausible if the examinee miscalculates the available dose left.

B **CORRECT:** See above

C **INCORRECT:** Plausible if miscalculates using their current TEDE as the dose left.

D **INCORRECT:** Plausible if the examinee uses the Federal TEDE dose limit instead of the admin limit.

Learning Objective:
Knowledge of radiation exposure limits under normal or emergency conditions. (SD86.3 2.03.04)

73. 2021 NRC 073

Given the following:

- While performing steps in the EOP Network, the OS reads a caution
- Subsequently, the crew transitions to a RED path CSP due to degrading conditions

The caution. . .

A. is no longer applicable regardless of transition

B✓ is no longer applicable until that EOP is returned to

C. remains applicable if it does not interfere with CSP actions

D. remains applicable until superseded by alternate guidance in the CSP

RO Tier 3

Source:
Bank

Question History:
055.01.LP3959.001 003

K/A:
G2.4.20 Emergency Procedures / Plan
Knowledge of the operational implications of EOP warnings, cautions, and notes.
(Imp 3.8/4.3)

Justification for K/A Match:
Matches the K/A by requiring the operator to recall knowledge of how to apply cautions to a procedure/procedure steps thus demonstrating the operational implications of cautions.

Cognitive Level:
Knowledge 1-P: The operator needs to recall how cautions are applied while performing an AOP.

10 CFR Part 55 Content:
55.41 10
55.43 5
55.45 13

Reference:
OM 3.7, AOP and EOP Procedure Usage for Response to Plant Transients, Rev 33

Proposed reference to be provided to the applicants during examination:
None

Original Question:
While performing steps in an Abnormal Operating Procedure (AOP) you come to a box labeled CAUTION.

What are the requirements regarding this Caution if it is applicable to current plant conditions?

A. The Caution is required to be read out loud to the applicable board operator(s) and applies to the previous steps in the AOP.

B. The Caution is required to be placekept, and read out loud to the applicable board operator(s) every time it applies in the AOP.

C. The Caution is required to be placekept, read out loud to the applicable board operator(s) and applies only to the next step in the AOP.

D. The Caution is required to be placekept, read out loud to the applicable board operator(s) and applies to the next and all additional steps in the AOP.

Proposed answer: D

Justification:

Per OM 3.7, the following rules apply:

-Notes and cautions that are applicable when a transition is made are only applicable after the transition is made if identified in the new procedure.

-Implied continuous actions may be contained in steps, notes or cautions. If a RED or ORANGE path CSP is entered, implied continuous actions should not be performed, if the operator is returned to the suspended EOP/ECA after the CSP has been completed, performance of the implied continuous action should resume.

A **INCORRECT:** Plausible as this is how to apply cautions when they do not contain an implied continuous action, and given the initial conditions, when step and procedure in effect are returned to, the crew will be at a step with the caution preceding it, so that caution will apply upon transition as will all preceding notes and cautions within that procedure.

B **CORRECT:** See above.

C **INCORRECT:** Plausible as this is how implied continuous action contained in cautions that have not been performed yet will be dealt with if the transition in the question stem was to an EOP/ECA, and not a CSP.

D **INCORRECT:** Plausible as this is how implied continuous action in cautions which are being performed will be dealt with if the transition in the question stem was to an EOP/ECA, and not a CSP.

Learning Objective:

Knowledge of the operational implications of EOP warnings, cautions, and notes.
(SD86.2 2.4.35)

74. 2021 NRC 074

Concerning OM 3.10, Operations Personnel Assignments and Scheduling, Section 4.19, EP Responder/ Fire Brigade eSOMS Login and Fire Brigade Response Requirements…

The Fire Brigade shall consist of at least ___(1)___ members.

The Fire Brigade Leader and at least ___(2)___ brigade member(s) shall be either fully qualified Auxiliary Operator(s) or Primary Auxiliary Building qualified Auxiliary Operator Trainee(s), as well as being Fire Brigade qualified.

A. (1) 4
(2) 1

B. (1) 4
(2) 2

C. (1) 5
(2) 1

D✓ (1) 5
(2) 2

RO Tier 3

Source:
Bank

Question History:
2016 North Anna RO 74

K/A:
G2.4.26 Emergency Procedures / Plan
Knowledge of facility protection requirements, including fire brigade and portable firefighting equipment usage.
(Imp 3.1/3.6)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the requirements for Fire Brigade manning.

Cognitive Level:
Knowledge 1-F: The operator must recall the requirements for the Fire Brigade manning from administrative documents.

10 CFR Part 55 Content:
55.41 10
55.43 5
55.45 12

Reference:
OM 3.10, Operations Personnel Assignments and Scheduling. Rev 43

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Which of the choices below completes the following statements in accordance with TR 7.3, Fire Brigade?

A Fire Brigade of at least (1) members shall be maintained onsite.

The Fire Brigade Scene Leader and at least (2) brigade members shall have sufficient knowledge of safety-related systems to understand the effects of the fire and fire suppressants on safe shutdown capability.

A. (1)4
(2) 1

B. (1)4
(2) 2

C. (1)5
(2) 1

D. (1)5
(2) 2

Proposed Answer: D.

Justification:
Per OM 3.10, Section 4.19, the following is the Fire Brigade and EP Responder shift compliment:

	Position	Qualification	Watchstation	Keys
A	FBL	FQAO		CR
B	FB1	FB/AO-AOT	PAB	Y
C	FB2	FB/AO-AOT		Y
D	FB3	FB		N
E	FB4	FB		N
F	EP1	FQAO	U1 TH	Y
G	EP2	FQAO	U2 TH	Y

FQAO: Fully qualified AO (all watchstations – WT, PAB, TH)
FB: Fire Brigade qualified
AO-AOT: FQAO or PAB qualified AOT

A **INCORRECT:** Plausible if the examinee discounts the Fire Brigade Leader as part of the Fire Brigade count. Also, plausible if the examinee counts only the Fire Brigade Leader as the only required qualified member.

B **INCORRECT:** Plausible since the number of qualified members is correct. The first part is plausible if the examinee discounts the Fire Brigade Leader as a member of the Fire Brigade.

C **INCORRECT:** Plausible because the number of members is correct. Also, plausible if the examinee counts only the Fire Brigade Leader as the only required qualified member.

D **CORRECT:** See above.

Learning Objective:
Knowledge of facility protection requirements, including fire brigade and portable firefighting equipment usage.
(SD 86.4 2.04.26)

75. 2021 NRC 075
Given the following

- An emergency condition has been declared
- Accountability has been completed
- The TSC and OSC have been activated

Which completes the following:
Reentry teams are ___(1)___ to be briefed prior to entry into the RCA to perform valve lineups for establishing sump recirc.
AND
Two person (or more) teams are ___(2)___ for reentry unless authorized by the Emergency Coordinator.

	(1)	(2)
A.	required	NOT required
B.✓	required	required
C.	NOT required	required
D.	NOT required	NOT required

RO Tier 3

Source:
New

Question History:
None

K/A:
G2.4.35 Emergency Procedures / Plan
Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.
(Imp 3.8/4.0)

Justification for K/A Match:
Matches the K/A by requiring the operator to identify the requirements for implementing local operator actions during a declared emergency.

Cognitive Level:
Knowledge 1-P: The operator must recall the requirements for reentry during a declared emergency.

10 CFR Part 55 Content:
55.41 10
55.43 5
55.45 13

Reference:
EPIP 10.1, Emergency Reentry, Rev 39

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

Per EPIP 10.1, after the OSC/TSC has been activated, the auxiliary operators are turned over to the OSC, and when a reentry team is required an OSC supervisor shall brief the team, and teams of two members or more are required, unless the Emergency Coordinator has authorized that a team of one member is allowed.

A **INCORRECT:** The first part is correct. The second half is wrong, plausible if the examinee mistakenly recalls the requirement for 2 person teams, as there are allowances for single person teams

B **CORRECT:** See above.

C **INCORRECT:** The first part is wrong, plausible if the student doesn't recall that after the OSC and TSC have been activated, there is a requirement for briefing prior to reentry and during normal or off normal (non-emergency conditions) briefs are not mandatory. The second half is correct.

D **INCORRECT:** The first part is wrong, plausible if the student doesn't recall that after the OSC and TSC have been activated, there is a requirement for briefing prior to reentry and during normal or off normal (non-emergency conditions) briefs are not mandatory. The second half is wrong, plausible if the examinee mistakenly recalls the requirement for 2 person teams, as there are allowances for single person teams.

Learning Objective:

Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.
(SD86.2 2.4.35)

76. 2021 NRC 076

Given the following:

- Unit 1 is at 95% power
- Pressurizer and VCT levels begin to LOWER SLOWLY
- The crew enters AOP-1A, Reactor Coolant Leak
- After entering AOP-1A, the Third License noted the following alarms came in and cleared:
    - 1C03 1D 1-1, 1P-1A or B RCP LABYR SEAL WATER INLET or BEARING TEMP HIGH
    - 1C03 1D 2-1, 1P-1A or B RCP LABYR SEAL ΔP LOW
- 1C03 1D 1-5, 1P-1B RCP COOLING WATER FLOW LOW annunciator is LIT
- CCW Surge Tank level rose 4%, and STABILIZED
- Pressurizer and VCT levels have STABILIZED

Which of the following actions should the SRO direct the operators to perform based on the above conditions?

(AOP-1B, Reactor Coolant Pump Malfunction)
(AOP-9B, Component Cooling System Malfunction)
(EOP-0, Reactor Trip and Safety Injection)

A. Continue in AOP-1A; monitor RCPs seal parameters for degradation.

B. Transition to AOP-1B; trip the Reactor, stabilize per EOP-0, trip 1P-1B RCP then isolate CC flow to the RCP per the AOP-1B foldout page.

C. Transition to AOP-9B; bypass and isolate the Seal Water Heat Exchanger per AOP-9B, Attachment A, Leak Isolation for Lowering Surge Tank Level.

D.✓ Transition to AOP-9B; ensure both RCPs have seal injection supply flow, then verify isolation of 'B' RCP thermal barrier cooling return, per AOP-9B, Attachment B, Leak Isolation for Rising Surge Tank Level.

SRO Tier 1 Group 1

Source:
Bank

Question History:
2012 PBNP SRO 76

SRO:
10CFR55.43(b)(5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing system knowledge, immediate operator actions, knowing entry condition for AOPs or plant parameters which direct entry into major EOPs, the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and determine the selection of a procedure to mitigate and knowledge of appendices, including how to coordinate these items with procedure steps.

K/A:
026AG2.2.44 Loss of Component Cooling Water
Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.
(Imp 4.4)

Justification for K/A Match:
Matches the K/A by requiring the examinee to use knowledge of the control room indications and annunciators to determine plant status, and then determine what operator actions are necessary based on those conditions.

Cognitive Level:
Comprehension 3-SPK: The examinee must analyze the initial conditions, to determine the status, then apply that to determine which procedure/appendix is needed to mitigate the event.

10 CFR Part 55 Content:
55.41 50
55.43 5
55.45.12

Reference:
AOP-1A, Reactor Coolant Leak, Rev 19
AOP-9B, Component Cooling System Malfunction, (Attachment B, B3) Rev 26

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following conditions:

- Unit 1 is at 95% power
- Pressurizer and VCT levels begin to ***SLOWLY LOWER****, prompting the crew to enter AOP-1A, 'Reactor Coolant Leak'*
- Shortly after entering AOP-1A, the Third license noted the following alarms came in and cleared:

- "1P-1A or B RCP LABYR SEAL WATER INLET or BEARING TEMP HIGH"
- "1P-1A or B RCP LABYR SEAL ∆P LOW"

- "1P-1B RCP COOLING WATER FLOW LOW" annunciator is ***LIT***
- CCW Surge Tank level rose 4 inches, and ***STABILIZED***
- Pressurizer and VCT levels have ***STABILIZED***

Which of the following actions should the SRO direct the operators to perform based on the above conditions?
(AOP-1B, 'Reactor Coolant Pump Malfunction')
(AOP-9B, 'Component Cooling System Malfunction')
(EOP-0, 'Reactor Trip and Safety Injection'

A. Continue in AOP-1A; monitor RCPs seal parameters for degradation.

B. Transition to AOP-1B; trip the Reactor, stabilize per EOP-0, trip 1P-1B RCP then isolate CC flow to the RCP per the AOP-1B foldout page.

C. Transition to AOP-1B; trip the Reactor, stabilize per EOP-0, trip 1P-1B RCP then isolate CC flow to the RCP per the AOP-1B foldout page.

D. Transition to AOP-9B; ensure both RCPs have seal injection supply flow, then verify isolation of 'B' RCP thermal barrier cooling return, per AOP-9B, Attachment B.

Proposed answer: D

Justification:

Based on the indications, the plant is experiencing an RCS to CCW leak via the RCP thermal barrier. The thermal barrier will automatically isolate on a high flow, which will cause the PZR and VCT levels to stabilize, causing the need to navigate the procedure historically to properly utilize the procedure, and verify the isolation of the leak.

A **INCORRECT:** This will not address the isolating of the RCS to CCW leak. Plausible as entry conditions were are met for this procedure, and if the examinee does not recognize a transition is made to AOP-9B, due to level in the CCW surge tank, thus determining the RNO is not needed due to level being stable now.

B **INCORRECT:** A reactor trip or RCP trip is not warranted at this time given the current plant status. Plausible if the examinee determines a trip of the RCP is necessary based on the loss of thermal barrier cooling.

C **INCORRECT:** VCT level has risen and stabilized, this action would not be appropriate. Plausible if the examinee misdiagnosis the initiating event, determining that the Seal Water Heat Exchange leak is the cause.

D **CORRECT:** See above.

Learning Objective:

Diagnose and respond to indication of a CCW leak into or out of the system in accordance with AOP-9B.
(055.03.LP2444.002)

77. 2021 NRC 077
Given the following:

- Unit 1 has the following indications:
  - A SG pressure is 200 psig and LOWERING
  - B SG pressure is 210 psig and LOWERING
  - CET temperatures are 397°F and LOWERING
  - RCS pressure is 950 psig and LOWERING
  - CTMT sump A level is 72 % and RISING
  - CTMT pressure 42 psig and LOWERING
- The following annunciators are lit:
  - C01B 1-4, UNIT 1 CONTAINMENT SUMP A LEVEL HIGH
  - 1C20 D 1-3, UNIT 1 RCS SUBCOOLING MARGIN ALERT
  - 1C04 1C 1-3, PRESSURIZER PRESSURE HIGH OR LOW
  - C01B 1-5, UNIT 1 CONTAINMENT PRESSURE CHANNEL ALERT
  - C01B 2-5, UNIT 1 CONTAINMENT ISOLATION

Which answers the following:
(1) Are the listed annunciators consistent with the plant event in progress?
AND
(2) What are the procedure transitions for the plant event in progress after EOP-0?

(EOP-0, Reactor Trip or Safety Injection)
(EOP-1, Loss of Reactor or Secondary Coolant)
(EOP-2, Faulted Steam Generator Isolation)
(EOP-1.2, Post LOCA Cooldown and Depressurization)
(ECA-2.1, Uncontrolled Depressurization of Both Steam Generators)

A✓ (1) No
(2) EOP-2 → ECA-2.1

B. (1) No
(2) EOP-2 → EOP-1 → EOP-1.2

C. (1) Yes
(2) EOP-2 → ECA-2.1

D. (1) Yes
(2) EOP-2 → EOP-1 → EOP-1.2

SRO Tier 1 Group 1

Source:
Bank

Question History:
2016 Surry SRO 96 (Question's original K/A was G2.4.46)

SRO:
10CFR55.43(b)(5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing system knowledge, immediate operator actions, knowing entry condition for AOPs or plant parameters which direct entry into major EOPs, the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and determine the selection of a procedures to mitigate with knowledge of diagnostic steps and decision points in the EOP s that involve transitions to event-specific sub-procedures or emergency contingency procedures.

K/A:
E12G2.4.45 Uncontrolled Depressurization of all Steam Generators
Ability to prioritize and interpret the significance of each annunciator or alarm
(Imp 4.3)

Justification for K/A Match:
Matches the K/A by requiring the examinee to analyze the annunciators to determine if they are consistent with plant conditions/indications, and then diagnose plant conditions based on indications and annunciators prioritizing the mitigation strategy.

Cognitive Level:
Comprehension 3-SPK: The examinee must analyze the initial conditions, to determine the plant status, determine if the annunciators match conditions, then determine mitigation.

10 CFR Part 55 Content:
55.41 10
55.43 5
55.45.3
55.45.12

Reference:
EOP-0, Reactor Trip or Safety Injection, Rev 70
EOP-2, Faulted Steam Generator Isolation, Rev 26
ECA-2.1, Uncontrolled Depressurization of Both Steam Generators, Rev 45
ARB 1C20 D 1-3, UNIT 1 RCS SUBCOOLING MARGIN ALERT, Rev 7
STPT 11.1, Safety Injection System General Instrumentation Channels, Rev 20

Proposed reference to be provided to the applicants during examination:
None

Original Question:

- *Unit 1 has the following indications:*
  - *"A" S/G – 200 psig, lowering*
  - *"B" S/G – 210 psig, lowering*
  - *"C" S/G – 205 psig, lowering*
  - *CETC - 397°F, lowering*
  - *RCS pressure – 900 psig, lowering*
  - *CTMT sump level – 1.8 feet, rising*
  - *CTMT pressure – 58 psia, lowering*
- *The following annunciators are lit:*
  - *1E-B9, CTMT HI PRESS – RED*
  - *1A-A1, RWST TECH SPEC LO LVL 1B-A3, CTMT SUMP HI LVL*
  - *1B-C4, CLS HI-HI TR A*
  - *1B-C5, CLS HI-HI TR B*
  - *1C-B8, PRZR LO PRESS*
  - *1G-B1, APPROACH TO SATURATION TEMP ALARM*

1) *Are the listed annunciators consistent with the plant event in progress?*
2) *What are the procedure transitions for the plant event in progress?*

(REFERENCE PROVIDED)

A. 1) No.

2) E-0 → E-2 → ECA-2.1.

B. 1) No.

2) E-0 → E-1 → ES-1.3 → E-1.

C. 1) Yes.

2) E-0 → E-2 → ECA-2.1.

D. 1) Yes.

2) E-0 → E-1 → ES-1.3 → E-1.

Proposed answer: A

Justification:

Based on the indications, the 1C20 D 1-3, UNIT 1 RCS SUBCOOLING MARGIN ALERT annunciators would not be expected. With steam break, subcooling should rise significantly. The crew would enter the EOP network at EOP-0, transition to EOP-2 to deal with the steam break, and then transition to ECA-2.1 to mitigate the uncontrolled depressurization of all steam generators.

A **CORRECT:** See above

B **INCORRECT:** The first part is correct. The second part is incorrect, plausible if a misdiagnosis of only one faulted SG, with a small break LOCA. Given this diagnosis, when that generator is blown dry, RCS pressure will stabilize or continue to lower and non-faulted SG pressure will stabilize and start to rise, this would lead to a transition to EOP-1.2.

C **INCORRECT:** The first part is wrong, the second part is correct. Plausible if the examinee miscalculates subcooling or becomes distracted by containment sump level reading/rise.

D **INCORRECT:** The first part is wrong. The second part is incorrect, plausible if a misdiagnosis of only one faulted SG, with a small break LOCA. Given this diagnosis, when that generator is blown dry, RCS pressure will stabilize or continue to lower and non-faulted SG pressure will stabilize and start to rise, this would lead to a transition to EOP-1.2.

Learning Objective:

Given a set of plant conditions diagnose and respond to Uncontrolled Depressurization of Both SGs in accordance with ECA-2.1 and BG-ECA-2.1 (031.02.LP0465.006)

78. 2021 NRC 078
Given the following:

- Both units are at Rated Thermal Power
- The electric plant is in a normal lineup
- Subsequently an electrical perturbation causes the indication pictured on the next page
- Operators have restored D-07, DC Station Battery Charger, to service

Considering UNIT 1 ONLY, which of the following:
(1) Lists the required actions for LCO 3.8.1 Electrical Power Systems, AC Sources – Operating?
AND
(2) The operability status of 1P-15A, SI pump?
(Assume no additional operator action)

REFERENCE PROVIDED

A. (1) Enter TSAC 3.8.1.B, 3.8.1 E and 3.8.1F only
(2) Inoperable, due to the loss of offsite power

B. (1) Enter TSACs 3.8.1.B, 3.8.1.C, 3.8.1.D, 3.8.1 E and 3.8.1F
(2) Inoperable, due to the loss of offsite power

C. (1) Enter TSAC 3.8.1.B, 3.8.1 E and 3.8.1F only
(2) Operable, 1P-15A will be declared inoperable after 24 hours

D✓ (1) Enter TSACs 3.8.1.B, 3.8.1.C, 3.8.1.D, 3.8.1 E and 3.8.1F
(2) Operable, 1P-15A will be declared inoperable after 12 hours

SRO Tier 1 Group 1

Source:
Bank

Question History:
2019 PBNP SRO 79 **PREVIOUS 2 NRC EXAMS**

SRO:
10CFR55.43(b)(2) Facility operating limitations in the technical specifications and their bases.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing ≤ 1-hour TS/TRM Actions, the LCO/TRM information listed “above the line”, or TS safety limits; AND requires the operator to assess plant conditions utilize TS bases for redundant power supplies in the application of required actions (TS Section 3) and apply completion times for equipment, declaring it inoperable.

K/A:
056AA2.44 Loss of Offsite Power
Ability to determine and interpret the following as they apply to the Loss of Offsite Power: **Indications of loss of offsite power.**
(Imp 4.5)

Justification for K/A Match:
Matches the K/A by requiring identification of the loss of offsite power given control room indications.

Cognitive Level:
Comprehension 3-SPR: The examinee must understand the plant conditions and final lineup of the cause the by perturbation, and apply tech specs to determine which action(s) are required to be entered and the status (operable or inoperable) for 1P-15A.

10 CFR Part 55 Content:
55.43 5
55.45.13

Reference:

TS 3.8.1, Electrical Power Systems, AC Sources – Operating Rev 4
TS B 3.8.1 Basis - Electrical Power Systems, AC Sources – Operating Rev 20

Proposed reference to be provided to the applicants during examination:

TS 3.8.1, Electrical Power Systems, AC Sources – Operating Rev 4 PAGES 1-5

Original Question:

Given the following:

- *Both units are at Rated Thermal Power*
- *The electric plant is in a normal lineup*
- *An electrical perturbation causes the indication pictured on the next page*
- *Operators have restored D-07, DC Station Battery Charger, to service*

Considering UNIT 1 ONLY, which of the following:
(1) Lists the required actions for LCO 3.8.1 Electrical Power Systems, AC Sources – Operating?
AND
(2) The operability status of 1P-15A, SI pump?
(Assume no additional operator action)

REFERENCE PROVIDED
TS 3.8.1 (5 pages)

A. (1) Enter TSAC 3.8.1.B, 3.8.1 E and 3.8.1F
(2) Inoperable, due to the loss of offsite power

B. (1) Enter TSACs 3.8.1.B, 3.8.1.C, 3.8.1.D, 3.8.1 E and 3.8.1F
(2) Inoperable, due to the loss of offsite power

C. (1) Enter TSAC 3.8.1.B, 3.8.1 E and 3.8.1F
(2) Operable, 1P-15A will be declared inoperable after 24 hours

D. (1) Enter TSACs 3.8.1.B, 3.8.1.C, 3.8.1.D, 3.8.1 E and 3.8.1F
(2) Operable, 1P-15A will be declared inoperable after 12 hours

Proposed answer: D

Justification:

The operator must diagnose the loss of offsite power to the safeguard busses, complicated by G03, EDG not starting. Given the assumption that no further actions have occurred after the restoration of D-07, the operator must determine that Unit 1 is the only unit affected by the loss of the G03 and that TSAC-3.8.1.B/C/D need to be entered based on the initial conditions. The operator must also determine that 1P-15A is operable but must complete required action D.1 in 12 hours form discovery.

A **INCORRECT:** The first part is incorrect, plausible as this is one of the TSACs needed to be entered, but not a completed list. The second part is correct based on the loss of offsite power with loss of G03.

B **INCORRECT:** The first part is correct. The second part is incorrect, plausible if the operator has the misconception that the loss of offsite power causes the pump to immediately inoperable

C **INCORRECT:** The first part is incorrect, plausible as this is one of the TSACs needed to be entered, but not a completed list. The second part is incorrect, plausible if the operator determine that after the 24 hours that 1P-15A is no longer operable.

D **CORRECT:** See above.

Learning Objective:

Given specific plant conditions, ASSESS and APPLY Technical Specification requirements as appropriate.
(057.02.LP3344.002)

79. 2021 NRC 079

Given the following:

- The site has experienced a loss of D-03 DC Bus, recovery using D-105 Battery is not possible at this time
- The crew is recovering D-03 bus using AOP-0.0, Vital DC System Malfunction
- D-305, Swing Battery, has been disconnected from ALL Battery Chargers for the last 2 hours

Which of the following describes:
(1) The action to be taken per 0-SOP-DC-003, 125 VDC, Bus D-03 & Components?
AND
(2) What is the status of D-03 once the lineup actions are complete?

A. (1) Align D-305, Swing Battery and D-09, Swing Station Battery Charger to D-03
(2) OPERABLE

B✓ (1) Align D-305, Swing Battery and D-109, Swing Station Battery Charger to D-03
(2) OPERABLE

C. (1) Align D-305, Swing Battery and D-09, Swing Station Battery Charger to D-03
(2) inoperable

D. (1) Align D-305, Swing Battery and D-109, Swing Station Battery Charger to D-03
(2) inoperable

SRO Tier 1 Group 1

Source:
Bank

Question History:
2012 PBNP SRO 81 (Question's original K/A was 058AG2.1.32)

SRO:
10CFR55.43(b)(2) Facility operating limitations in the technical specifications and their bases.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing ≤ 1-hour TS/TRM Actions, the LCO/TRM information listed "above the line", or TS safety limits; AND requires the operator to assess plant conditions utilize TS bases for redundant power supplies in the application of required actions (TS Section 3) and apply completion times for equipment, declaring it inoperable.

K/A:
058AG2.1.23 Loss of DC Power
Ability to perform specific system and integrated plant procedures during all modes of plant operation.
(Imp 4.4)

Justification for K/A Match:
Matches the K/A by requiring determination of the required system manipulation and determination of plant end state.

Cognitive Level:
Comprehension 3-SPK: The examinee must understand the plant conditions and cause the by perturbation, and apply tech specs to determine which action(s) are required to be entered and the status (operable or inoperable) for D-305 and then determine the end state for the plant.

10 CFR Part 55 Content:
55.41 10
55.43 5
55.45 2
55.45 6

Reference:
TS 3.8.4 DC Sources - Operating, Rev 2
TS B 3.8.4, DC Sources - Operating, Rev 5
0-SOP-DC-003, 125 VDC System Bus D03 & Components, Rev 22
AOP-0.0, Vital DC Malfunctions, Rev 37

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following conditions:

- The site has experienced a loss of D-03 DC Bus, recovery using D-105 Battery is not possible at this time
- The crew is recovering D-03 bus using AOP-0.0, 'Vital DC System Malfunction'
- D-305, Swing Battery, has been disconnected from ***ALL*** *Battery Chargers for the last 2 hours*

Considering <u>ONLY</u> Swing Battery D-305, what is the status of D-305 and what action(s) are required for the current conditions?
(0-SOP-DC-003, '125 VDC, Bus D-03 & Components')

A. ***OPERABLE****; align D-305 and D-109 Swing Battery Charger to D-03 using 0-SOP-DC-003.*

B. ***OPERABLE****; align D-305 and D-09 Battery Charger to D-03 using 0-SOP-DC-003.*

C. ***INOPERABLE****; declare LCO 3.8.4 DC Sources - Operating* ***NOT MET*** *by entering TSAC 3.8.4.A until D-305 is charged for an hour.*

D. ***INOPERABLE****; declare LCO 3.8.4 DC Sources - Operating* ***NOT MET*** *by entering TSAC 3.8.4.A; declare LCO 3.0.3 and commence a dual unit shutdown.*

Proposed Answer: A

Justification:

A battery that is fully charged can be considered operable if it is not connected to a charger; AOP-0.0 Step 21 RNO states that D-305 Battery with the D-109 Charger can be aligned to DC Bus D-03.

A **INCORRECT:** The first part is wrong, plausible if the student has misconception of the system layout, as D-09 can be aligned to D-305, but not to D-03 without also aligning D-109. The second part is correct.

B **CORRECT:** See above.

C **INCORRECT:** The first part is wrong, plausible if the student has misconception of the system layout, as D-09 can be aligned to D-305, but not to D-03 without also aligning D-109. The second part is wrong, plausible if the examinee does not understand the basis for operability takes affect once the battery is lined up to the system.

D **INCORRECT:** The first part is correct. The second part is wrong, plausible if the examinee does not understand the basis for operability takes affect once the battery is lined up to the system.

Learning Objective:

Given specific plant conditions, ASSESS and APPLY Technical Specification requirements as appropriate.
(057.02.LP3344.002)

80. 2021 NRC 080

Given the following:

- Both units were operating at Rated Thermal Power
- An inadvertent Safety Injection occurred on Unit 2
- The crew is responding per EOP-0, Unit 2 Reactor Trip or Safety Injection
- Upon completion of EOP-0 Attachment 'A', Automatic Action Verification the 3rd License reports:
  - P-32B, Service Water pump FAILED TO START
  - SW-2927A, 'A' Spent Fuel Pool HX Inlet FAILED TO SHUT
  - All other equipment operated correctly for the safety injection signal

Considering Service Water only; which of the following describes the complete list of Action Conditions requiring entry for this event?

REFERENCE PROVIDED

A. TSAC 3.7.8 A for Unit 2; TSAC 3.7.8 F for Unit 1

B.✓ TSAC 3.7.8 A for Both Units; TSAC 3.7.8 F for Unit 1

C. TSAC 3.7.8 A for Both Units; TSAC 3.7.8 F for Unit 2

D. TSAC 3.7.8 A for Both Units; TSAC 3.7.8 D for Both Units

SRO Tier 1 Group 1

Source:
Bank

Question History:
TS 3.7.8 SW 003

SRO:
10CFR55.43(b)(2) Facility operating limitations in the technical specifications and their bases.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing $\leq$ 1-hour TS/TRM Actions, the LCO/TRM information listed “above the line”, or TS safety limits; AND requires the operator to assess plant conditions determine the effect of a common system for both units, utilize TS in the application of required actions (TS Section 3) and apply completion times for equipment.

K/A:
062AA2.02 Loss of Nuclear Service Water
Ability to determine and interpret the following as they apply to the Loss of Nuclear Service Water: **The cause of possible SWS loss**
(Imp 3.6)

Justification for K/A Match:
Matches the K/A by requiring the student to recall what interlocks are utilized in SI and what SW flows will be lost under normal conditions, and also with a malfunction..

Cognitive Level:
Comprehension 3SPR: The examinee must understand the plant conditions recall the Safety injection interlocks, and then use TS to apply any applicable action conditions, then determine which unit those actions apply to.

10 CFR Part 55 Content:
55.43 5
55.45.13

Reference:

TS 3.7.8, Service Water (SW) Systems, Rev 2
TS B 3.7.8, Basis Service Water (SW) Systems, Rev 2
883D195 SH 8, Safeguards Actuation Signal Logic, Rev 19

Proposed reference to be provided to the applicants during examination:

TS 3.7.8, Service Water (SW) Systems, 4 PAGES (3.7.8-1 thru 3.7.8-4)

Original Question:

Given the following:

- *Both units were operating in MODE 1*
- *An inadvertent Safety Injection occurred on Unit 2*
- *The crew is responding per EOP-0, Unit 2 Reactor Trip or Safety Injection*
- *Upon completion of EOP-0 Attachment 'A', Automatic Action Verification the 3rd License reports*
    - *P-32B, Service Water pump FAILED TO START*
    - *SW-2927A, 'A' Spent Fuel Pool HX Inlet FAILED TO SHUT*
    - *All other equipment operated correctly for the safety injection signal*

Considering Service Water only; which of the following describes the complete list of Action Conditions requiring entry for this event?

A. TSAC 3.7.8 A for Both Units; TSAC 3.7.8 F for Unit 2

B. TSAC 3.7.8 A for Unit 2; TSAC 3.7.8 F for Unit 1

C. TSAC 3.7.8 A for Both Units; TSAC 3.7.8 F for Unit 1

D. TSAC 3.7.8 A for Both Units; TSAC 3.7.8 D for Both Units

Proposed Answer: C

Justification:

Both units will be affected by the inoperable SW pump, so both must enter TSAC 3.7.8.A

The Safety Injection will cause 2SW-2907 and 2SW-2908, Containment Vent Coolers Outlet Emergency FCV to open. This will put Unit 1 in TSAC 3.7.8 F

A **INCORRECT:** Plausible if the student incorrectly applies 3.7.8A to unit 2, as both units are in the mode of applicability.

B **CORRECT:** See above

C **INCORRECT:** Plausible if the student incorrectly applies 3.7.8 F, which would only apply to Unit 1.

D **INCORRECT:** Plausible if the student fails to recall that even though SW-2927A didn’t shut, the backup did shut, which makes entering 3.7.8 D inappropriate.

Learning Objective:

Given specific plant conditions, ASSESS and APPLY Technical Specification requirements as appropriate.
(057.02.LP3343.002)

81. 2021 NRC 081

Given the following:

- Unit 2 was operating at 75%
- A plant transient resulted in a reactor trip and safety injection
- The crew has entered EOP-0, Reactor Trip or Safety Injection
- The following plant conditions are noted:
  - RCS pressure is 1100 psig and LOWERING SLOWLY
  - Pressurizer level is 5% and LOWERING SLOWLY
  - Pressurizer PORVs are closed
  - Spray valves are closed
  - SGs levels are normal
  - SGs pressures are normal
  - Containment pressure is normal
  - Containment radiation is normal
  - Sump 'A' level is normal
  - RE 214, PAB Exhaust Monitor is RISING
  - Several PAB area radiation monitors are RISING

After assessing these conditions, the next procedure the OS will implement is:

A. EOP-1.1, SI Termination

B. EOP-1.2, Post-LOCA Cooldown and Depressurization

C. ECA-1.1, Loss of Containment Sump Recirculation

D.✓ ECA-1.2, LOCA Outside Containment

SRO Tier 1 Group 1

Source:
Bank

Question History:
2011 PBNP SRO 81

SRO:
10CFR55.43(b)(2) Facility operating limitations in the technical specifications and their bases.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing system knowledge, immediate operator actions, knowing entry condition for AOPs or plant parameters which direct entry into major EOPs, the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and determine the selection of a procedures to mitigate with knowledge of diagnostic steps and decision points in the EOP s that involve transitions to event-specific sub-procedures or emergency contingency procedures.

K/A:
E04EA2.1 LOCA Outside Containment
Ability to determine and interpret the following as they apply to the (LOCA Outside Containment): **Facility conditions and selection of appropriate procedures during abnormal and emergency operations.**
(Imp 4.3)

Justification for K/A Match:
Matches the K/A by requiring identification of the loss of offsite power given control room indications.

Cognitive Level:
Comprehension 3-SPK: The examinee must analyze the initial conditions, to determine the plant status, then determine mitigation strategy needed.

10 CFR Part 55 Content:
55.43 5
55.45.13

Reference:

ECA-1.2, LOCA Outside Containment, Rev 69
EOP-0, Reactor Trip or Safety Injection, Rev 25

Proposed reference to be provided to the applicants during examination:

None

Original Question:

Unit 2 was operating at 75% power when a plant transient resulted in a reactor trip and safety injection. EOP-0, 'Reactor Trip or Safety Injection', has been entered and the crew is carrying out actions of the procedure. The following plant conditions are noted:

- *RCS pressure 1100 psig and slowly lowering*
- *Pressurizer level 5% and slowly lowering*
- *Pressurizer PORVs closed*
- *Spray valves closed*
- *Steam Generator levels normal*
- *Steam Generator pressures normal*
- *Containment pressure normal*
- *Containment radiation normal*
- *Sump 'A' level normal*
- *RE 214, PAB Exhaust Monitor rising*
- *Several PAB area radiation monitors rising*

After assessing these conditions, the next procedure the OS will implement is:

A. ECA-1.2, 'LOCA Outside Containment'

B. EOP-1.1, 'SI Termination'

C. ECA-1.1, 'Loss of Containment Sump Recirculation'

D. EOP-1.2, 'Small Break LOCA'

Proposed Answer: A

Justification:

Based on the indications, a LOCA outside containment is occurring, other transition criteria will not apply until ECA-1.2 Step 4 when the break would be analyzed to determine if it is isolated.

A **INCORRECT:** SI termination criteria is not met. Plausible if the examinee incorrectly determines that ECCS flow should be terminated based on normal secondary conditions.

B **INCORRECT:** A LOCA is occurring, but outside containment. Plausible because there is a LOCA occurring and if the examinee incorrectly diagnosis it.

C **INCORRECT:** Do not currently meet this transition criteria. Plausible because this is the required transition is the leak is not isolated during the performance of ECA-1.2

D **CORRECT:** See above.

Learning Objective:

Given a set of plant conditions diagnose and respond to a LOCA Outside Containment in accordance with ECA-1.2 and BG-ECA-1.2 (031.02.LP0465.004)

82. 2021 NRC 082

Given the following:

- Unit 1 is at Rated Thermal Power
- An instrument malfunction causes the following plant response:
  - Letdown automatically isolated.
  - Speed is rising on the charging pump selected to AUTO

Which of the following:
(1) Identifies the failed channel
AND
(2) Includes the protection function described by the Technical Specification Bases that is impacted by this failure?

A. (1) 1LT-427, Pressurizer Level (White)
(2) protection from violating the DNBR limit due to low pressure via the low pressure trip

B. (1) 1LT-427, Pressurizer Level (White)
(2) protection against water relief through the Pressurizer Safety Valves via the high level trip

C. (1) 1LT-428, Pressurizer Level (Blue)
(2) protection from violating the DNBR limit due to low pressure via the low pressure trip

D.✓ (1) 1LT-428, Pressurizer Level (Blue)
(2) protection against water relief through the Pressurizer Safety Valves via the high level trip

SRO Tier 1 Group 2

Source:
Bank

Question History:
2010 North Anna SRO 85

SRO:
10CFR55.43(b)(2) Facility operating limitations in the technical specifications and their bases.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing $\leq$ 1-hour TS/TRM Actions, the LCO/TRM information listed “above the line”, or TS safety limits; AND requires the operator to assess plant conditions utilize TS bases to determine what protective function will be impacted by the failure, and knowledge of TS bases that is required to analyze TS- required actions and terminology..

K/A:
028AA2.12 Pressurizer (PZR) Level Control Malfunction
Ability to determine and interpret the following as they apply to the Pressurizer Level Control Malfunctions: **Cause for PZR level deviation alarm: controller malfunction or other instrumentation malfunction.**
(Imp 3.5)

Justification for K/A Match:
Matches the K/A by requiring identification of the cause of loss of offsite power given control room indications.

Cognitive Level:
Comprehension 3-SPK: The examinee must analyze the initial conditions, to determine the cause for indications, then recall the the protective feature being impacted by the failure.

10 CFR Part 55 Content:
55.43 5
55.45.13

Reference:

TS B 3.3.1, Bases - Reactor Protection System (RPS) Instrumentation, Rev 9
883D195 SH 18, PZR Pressure And Level Control Logic, Rev 13

Proposed reference to be provided to the applicants during examination:

None

Original Question:

Unit 1 is at 100% power with the PRZR Level Channel Defeat Switch selected to position 461/460.

An instrument malfunction causes the following plant response:

- *Letdown automatically isolated.*
- *Normal charging flow control valve 1-CH-FCV-1122 fully open.*

*Which ONE of the following identifies the failed channel, **AND** includes the protection function described by the Technical Specification Bases that is impacted by this failure?*

A. 1-RC-LT-1460 is failed ; primary protection against RCS overpressurization.

B. 1-RC-LT-1460 is failed ; protection against water relief through the PRZR Safety Valves.

C. 1-RC-LT-1461 is failed; primary protection against RCS overpressurization.

D. 1-RC-LT-1461 is failed; protection against water relief through the PRZR Safety Valves.

Proposed Answer: D

Justification:

Based on the conditions given, the controlling channel or (1LT-428, Pressurizer Level (Blue)) has fail low. The protection function as explained in Technical Specifications, is “provides protection against water relief through the pressurizer safety valves.”

A **INCORRECT:** The first part is wrong, but plausible if the examinee does not have a solid understanding of the failure mode and effects of the instrument failure. The second part is wrong, but plausible since the instrument, failing in the opposite direction, can cause pressurizer level to lower, which will cause a loss of heater / pressure control on low level setpoint. The low pressurizer pressure trip would help protect against a pressure transient due to that loss of PZR level.

B **INCORRECT:** The first part is wrong, but plausible if the examinee does not have a solid understanding of the failure mode and effects of the instrument failure. The second part is right.

C **INCORRECT:** The first part is right. The second part is wrong, but plausible since the instrument, failing in the opposite direction, can cause pressurizer level to lower, which will cause a loss of heater / pressure control on low level setpoint. The low pressurizer pressure trip would help protect against a pressure transient due to that loss of PZR level.

D **CORRECT:** See above.

Learning Objective:

Given specific plant conditions assess and apply Technical Specification requirements as appropriate
(057.02.LP3341.002)

83. 2021 NRC 083

Given the following:

- Unit 1 was at Rated Thermal Power
- A Tube leak developed on SG 'A'
- The crew entered AOP-3, Steam Generator Tube Leak
- During the load reduction, a failure causes an inadvertent reactor trip **without an SI**

Which of the following actions should the SRO direct the operators to perform based on the above conditions?

(EOP-0, Reactor Trip or Safety Injection)
(EOP-0.1, Reactor Trip Response)
(EOP-3, Steam Generator Tube Rupture)

A. 1) Remain in AOP-3, transition to EOP-0 is not needed

B. 1) Enter EOP-0,
2) Transition to EOP-3

C✓ 1) Enter EOP-0,
2) Transition to EOP-0.1 and perform AOP-3 in parallel

D. 1) Enter EOP-0,
2) Transition to AOP-3

SRO Tier 1 Group 2

Source:
New

Question History:
None

SRO:
10CFR55.43(b)(5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing system knowledge, immediate operator actions, knowing entry condition for AOPs or plant parameters which direct entry into major EOPs, the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and determine the selection of a procedures to mitigate with knowledge of administrative procedures that specify hierarchy, implementation, and\or coordination of plant normal, abnormal, and emergency procedures.

K/A:
037AG2.4.08 Steam Generator Tube Leak
Knowledge of how abnormal operating procedures are used in conjunction with EOPs.
(Imp 4.5)

Justification for K/A Match:
Matches the K/A by requiring the examinee to analyze the plant conditions and determine how to utilize abnormal procedures in conjunction with emergency operating procedures.

Cognitive Level:
Comprehension 3-SPR: The examinee must analyze the initial conditions, to determine the plant status, determine the appropriate procedures to utilize based on plant conditions and administrative requirements.

10 CFR Part 55 Content:
55.41 10
55.43 5
55.45.13

Reference:

OM 3.7, AOP and EOP Procedure Usage for Response to Plant Transients, Rev 33, Sections 6.10.3, 6.16
AOP-3, Steam Generator Tube Leak, Rev 15
EOP-0, Reactor Trip or Safety Injection, Rev 70
EOP-0.1, Reactor Trip Response, Rev 48

Proposed reference to be provided to the applicants during examination:

None

Original Question:

N/A

Justification:

Based on the plant conditions of an inadvertent reactor trip, per OM 3.7 EOP-0 shall be entered. Since there is no SI, transition to EOP-0.1 will be required. Section 6.16 of OM 3.7 will direct parallel performance of AOP-3 and EOP-0.1.

A **INCORRECT:** Plausible since this is an uncomplicated trip without an SI, if the examinee misapplies the note prior to tripping the reactor in AOP-3, which directs the crew to remain in AOP-3, as EOP-0 is not required.

B **INCORRECT:** Plausible if the examinee uses the EOP network to mitigate the tube leak which based on plant conditions, there is no transition or procedure path to EOP-3 currently present.

C **CORRECT:** See above.

D **INCORRECT:** Plausible if the examinee incorrectly wants to exit the EOP network prior to addressing the tube leak.

Learning Objective:

Recognize and predict the use and adherence requirements applicable to Abnormal Operating Procedure sets.
(055.01.LP3959.001)

84. 2021 NRC 084

Given the following:

- Unit 1 has experienced a large break LOCA
- The crew has transitioned to EOP-1.3, Transfer to Containment Sump Recirculation – Low Head Injection
- The crew is checking train ‘A’ Ready for recirculation per step 18
- RWST level 32%
- The STA informs you that an Orange Path on Containment exists due to containment sump level being 90 inches

As the Operations Supervisor of Unit 1 what actions are you going to take?

(CSP-Z.2, Response to Containment Flooding)

A.✓ Continue in EOP-1.3, until at least one train of RHR is on sump recirculation, then transition to CSP-Z.2

B. Complete EOP-1.3 in its entirety, when both trains of sump recirc have been established, then transition to CSP-Z.2

C. Transition to CSP-Z.2, locate and isolate the source of water entering containment, then return to EOP-1.3

D. Transition to CSP-Z.2, after verifying sump level is due to the LOCA and RWST water injected into containment then return to EOP-1.3

SRO Tier 1 Group 2

Source:
New

Question History:
None

SRO:
10CFR55.43(b)(5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing system knowledge, immediate operator actions, knowing entry condition for AOPs or plant parameters which direct entry into major EOPs, the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and use knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event specific sub-procedures or emergency contingency procedures after specific criteria has been met.

K/A:
E15EA2.2 Containment Flooding
Ability to determine and interpret the following as they apply to the (Containment Flooding): **Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.**
(Imp 3.3)

Justification for K/A Match:
Matches the K/A by requiring the operator to assess plant conditions and based on that select the appropriate course of action and implement procedures to accomplish this.

Cognitive Level:
Comprehension 3-SPK: The operator must understand the initial condition, which one of the conditions must be calculated by the operator, and apply those conditions to the critical safety function status Trees, and interpret how the information impacts the EOP Network and determine the course of action to take next.

10 CFR Part 55 Content:
55.41
55.43 5

Reference:

EOP-1.3, Transfer to Containment Sump Recirculation – Low Head Injection Unit 1 Rev 59

Proposed reference to be provided to the applicants during examination:

None

Original Question:

N/A

Justification:

After transitioning to EOP-1.3, A note prior to step 1 “Steps 1 through 31 should be performed without delay. CSPs should not be implemented prior to completion of these steps.” This note is modified by step 21 which checks that the RWST is less than or equal to 34%, if level is not, the RNO directs “implement critical safety procedures and continue with procedure and step in effect.” Given the conditions the crew will be reaching this step, but RWST level is less than 34%, so the OS should continue on without delay to establish sump recirc prior to transition to CSP-Z.2.

A **CORRECT:** See above.

B **INCORRECT:** Plausible if the examinee mistakes both trains being required to be on sump recirc prior to transition out of EOP-1.3.

C **INCORRECT:** Plausible as the status trees indicate the need for an orange path transition, but it is not allowed procedurally by EOP-1.3 at this time.

D **INCORRECT:** Plausible as the status trees indication is an orange path and several CSPs have notes or checks to ensure indications are within normally allowed amounts, or operator controlled bands.

Learning Objective:

Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.
(SD86.4.2.4.9)

85. 2021 NRC 085

Given the following:

- A substation perturbation caused the loss of 1A01 and 1A02, 4160 VAC Non-Safeguards busses on unit 1
- The crew is implementing EOP-0.3, Natural Circulation Cooldown with Steam Void in Vessel (with RVLIS)
- The crew is performing the “Continue RCS Cooldown And Initiate Depressurization” step, and is cooling down to 350°F and depressurizing the plant to 1200 psig
- Power has been restored to 1A01, 4160 VAC Non-Safeguards bus
- The crew starts 1P-1A, Reactor Coolant Pump
- Annunciator 1C04 1C 1-5, 1P-1A&B RCP VIBRATION ALARM is received
- The CO reports ‘A’ RCP vibrations are as follows:
    - Shaft vibration is 20 mils and SLOWLY RISING
    - Frame vibration is 7 mils and SLOWLY RISING

Which of the following describes the procedure flow path the SRO is required to direct?

(AOP-1B, Reactor Coolant Pump Malfunction)
(OP 3C, Hot Standby to Cold Shutdown)
(OP 3D, Post Tractor Trip Stabilization to Hot Standby)
(EOP-0.1, Reactor Trip Response)
(EOP-0.3, Natural Circulation Cooldown with Steam Void in the Vessel)

A. Transition to OP 3C, and commence the plant cooldown to cold shutdown

B.✓ Remain in EOP-0.3, and perform AOP-1B, in parallel and trip the ‘A’ RCP

C. Transition to EOP-0.1, to terminate the cooldown and stabilize the plant, then transition to OP 3D, to stabilize the plant.

D. Remain in EOP-0.3 until the cooldown and depressurization is completed then transition to OP 3C, and perform AOP-1B, in parallel and trip the ‘A’ RCP

SRO Tier 1 Group 2

Source:
Bank

Question History:
2017 PBNP SRO 85 **PREVIOUS 2 NRC EXAMS** (Question's original K/A was E10G2.4.50)

SRO:
10CFR55.43(b)(5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing system knowledge, immediate operator actions, knowing entry condition for AOPs or plant parameters which direct entry into major EOPs, the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and use knowledge that involves administrative procedure for the hierarchy and implementation of abnormal and emergency procedures.

K/A:
E09EG2.4.46 Natural Circulation
Ability to verify that the alarms are consistent with the plant conditions.
(Imp 4.2)

Justification for K/A Match:
Matches the K/A by requiring the operator to assess plant conditions determine if the alarms are consistent with the plant conditions, then select the appropriate course of action and implement procedures to accomplish this.

Cognitive Level:
Comprehension 3-SPK: The operator must understand the initial conditions, determine if the alarms are consistent with the plant conditions, then select the appropriate course of action and implement procedures to accomplish this

10 CFR Part 55 Content:
55.41 .10
55.43 5
55.45.3
55.45.12

Reference:

ARB 1C04 1C 1-5, 1P-1A&B RCP VIBRATION ALARM, Rev 5
AOP-1B Unit 1, Reactor Coolant Pump Malfunction, Rev 30
EOP-0.3 Unit 1, Natural Circulation Cooldown with Steam Void in Vessel (with RVLIS), Rev 33

Proposed reference to be provided to the applicants during examination:

None

Original Question:

Given the following:

- *A substation perturbation caused the loss of 1A01 and 1A02, 4160 VAC Non-Safeguards busses*
- *The crew is implementing EOP-0.3, Natural Circulation Cooldown with Steam Void in Vessel (with RVLIS)*
- *The crew is performing the "Continue RCS Cooldown And Initiate Depressurization" step, and is cooling down to 350°F and depressurizing the plant to 1200 psig*
- *Power has been restored to 1A01, 4160 VAC Non-Safeguards bus*
- *The crew starts 1P-1A, Reactor Coolant Pump*
- *Annunciator 1C04 1C 1-5, 1P-1A&B RCP VIBRATION ALARM is received*
- *The CO reports 'A' RCP vibrations are as follows:*
    - *Shaft vibration is 20 mils and SLOWLY RISING*
    - *Frame vibration is 7 mils and SLOWLY RISING*

Which of the following describes the procedure flow path the SRO should direct?

A. Transition to OP 3C, Hot Standby to Cold Shutdown, and commence the plant cooldown to cold shutdown

B. Remain in EOP-0.3, and perform AOP-1B, Reactor Coolant Pump Malfunction in parallel and trip the 'A' RCP

C. Remain in EOP-0.3 until the cooldown and depressurization is completed then transition to OP 3C, Hot Standby to Cold Shutdown, and continue the plant cooldown to cold shutdown.

D. Transition to EOP-0.1, Reactor Trip Response, to terminate the cooldown and stabilize the plant with the RCP running, then transition to OP 3D, Post Reactor Trip Stabilization to Hot Standby

Proposed answer: B

Justification:

EOP-0.3, step 1 is a continuous action step to try to restart an RCP, when this is successful, a transition OP 3C is directed for further plant recovery. The annunciator received indicates an off-normal condition with the RCP exists, and directs entry to AOP-1B if necessary which will be performed in parallel while still controlling the cooldown and depressurization. Based on the values for the vibration and given they are also still rising, this meets the foldout page criteria for tripping the RCP. Stating the RCP therefore has not been successful, so transition from EOP-0.3 is not warranted, and AOP-1B needs to be performed in parallel to secure the RCP.

A **INCORRECT:** Plausible if the student does not recall the trip criteria of the RCP, and utilizes the normal procedure transition given a successful RCP start.

B **CORRECT:** See above.

C **INCORRECT:** Plausible if the student in under the assumption that with restart of an RCP, that the cooldown is no longer required, and wants to transition to the post trip procedures.

D **INCORRECT:** Plausible if the student incorrectly applies the procedure usage to complete the plant cooldown/depressurization prior to dealing the RCP issue, with no reason to prioritize the cooldown over the RCP malfunction.

Learning Objective:

Ability to verify that the alarms are consistent with the plant conditions. (SD86.4 2.4.46)

86. 2021 NRC 086

Given the following:

- Unit 1 is at Rated Thermal Power
- Unit 2 is in MODE 5
- The following issues happen to the Component Cooling Water (CCW) System
  - 1 February at 0600, HX-12B, CCW Heat Exchanger develops a tube leak and is declared inoperable
  - 2 February at 0200, 1P-11A, CCW Pump is declared inoperable due to vibrations
  - 4 February at 1400, HX-12C, CCW Heat Exchanger is declared inoperable due to a tubesheet leak
  - 4 February at 2200, 1P-11A is repaired, tested and declared OPERABLE
  - 6 February at 2100, 1P-11B, CCW Pump is declared inoperable for a bearing failure
  - 7 February at 1300, HX-12B is repaired, tested and declared OPERABLE

Assuming that the current inoperable components cannot be repaired and brought to an OPERABLE status, which describes the latest allowable date and time which Unit 1 must be in MODE 3?

REFERENCE PROVIDED

A. 7 February at 2000

B.✓ 8 February at 0800

C. 10 February at 0300

D. 10 February at 2000

SRO Tier 2 Group 1

Source:
Bank

Question History:
2015 PBNP SRO 77 (Question's original K/A was 026G2.2.38)

SRO:
10CFR55.43(b)(2) Facility operating limitations in the technical specifications and their bases.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing ≤ 1-hour TS/TRM Actions, the LCO/TRM information listed "above the line", or TS safety limits; AND requires the operator to assess plant conditions in the application of required actions (TS Section 3) and apply completion times for equipment, declaring it inoperable.

K/A:
008G2.2.40 Component Cooling Water
Ability to apply Technical Specifications for a system.
(Imp 4.7)

Justification for K/A Match:
Matches the K/A by requiring the examinee to apply TS for the compoment cooling system.

Cognitive Level:
Comprehension 3-SPR: The operator must use Technical Specifications as a reference and Technical Specification Bases knowledge to determine when plant shutdown is required.

10 CFR Part 55 Content:
55.41 10
55.43 2
55.43 5
55.45.3

Reference:

TS 3.7.7, Component Cooling Water (CC) System Rev 1
TS B 3.7.7, Component Cooling Water (CC) System Bases Rev 4

Proposed reference to be provided to the applicants during examination:

TS 3.7.7, Component Cooling Water (CC) System 2 pages

Original Question:

Given the following:

- *Unit 1 is at Rated Thermal Power*
- *Unit 2 is in MODE 5*
- *The following issues happen to the Component Cooling Water (CCW) System*
- *1 February at 0600, HX-12B, CCW Heat Exchanger develops a tube leak and is declared inoperable*
- *2 February at 0200, 1P-11A, CCW Pump is declared inoperable due to vibrations*
- *4 February at 1400, HX-12C, CCW Heat Exchanger is declared inoperable due to a tubesheet leak*
- *4 February at 2200, 1P-11A is repaired, tested and declared OPERABLE*
- *6 February at 2100, 1P-11B, CCW Pump is declared inoperable for a bearing failure*
- *7 February at 1300, HX-12B is repaired, tested and declared OPERABLE*

Assuming that the current inoperable components cannot be repaired and brought to an OPERABLE status, which describes the latest allowable date and time which Unit 1 must be in MODE 3?
(See provided reference)

A. 7 February at 2000

B. 8 February at 0800

C. 10 February at 0300

D. 10 February at 2000

Proposed Answer: B

Justification:

This answer is based on the 144 hours (+6) from not meeting the LCO. The LCO is not met with the inoperable declaration of the 1P-11A pump, the LCO is met with the inoperable declaration of the HX-12B, as the system design and bases allows for one heat exchanger to be inoperable, and still met the LCO. Once the LCO is not met, it must be met within 144 hours.

A **INCORRECT:** This answer is based on the 72 hours (+6) for HX-12C. This is incorrect as when HX-12B is declared OPERABLE (at the 71 hour point for HX-12C), that ACTION CONDITION is exited, so HX-12C does not need to be OPERABLE to meet the LCO. Plausible if the student does not realize the ACTION CONDITION is exited with the repair of HX-12B.

B **CORRECT:** See Above

C **INCORRECT:** This answer is based on 72 hours (+6) for 1P-11B. This is incorrect, this would be longer than the 144 hour requirement to met the LCO. Plausible due to 1P-11B is the only component which is inoperable and does not cause the LCO not to be met.

D **INCORRECT:** This answer is based on the 144 hours (+6) for HX-12C. This is incorrect, as the clock actually started when 1P-11A was declared inoperable. Plausible if the student applies the 144 hour requirement to components which are not considered OPERABLE.

Learning Objective:

Given specific plant conditions, assess and apply Technical Specification Requirements, as appropriate
(057.02.LP3343.002)

87. 2021 NRC 087

Given the following:

- Unit 2 is in MODE 3
- A significant amount of water is discovered around 2HX-15A1-8, Containment Accident Recirc HX
- A water sample determines the water is from Service Water
- The inlet and outlet of the HX have been isolated

What is the OPERABILITY status of Containment and 2W-1A1, Containment Accident Recirc Fan Cooler Unit?

	Containment	2W-1A1 Cooler Unit
A.	OPERABLE	OPERABLE
B.✓	OPERABLE	inoperable
C.	inoperable	OPERABLE
D.	inoperable	inoperable

SRO Tier 2 Group 1

Source:
Bank

Question History:
2016 Prairie Island SRO 87

SRO:
10CFR55.43(b)(2) Facility operating limitations in the technical specifications and their bases.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing ≤ 1-hour TS/TRM Actions, the LCO/TRM information listed “above the line”, or TS safety limits; AND requires the operator to assess plant conditions in the application of the TS Bases to determine if the component is operable.

K/A:
022A2.05 Containment Cooling System (CCS)
Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:
Major leak in CCS
(Imp 3.5)

Justification for K/A Match:
Matches the K/A by requiring the examinee to determine the impact of a major leak in CCS.

Cognitive Level:
Comprehension 3-SPR: The operator must use Technical Specifications Bases knowledge to determine component operability.

10 CFR Part 55 Content:
55.41 10
55.43 2
55.43 5
55.45.3

Reference:
TS B 3.6.1 Bases Containment, Rev 3
TS B 3.6.6, Bases Containment Spray and Cooling Systems, Rev 12

Proposed reference to be provided to the applicants during examination:
None

Original Question:

- Unit 2 is in Mode 3.
- A significant amount of water is discovered around 22 CFCU.
- A water sample determines the water is from the river.
- All actions of C35 AOP4, Cooling Water Leakage in Containment, are complete.

What is the OPERABILITY status of Containment and 22 CFCU?

	Containment	22 CFCU
A.	OPERABLE	OPERABLE
B.	OPERABLE	INOPERABLE
C.	INOPERABLE	OPERABLE
D.	INOPERABLE	INOPERABLE

Proposed Answer: B

Justification:

The containment would OPERABLE after leak isolation. The Accident Fan, even though it runs, would remain inoperable until repair and system restoration.

A **INCORRECT:** Plausible if the examinee applies the minimum requirement for LOCA analysis and not a SLB analysis and does not take into consideration the leak on the cooling unit.

B **CORRECT:** See above.

C **INCORRECT:** Plausible if the examinee does not take the leak isolation into consideration while also Appling the minimum requirement for LOCA analysis and not a SLB analysis and does not take into consideration the leak on the cooling unit.

D **INCORRECT:** .Plausible due to both being inoperable if no actions were taken.

Learning Objective:

Given specific plant conditions, ASSESS and APPLY Technical Specification requirements as appropriate.
(057.02.LP3342.002)

88. 2021 NRC 088

Given the following:

- Unit 1 is in MODE 1
- Technical Specification surveillance IT 8A, Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1 (satisfies SR 3.7.5.2) was recently performed inside the normal frequency

Which of the following describes:
(1) Can a 25% extension be applied to the next performance of the surveillance?
AND
(2) If 1MS-2019, B SG Steam Supply to 1P-29 AFP FAILED to open per IT 8A, what is the status of LCO 3.7.5, Auxiliary Feedwater (AFW)?

A. (1) Yes
(2) MET

B✓ (1) Yes
(2) NOT Met

C. (1) No
(2) MET

D. (1) No
(2) NOT Met

SRO Tier 2 Group 1

Source:
New

Question History:
None

SRO:
10CFR55.43(b)(2) Facility operating limitations in the technical specifications and their bases.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing $\leq$ 1-hour TS/TRM Actions, the LCO/TRM information listed “above the line”, or TS safety limits; AND requires the operator to assess the application of required actions (TS Section 3) and apply completion times for equipment surveillances.

K/A:
061G2.2.12 Auxiliary / Emergency Feedwater (AFW) System
Knowledge of surveillance procedures.
(Imp 4.1)

Justification for K/A Match:
Matches the K/A by requiring the examinee to display knowledge of the surveillance process and what is being tested during surveillances.

Cognitive Level:
Comprehension 3-SPK: The operator must use Technical Specifications as a reference and Technical Specification usage knowledge to determine what condition actions are required to be entered and when the next surveillance is allowed to be performed.

10 CFR Part 55 Content:
55.41 10
55.43 13

Reference:
TS 3.7.5, Auxiliary Feedwater (AFW) System, Rev 4
TS 3.0, Surveillance Requirement Applicability, Rev 3

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:
The answer is based on 1.25 times the interval specified in the Frequency as measured from the previous performance or as measured from the specified condition of the Frequency is met which it is. The IT is a quarterly performance, and this will satisfy the requirement of SR 3.7.5.2. The action condition required to be entered is 3.7.5.A only, thus the LCO will not be met.

A **INCORRECT:** The first part is correct. The second part is wrong, plausible if the student does not recall the requirement for both steam isolations to automatically open

B **CORRECT:** See above.

C **INCORRECT:** .The first part is wrong, plausible if the student has a misconception about the application of and extension to a surveillance. The second part is wrong, plausible if the student does not recall the requirement for both steam isolations to automatically open.

D **INCORRECT:** The first part is wrong, plausible if the student has a misconception about the application of and extension to a surveillance. The second part is correct.

Learning Objective:
Knowledge of surveillance procedures
(SD 86.2.2.2.12)

89. 2021 NRC 089

Given the following:

- Both units are at Rated Thermal Power
- 2C20 B 4-8, D-05/D-06 BATTERY ROOM VENT FLOW LOW alarms
- The AO reports:
  - W-10B, D-05 Battery Room Exhaust Fan is not running and will not start
  - Battery pilot cell temperature is 75°F

Complete the following:

The operational concern of the exhaust fan malfunction is excessive D-05 Battery Room ____(1)___.

AND

D-05, Station Battery ___(2)___ OPERABLE per TS 3.8.4 DC Sources – Operating.

A.✔ (1) Hydrogen concentration
(2) is

B. (1) Temperature
(2) is NOT

C. (1) Hydrogen concentration
(2) is NOT

D. (1) Temperature
(2) is

SRO Tier 2 Group 1

Source:
Bank

Question History:
2017 Farley SRO 88

SRO:
10CFR55.43(b)(2) Facility operating limitations in the technical specifications and their bases.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing $\leq$ 1-hour TS/TRM Actions, the LCO/TRM information listed “above the line”, or TS safety limits; AND requires the operator to assess plant conditions, recall the basis to determine whether or not a component is OPERABLE.

K/A:
063A2.02 D.C. Electrical Distribution
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: **Loss of ventilation during battery charging**
(Imp 3.1)

Justification for K/A Match:
Matches the K/A by requiring the examinee to recall the operational concern of the loss of ventilation during an equalizing change, and then use procedure knowledge to determine the consequences of the loss on the battery.

Cognitive Level:
Comprehension 3-SPK: The operator must recall the operational concern for the loss of ventilation, and then apply procedural Technical Specifications knowledge to determine the operable status of the station battery given an equalizer charge and loss of ventilation.

10 CFR Part 55 Content:
55.41 10
55.43 13

Reference:
ARB 2C20 B 4-8, D-05/D-06 BATTERY ROOM VENT FLOW LOW, Rev 3
TS B 3.8.4, DC Sources – Operating Basis, Rev 5

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Unit 1 is at 100% Power with the following conditions:

An equalizing battery charge is in progress on the 1A Aux Building Battery.
LG3, 1A BATT RM EXH FAN FAULT, has come into alarm on the BOP.
Upon investigation, maintenance has determined that the 1A BATT RM EXH FAN has a seized bearing and cannot be returned to service.

Which one of the following completes the statements below?

The operational concern of the exhaust fan malfunction is excessive Battery Room ___(1)___

The 1A Aux Building Battery ___(2)___ OPERABLE, per TS 3.8.4, DC Sources - Operating.

A. (1) hydrogen concentration
(2) IS

B. (1) hydrogen concentration
(2) is NOT

C. (1)temperature
(2) IS

D. (1)temperature
(2) is NOT

Proposed answer: A

Justification:

One of the initial conditions for an equalizing battery charge is that battery room normal exhaust fan or temporary ventilation is in operation. Hydrogen buildup is the operational concern, and it addressed in the Battery Room low vent flow ARB. Per the TS Basis, each of the 125 VDC batteries are separately housed in a ventilated room apart from its charger and distribution centers. With the AO report of pilot cell temperature, LCO 3.8.6, Battery Cell Parameters will be met, there is a low temperature limit, but no upper temperature limit, and the battery will be operable based on battery cell temperature.

A **CORRECT:** See Above

B **INCORRECT:** The first part is wrong, plausible that temperature in the battery room would rise without an exhaust fan but this is not an operational concern. The second part is wrong, plausible if the student assumes that ventilation is needed to an equalizing battery charge.

C **INCORRECT:** The first part is correct. The second part is wrong, plausible if the student assumes that ventilation is needed to an equalizing battery charge.

D **INCORRECT:** The first part is wrong, plausible that temperature in the battery room would rise without an exhaust fan but this is not an operational concern. The second part is correct.

Learning Objective:

Given specific plant conditions, assess and apply technical specification requirement as appropriate
(057.02.LP3336.017)

90. 2021 NRC 090
Given the following:

- Both units are at Rated Thermal Power
- K-3A, Service Air Compressor is tagged out for repair
- A Service Water (SW) leak occurs in the plant
- K-2A, Instrument Air Compressor, AND K-2B, InstrumentAir Compressor trip
- The crew enters AOP-9A, Service Water System Malfunction, and isolates the South SW header to isolate the SW leak
- SW loads have NOT been shifted to alternate supplies

Complete the following statement:
K-3B will ___(1)___, an OS will enter AOP-5B, Loss of Instrument Air and ___(2)___.

	(1)	(2)
A.	have tripped on high SW discharge temperature	exit AOP-5B, transition to EOP-0 Reactor trip or Safety Injection
B.	continue to run, SW cooling is not required	exit AOP-5B, transition to EOP-0 Reactor trip or Safety Injection
C.✓	have tripped on high SW discharge temperature	trip both reactors and enter EOP-0, Reactor Trip or Safety Injection, while concurrently performing AOP-5B, Loss of Instrument Air
D.	continue to run, SW cooling is not required	trip both reactors and enter EOP-0, Reactor Trip or Safety Injection, while concurrently performing AOP-5B, Loss of Instrument Air

SRO Tier 2 Group 1

Source:
Bank

Question History:
2015 PBNP SRO 80 (Question's original K/A was 065AA2.04)

SRO:
10CFR55.43(b)(2) Facility operating limitations in the technical specifications and their bases.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing system knowledge, immediate operator actions, knowing entry condition for AOPs or plant parameters which direct entry into major EOPs, the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and determine the selection of a procedures to mitigate with knowledge of administrative procedures that specify hierarchy, implementation, and\or coordination of plant normal, abnormal, and emergency procedures.

K/A:
078G2.1.7 Instrument Air
Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.
(Imp 4.7)

Justification for K/A Match:
Matches the K/A by requiring the examinee to evaluate plant performance and make an operational decision based on the operating characteristics of the instrument air/service air system and the interface with service water.

Cognitive Level:
Comprehension 3-SPK: The operator must understand the initial condition and the given fault of the loss of the south service water header, take that knowledge and IA system operating characteristics and determine the effect on the plant making an operational decision on how to mitigate the event.

10 CFR Part 55 Content:
55.41 5
55.43 5
55.45.12
55.45.13

Reference:

AOP-5B, Loss of Instrument Air Rev 49
M-207 Sh 1, P&ID Service Water Rev 91
M-207 Sh 1A, P&ID Service Water Rev 45
FSAR, UFSAR 2012 Section 9.7 Instrument Air and Service Air
LP0338 Instrument and Service Air Rev 14

Proposed reference to be provided to the applicants during examination:

None

Original Question:

Given the following:

- *Unit 1 and Unit 2 are at Rated Thermal Power*
- *K-2B, Instrument Air Compressor is out of service for repair*
- *A Service Water (SW) leak occurs in the plant*
- *K-2A, Instrument Air Compressor, AND K-3A, Service Air Compressor trip*
- *The crew enters AOP-9A, Service Water System Malfunction, and isolates the South SW header to isolate the SW leak*

Complete the following statement:
K-3B will ___(1)___, an OS will enter AOP-5B, Loss of Instrument Air and ___(2)___.

	(1)	(2)
A.	*trip on high SW discharge temperature*	*remain in AOP-5B, no transitions from AOP-5B are required*
B.	*continue to run, SW cooling is not required*	*remain in AOP-5B, no transitions from AOP-5B are required*
C.	*trip on high SW discharge temperature*	*trip both reactors and enter EOP-0, Reactor Trip or Safety Injection, while concurrently performing AOP-5B, Loss of Instrument Air*
D.	*continue to run, SW cooling is not required*	*trip both reactors and enter EOP-0, Reactor Trip or Safety Injection, while concurrently performing AOP-5B, Loss of Instrument Air*

Proposed answer: C

Justification:

The compressor having lost the required SW cooling will trip on high SW discharge temperature this results in a loss of instrument AND service air compressors. OS1 will enter AOP-5B, transition to EOP-0, trip and stabilize the plant and branch back to AOP-5B, with the purpose of performing both in parallel

A **INCORRECT:** The compressor having lost the required SW cooling will trip on high SW discharge temperature. The direction is incorrect, AOP-5B will also have you trip the reactor based on a loss of all compressed air. Plausible because there are actions taken in AOP-5B to mitigate a loss of instrument air and AOP-5B will be performed in parallel with EOP-0.

B **INCORRECT:** The status is incorrect K-3B is the SW cooled air compressor, and AOP-5B will also have you trip the reactor based on a loss of all compressed air. Plausible because one of the two service air compressors has a SW discharge temperature trip and the other does not, and there are actions taken in AOP-5B to mitigate a loss of instrument air and AOP-5B will be performed in parallel with EOP-0.

C **CORRECT:** See above.

D **INCORRECT:** The status is incorrect K-3B is the SW cooled air compressor, OS1 will enter AOP-5B, transition to EOP-0, trip and stabilize the plant and branch back to AOP-5B, with the purpose of performing both in parallel. Plausible because one of the two service air compressors has a SW discharge temperature trip and the other does not.

Learning Objective:

DISCUSS how the following conditions/events could affect overall operation of the plant.
a. Loss of Instrument Air
b. Gland Steam Condenser Tube Leak
c. Loss of Condenser Vacuum
d. Abnormal conditions for Reactor Coolant Pump vibration and/or oil, as indicated by alarms
e. Steam binding or overheating of Auxiliary Feedwater Pumps
f. Feedwater Heater and/or Heater Drain Tank malfunction
g. Loss of DC Control Power to Main Generator Exciter Breakers
h. Loss of or malfunction of the CVCS System.
(069.04.LP0352.005)

91. 2021 NRC 091

Given the following:

- Units 1 is starting up after completing a refueling outage
- Unit 2 is at Rated Thermal Power
- Spent Fuel Pool (SFP) boron concentration sample results have dropped since last sample and are currently below the Technical Specification

Which answers the following:

If SFP boron concentration continues to drop, a Keff <1.0 will be ___(1)___.
AND
Action must be initiated immediately to restore the Tech Spec minimum SFP boron concentration of ___(2)___.

A.✔ (1) maintained regardless of SFP boron concentration
(2) 2100 ppm

B. (1) maintained regardless of SFP boron concentration
(2) 2350 ppm

C. (1) maintained only as long as SFP boron concentration is > 664 ppm
(2) 2100 ppm

D. (1) maintained only as long as SFP boron concentration is > 664 ppm
(2) 2350 ppm

SRO Tier 2 Group 2

Source:
Modified

Question History:
2016 Callaway SRO 93

SRO:
10CFR55.43(b)(2) Facility operating limitations in the technical specifications and their bases.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing ≤ 1-hour TS/TRM Actions, the LCO/TRM information listed "above the line", or TS safety limits; AND requires the operator to assess plant conditions have a detailed knowledge of TS bases and terminology to determine the impact of the boron dilution.

K/A:
033A2.01 Spent Fuel Pool Cooling
Ability to (a) predict the impacts of the following malfunctions or operations on the Spent Fuel Pool Cooling System ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: **Inadequate SDM**
(Imp 3.5)

Justification for K/A Match:
Matches the K/A by placing the examinee in a conditions where recently used fuel is in the SFP with a lowering boron concentration, making a prediction of the impact of a further loss of boron, and the recall the required amount of boron that is needed to maintain Keff and SDM.

Cognitive Level:
Knowledge 1-B: The operator must recall the bases information for boron concentration requirement to maintain Keff and required boron concentration fo the SFP.

10 CFR Part 55 Content:
55.41 5
55.43 5
55.45.3
55.45.13

Reference:
TS B 3.7.11, Fuel Storage Pool Boron Concentration, Rev 3

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Fuel is being moved in the Spent Fuel Pool.

Spent fuel pool boron concentration is 1950 ppm.

(1) Spent fuel pool Shutdown Margin (keff) is limited to a MAXIMUM of _____(1)_____? (Assume only one fuel assembly is mispositioned)
And
(2) Action must be initiated immediately to restore the MINIMUM boron concentration to ….?

A. (1) 0.95
(2) 2000 ppm

B. (1) 0.99
(2) 2165 ppm

C. (1) 0.95
(2) 2165 ppm

D. (1) 0.99
(2) 2000 ppm

Proposed answer: C

Justification:

Per TS B 3.711, The design of the spent fuel storage rack is based on the use of unborated water, with maintains the spent fuel pool in a subcritical condition during normal operation with the pool fully loaded. So a Keff of less than 1.0 will be maintained in the SPF based on the construction of the storage racks.

Per TS 3.7.11 and its associated bases, the >2100 PPM limit conservatively assures Keff is maintained within the limit (Keff <.95) for dropped fuel assembly etc,. In addition, this limit ensures no credible boron dilution event will reduce boron concentration to <664 ppm required during non-accident conditions to maintain Keff < .95.

A **CORRECT:** See above.

B **INCORRECT:** The first part is correct. The second part is wrong, plausible as this is the minimum boron concentration during refueling operations.

C **INCORRECT:** The first part is wrong, plausible as this is the boron concentration that is assumed to in accident analysis to maintain the SFP at a Keff <0.95. The second part is correct.

D **INCORRECT:** The first part is wrong, plausible as this is the boron concentration that is assumed to in accident analysis to maintain the SFP at a Keff <0.95. The second part is wrong, plausible as this is the minimum boron concentration during refueling operations.

Learning Objective:

DISCUSS Technical Specification Definitions, Rules of Usage, Safety Limits, 1 Hours or Less Actions for Systems, Equipment, and Basis of LCOs and Safety Limits.
(057.01.LP3336.017)

92. 2021 NRC 092
Given the following:

- Unit 1 is at Rated Thermal Power
- 1MS-2016, Steam Generator B Atmos Steam Dump CV opens

Which answers the following:
(1) What will the OS direct?
AND
(2) What is considered to be the most limiting event concerning operation of the Atmospheric Dump Valves?

A.✓ (1) Direct the BOP to shut 1MS-2016
(2) Steam generator tube rupture accident with a loss of off-site power

B. (1) Direct the BOP to shut 1MS-2016
(2) Small break loss of coolant accident with a loss of off-site power

C. (1) No direction needed, this condition is normal
(2) Small break loss of coolant accident with a loss of off-site power

D. (1) No direction needed, this condition is normal
(2) Steam generator tube rupture accident with a loss of off-site power

SRO Tier 2 Group 2

Source:
Modified

Question History:
2003 PBN 93

SRO:
10CFR55.43(b)(2) Facility operating limitations in the technical specifications and their bases.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing $\leq$ 1-hour TS/TRM Actions, the LCO/TRM information listed “above the line”, or TS safety limits; AND requires the operator to assess plant conditions have a detailed knowledge of TS bases to determine the impact of the valve failure on plant operations.

K/A:
041G2.1.31 Steam Dump/Turbine Bypass Control
Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.
(Imp 4.3)

Justification for K/A Match:
Matches the K/A by requiring the examinee to recall the actions and determine the impact of the loss of ADV.

Cognitive Level:
Knowledge 1-B: The operator must recall the actions to isolate and then the bases and apply that knowledge determine the effect on Unit 1

10 CFR Part 55 Content:
55.41 10
55.45.12

Reference:
AOP-2A, Secondary Coolant Leak, Rev 17
TS B 3.7.4, Atmospheric Dump Avle (ADV) Flowpaths Basis

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Which one of the following is considered to be the most limiting event (time critical) concerning operation of the Atmospheric Dump Valves?

A. Small break loss of coolant accident **without** a loss of off-site power.

B. Steam generator tube rupture accident **with** a loss of off-site power.

C. Large break loss of coolant accident **without** a loss of off-site power.

D. Main Steam Line break accident inside containment **with** a loss of off-site power.

Proposed answer: B

Justification:

Per AOP-2B, the instruction is to shut the ADV and this will be directed to the BOP to take manual control and shut the valve.

The design basis for the ADV is to cool the unit to RHR entry conditions. Prior to operator actions to cooldown the unit the steam generator safeties are assumed to operate automatically to relieve steam and maintain the steam generator pressure below the design value. For the recovery from a steam generator tube rupture, the operator is required to perform a limited cooldown to establish adequate subcooling as a necessary step to terminate the primary to secondary break flow into the ruptured steam generator. The time required to terminate the release from the ruptured steam generator is more critical than the time required to cooldown to RHR conditions.

A **CORRECT:** See above

B **INCORRECT:** The first part is correct. The second part is wrong, plausible because the basis for the ADV operation is to cool the unit to RHR entry conditions, and with a small break LOCA with a loss of offsite power, the condensers will be assumed lost, so the cooldown will need to be done using the steam generator ADV in order to get the unit to RHR conditions.

C **INCORRECT:** The second part is wrong, plausible because the basis for the ADV operation is to cool the unit to RHR entry conditions, and with a small break LOCA with a loss of offsite power, the condensers will be assumed lost, so the cooldown will need to be done using the steam generator ADV in order to get the unit to RHR conditions.

D **CORRECT:** The first part is wrong, plausible if the examinee considers this a normal event at RTP. The second part is correct.

Learning Objective:

DISCUSS Technical Specification Definitions, Rules of Usage, Safety Limits, 1 Hours or Less Actions for Systems, Equipment, and Basis of LCOs and Safety Limits.
(057.01.LP3336.017)

93. 2021 NRC 093

Given the following:

- Both units are at Rated Thermal Power
- While performing welding activities in the Cable Spreading Room, one of the heat detectors associated with the Halon system was inadvertently actuated
- The Halon actuation was successfully aborted with the use the ABORT palm switch and resetting fireworks prior to actual Halon discharge

Which answers the following:
(1) How is the Cable Spreading Room Halon system affected while the ABORT palm switch is held in the depressed position?
AND
(2) What actions are required per OM 3.27, Control of Fire Protection and NFPA 805 Equipment, if the Halon system is removed from service to stop further unintended actuations while work continues?

A✔ (1) Auto actuation ONLY is blocked
(2) Backup fire suppression capability is provided and an Hourly fire watch is established within one hour

B. (1) BOTH Manual and Auto actuation of the system is blocked
(2) Backup fire suppression capability is provided and an Hourly fire watch is established within one hour

C. (1) Auto actuation ONLY is blocked
(2) Backup fire suppression capability is provided and a Continuous fire watch is established within one hour

D. (1) BOTH Manual and Auto actuation of the system is blocked
(2) Backup fire suppression capability is provided and a Continuous fire watch is established within one hour

SRO Tier 2 Group 2

Source:
Bank

Question History:
2009 McGuire SRO 92

SRO:
10CFR55.43(b)(1) Conditions and limitations in the facility license

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it is the administration of fire protection program requirements, such as compensatory action associated with inoperable sprinkler systems and fire doors.

K/A:
086A2.03 Fire Protection System (FPS)
Ability to (a) predict the impacts of the following malfunctions or operations on the Fire Protection System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: **Inadvertent actuation of the FPS due to circuit failure or welding**
(Imp 2.9)

Justification for K/A Match:
Matches the K/A by requiring the examinee to predict what impact the auto actuation and abort switch operation will have on the fire protection system actuation sequence, and what actions are required to prevent further unintended system actuations.

Cognitive Level:
Knowledge 1-I The examinee must recall the interlock for the halon system actuation and what compensatory actions will be needed.

10 CFR Part 55 Content:
55.41 1
55.43 5
55.45 3
55.45 13

Reference:
LP0003, Fire Protection, Rev 27
OM 3.27, Control of Fire Protection and NFPA 805 Equipment, Rev 77

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following:
- Unit 1 was operating at 100% RTP
- While performing welding activities in the 1A D/G Room one of the heat detectors associated with the Halon system was inadvertently actuated
- The Halon actuation was successfully aborted by the fire watch depressing the ABORT/OFF pushbutton prior to actual Halon discharge.

How is the 1A D/G Halon system affected and what actions are required per SLC 16.9.3 (Halon Systems)?

A. Auto actuation ONLY is blocked
Establish an Hourly fire watch within one hour

B. BOTH Manual and Auto actuation of the system is blocked.
Establish a Hourly fire watch within one hour.

C. Auto actuation ONLY is blocked
Establish a Continuous Fire Watch within one hour.

D. BOTH Manual and Auto actuation of the system is blocked.
Establish a Continuous Fire Watch within one hour.

Proposed answer: C

Justification:

The halon system is actuated by 2 smoke detectors or one heat activated detector, and will have a 40 second time delay. If the operator uses the abort palm switch, this will stop the delay. During that time an operator can abort the discharge via the fireworks or FACP if the alarm condition is clear.
This button will only block automatic operations of the halon system.

If the system is to be removed from service per OM 3.27, the compensatory actions of a backup fire suppression capability is an hourly fire watch must be established with one hour.

A **CORRECT:** See above.

B **INCORRECT:** The first part is wrong, plausible if the examinee does not recall that manual actuation cannot be blocked. The second part is correct.

C **INCORRECT:** The first part is correct. The second part is wrong, plausible is the examinee apples the requirements of HSS fire barrier and a fire detection system being non-functional to this situation.

D **INCORRECT:** The first part is wrong, plausible if the examinee does not recall that manual actuation cannot be blocked. The second part is wrong, plausible is the examinee apples the requirements of HSS fire barrier and a fire detection system being non-functional to this situation.

Learning Objective:

Analyze system response to Fire Protection System malfunctions (051.01.LP0003.006)

94. 2021 NRC 094

Given the following:

- Unit 1 is at Rated Thermal Power
- Unit 2 is in MODE 2, starting up from a refueling outage

In accordance with OM 1.1, Conduct of Operations, PBNP Specific, which of the following personnel IS required to obtain permission from Shift Supervision for entry to the Control Room?

A. Operation Director

B. Site Vice President

C. NRC Resident Inspector

D.✓ Security Shift Supervisor

SRO Tier 3

Source:

Modified – based on change of location from at the controls to control room, and changing distractor d for question symmetry.

Question History:

2014 Callaway 95

Justification for SRO-ONLY Question:

This is an SRO-ONLY question based on the responsibility to control access to the control room by shift supervision (Shift Manager or Unit Supervisor) as required by site policies and procedures.

K/A:

G2.1.13 Conduct of Operations
Knowledge of facility requirements for controlling vital/controlled access.
(Imp 3.2)

Justification for K/A Match:

Matches the K/A by requiring the examinee to have recall the permissions necessary to enter the controlled areas of the control room and the at the controls area.

Cognitive Level:

Knowledge 1-P: The examinee recall the requirements needed to be enter the areas.

10 CFR Part 55 Content:

55.41 10
55.43 5
55.45 9
55.45 10

Reference:
OM 1.1, Conduct of Plant Operations, PBNP Specific, Attachment A, page 12, Rev 54

Proposed reference to be provided to the applicants during examination:
None

Original Question:
Which of the following personnel is required to be granted permission to enter the "At the Control Area" of the Control Room?

A. NRC Resident Inspector

B. On-Shift I&C Technician

C. On-Coming Shift Manager

D. Security Department Personnel

Justification:
OM 1.1, Attachment A, PBNP Specific Expectations, page 12, states: Personnel NOT required to request permission to enter the Control Room include, the On Shift Operations Personnel, WCC SRO, Control Room clerk, Operations Manager, Assistant Operations Manager, Plant Manager, Site Vice President, Oncoming shift and Nuclear Regulatory Commission personnel.
NOTE: Operations Director is the new title for the Operations Manager.

A **INCORRECT:** See above.

B **INCORRECT:** See above.

C **INCORRECT:** See above.

D **CORRECT:** The Security Shift Supervisor is not on the list of personnel that do not require permission to enter the Control Room.

Learning Objective:
Learning objectives were derived from the tasks contained in NUREG-1122 Rev 2, Knowledge and Abilities Catalog for Nuclear Power Plant Operator: Pressurized Water Reactors.
(SD 86.1.2.1.13)

95. 2021 NRC 095
Given the following:

- Unit 2 is being refueled following a complete core offload.

IAW RP 1C, Refuleing, any deviation from the specified core refueling approved sequence, while transporting fuel to or from the Spent Fuel Pool or the core, requires the concurrence of the ______ before any changes are made?

A. Reactor Engineering Duty and Call Supervisor

B. Core Loading Supervisor and the Shift Manager

C. Reactor Engineering representative and the Shift Manager

D.✓ Reactor Engineering representative and the Core Load Supervisor

SRO Tier 3

Source:
Bank

Question History:
2015 PBNP SRO 95 (Question's original K/A was G2.1.35)

SRO:
10CFR55.43(b)(6) Procedures and limitations involved in initial core loading, alterations in core configuration, control rod programming, and determination of various internal and external effects on core reactivity.

10CFR55.43(b)(7) Fuel handling facilities and procedures.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on SRO refueling floor responsibilities and refueling procedure knowledge as well as administrative controls associated with refueling actives.

K/A:
G2.1.42 Conduct of Operations
Knowledge of new and spent fuel movement procedures.
(Imp 3.4)

Justification for K/A Match:
Matches the K/A by requiring the examinee to have knowledge of the fuel movement procedures.

Cognitive Level:
Knowledge 1-P: The examinee must recall the administrative requirements, who's permission is required for changes.

10 CFR Part 55 Content:
55.41 10
55.43 7
55.45 13

Reference:
RP 1C, Refueling, Rev 83

Proposed reference to be provided to the applicants during examination:
None

Original Question:

Given the following:

- *Unit 2 is being refueled following a complete core offload.*

Any deviation from the specified core refueling approved sequence, while transporting fuel to or from the Spent Fuel Pool or the core, requires the concurrence of the ______ before any changes are made?

A. Reactor Engineering Duty and Call Supervisor

B. Core Loading Supervisor and the Shift Manager

C. Assigned Reactor Engineer and the Shift Manager

D. Assigned Reactor Engineer and the Core Load Supervisor

Proposed answer: D

Justification:

These are the required approvals per section 3.2.2 of RP 1C

A **INCORRECT:** This position is notified of issues during the fueling sequence, but concurrence is not required, plausible because this person is notified when issues arise.

B **INCORRECT:** The first person is right, but the Shift Manager is only required to be notified of the change, plausible because the change is required to through the Shift Manager for notification purposes.

C **INCORRECT:** The first person is right, but the Shift Manager is only required to be notified of the change, plausible because the change is required to through the Shift Manager for notification purposes.

D **CORRECT:** See above.

Learning Objective:

Learning objectives were derived from the tasks contained in NUREG-1122 Rev 2, Knowledge and Abilities Catalog for Nuclear Power Plant Operator: Pressurized Water Reactors.
(2.1.42)

96. 2021 NRC 096

Concerning Guarded Equipment areas, what type of permission (if any) is needed and who grants it for the following evolutions:
1) Non-intrusive walkdown of the area?
AND
2) Erection of scaffolding in the area?

(OATC, Operator At The Controls)
(SM, Shift Manger)

A. 1) Permission is not needed
2) Verbal permission from the OATC

B. 1) Verbal permission from the OATC
2) Verbal permission from the SM

C. 1) Verbal permission from the OATC
2) Written permission from the SM

D. ✓ 1) Verbal permission from SM or designee
2) Written permission from the SM

SRO Tier 3

Source:
New

Question History:
None

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on SRO (supervisor) responsibility for the to maintain equipment control and maintenance control of guarded equipment areas as required by plant procedure and policy.

K/A:
G2.2.17 Equipment Control
Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.
(Imp 3.8)

Justification for K/A Match:
Matches the K/A by requiring the examinee to have knowledge of the managing maintenance activities on guarded equipment.

Cognitive Level:
Knowledge 1-F: The examinee must recall the requirements for what is and is not allowed around guarded equipment.

10 CFR Part 55 Content:
55.41 10
55.43 5
55.45 13

Reference:
OP-AA-102-1003, Guarded Equipment, Rev 39,

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

For guarded equipment areas, written permission is required for physical work to be performed (i.e., scaffold building, maintenance), written permission is not required it no physical work is occurring such as a pre-job walkdown, these only require verbal permission, and there is list of work which requires no level of permission examples of this include, operator and fire rounds, responding to alarms, performing surveys, regulatory inspection.

A **INCORRECT:** The first part is wrong, plausible as there are similar activities which do not require permission. The second part is wrong, plausible if the examinee differentiates between work on a system, and work in the area of a system, this being work in the area may only require verbal permission.

B **INCORRECT:** The first part is right. The second part is wrong, plausible if the examinee differentiates between work on a system, and work in the area of a system, this being work in the area may only require verbal permission.

C **CORRECT:** See Above.

D **INCORRECT:** The first part is wrong, plausible as there are similar activities which do not require permission. The second part is right.

Learning Objective:

Learning objectives were derived from the tasks contained in NUREG-1122 Rev 2, Knowledge and Abilities Catalog for Nuclear Power Plant Operator: Pressurized Water Reactors.
(2.2.17)

97. 2021 NRC 097

Given the following:

- Unit 1 is in a refueling outage with a core offload in progress
- You are the Relief Crew SRO and have two Operators who need to hang a danger tag in containment on the 21' behind the LHRA refueling boundary

Which of the following describes:
(1) Whose permission is needed to enter the LHRA?
AND
(2) Can fuel be moved through the transfer tube while personnel are in the LHRA?

A. (1) Core Load Supervisor ONLY
(2) Yes

B. (1) Core Load Supervisor ONLY
(2) No

C. (1) Core Load Supervisor AND Radiation Protection
(2) Yes

D.✓ (1) Core Load Supervisor AND Radiation Protection
(2) No

SRO Tier 3

Source:
New

Question History:
None

SRO
10CFR55.43(b)(7) Fuel handling facilities and procedures.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on SRO (supervisor) responsibility for the determination of what requirements must be met to enter the area, during the refueling process, and if that process can restart.

K/A:
G2.3.12 Radiation Control
Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.
(Imp 3.7)

Justification for K/A Match:
Matches the K/A by requiring the examinee to have knowledge of the access requirements to locked high-radiation areas during fueling handling.

Cognitive Level:
Knowledge 1-P: The examinee recall the requirements needed to be met to enter the area and perform the task and if refueling can be restarted.

10 CFR Part 55 Content:
55.41 12
55.45 9
55.45 10

Reference:
RP 1C, Refueling, Rev 83
RP-AA-103-1002, High Radiation Area Controls Rev 12, Section 4.3.2

Proposed reference to be provided to the applicants during examination:
None

Original Question:
N/A

Justification:

Very High Radiation Areas are defined as an area, accessible to individuals, where radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads in 1 hour at 1 meter from a radiation source or from any surface that the radiation penetrates. Since refueling operations are currently happening, CLS permission is additionally required to enter this area. Refueling may not restart until the area has been verified free of personnel and has been locked, and control of the refueling operation (fuel movement) is the responsibility of the CLS.

A **INCORRECT:** The first part is wrong, plausible, as the CLS is controlling the refueling operation and is responsible for all facets of it. The second part is wrong, plausible if the student assumes the area has been setup based on fuel movement, and that access is allowed based on the new postings.

B **INCORRECT:** The first part is wrong, plausible, as the CLS is controlling the refueling operation and is responsible for all facets of it. The second part is correct.

C **INCORRECT:** The first part is correct. The second part is wrong, plausible if the student assumes the area has been setup based on fuel movement, and that access is allowed based on the new postings.

D **CORRECT:** See above.

Learning Objective:

Learning objectives were derived from the tasks contained in NUREG-1122 Rev 2, Knowledge and Abilities Catalog for Nuclear Power Plant Operator: Pressurized Water Reactors.
(SD 86.1.2.3.12)

98. 2021 NRC 098

Given the following:

- T-104A, Waste Distillate Tank is being discharged overboard via Unit 2 Service Water
- 2RE-229, Service Water Overboard Unit 2 monitor, momentarily goes into an **ALERT** status, and then clears
- RE-223, Waste Distillate Tank Overboard monitor, is normal and is well below setpoint

Which of the following describes how the system will respond and what actions are now required?

A. Discharge will need to be manually secured. The discharge path switched to Unit 1 Service Water Overboard, and then discharge may be recommenced. Document change of discharge path on the existing Liquid Waste Discharge Permit.

B✓ Discharge will need to be manually secured. Discharge may recommence using a new Liquid Waste Discharge Permit, following re-sampling and analysis.

C. BE-LW-15, Waste Distillate Overboard Discharge Flow Control, will automatically close. The alert condition on 2RE-229 will need to be evaluated and a new Liquid Waste Discharge Permit MUST be completed prior to continuing the discharge.

D. BE-LW-15, Waste Distillate Overboard Discharge Flow Control, will automatically close. Discharge may recommence using existing Liquid Waste Discharge Permit following the performance of RAM 3.1.1, Restarting a Liquid Batch Release.

SRO Tier 3

Source:
Bank

Question History:
2012 PBNP SRO 98 (Question's original K/A was G2.3.11)

SRO:
10CFR55.43(b)(4) Radiation hazards that may arise during normal and abnormal situations, including maintenance activities and various contamination conditions.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by RO knowledge of radiological safety principles (e.g., radiation work permit requirements, stay time, and DAC hours); AND requires the examinee to demonstrate SRO level of knowledge of procedures which controlling the release of radioactive fluids.

K/A:
G2.3.15 Radiation Control
Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.
(Imp 3.1)

Justification for K/A Match:
Matches the K/A by requiring the operator to use knowledge of fixed radiation monitors, alarms and the impact of that on discharge of liquid waste.

Cognitive Level:
Comprehension 3-SPK: The operator must analyze the initial conditions, determine how the discharge will be effected, and what actions are necessary to continue the discharge.

10 CFR Part 55 Content:
55.41 12
55.43 4

Reference:

RMSASRB CI 2RE-229, Service Water Overboard Monitor Unit 2 Rev 6
RMSASRB CI RE-223, Waste Distillate Tank Overboard Monitor Rev 6
OI 140B, Standard Radioactive Batch Liquid Release – Waste Distillate Tanks Rev 13
AOP-4A, High Effluent Activity Rev 6
RAM 3.1.1 Restarting a Liquid Batch Release Rev 7

Proposed reference to be provided to the applicants during examination:

None

Original Question:

Consider the following plant conditions:

- *Waste Distillate Tank 'A' is being discharged overboard via Unit 2 service water.*
- *2RE-229, Unit 2 SW Overboard monitor, momentarily goes into an ALERT status, and then clears.*
- *RE-223, Waste Distillate Tank Overboard monitor, is normal and is well below setpoint.*

Which of the following describes how the system will respond and what actions are now required?

A. Waste Distillate Overboard valve, BE-FCV-LW-15, will automatically close. The alert condition on 2RE-229 will need to be evaluated and a new Liquid Waste Discharge Permit MUST be completed prior to continuing the discharge.

B. Waste Distillate Overboard valve, BE-FCV-LW-15, will automatically close. Discharge may recommence using existing Liquid Waste Discharge Permit following the performance of RAM 3.1.1, Restarting a Liquid Batch Release.

C. Discharge will need to be manually secured while the discharge path is switched to Unit 1 SW Overboard, then discharge may be recommenced. Document change of SW alignment on the existing Liquid Waste Discharge Permit.

D. Discharge will need to be manually secured. Discharge may recommence using a new Liquid Waste Discharge Permit, following re-sampling and analysis.

Proposed answer: D

Justification:

With 2RE-229 having an alert alarm condition, the discharge will need to be manually secured per AOP-4A and RAM 3.1.1. 2RE-229 will not cause an automatically operation of BE-LW-15, so the discharge will need to be manually stopped. The tank will need to be resampled and a new permit issued.

A **INCORRECT:** The first part it correct. The second part is incorrect PBNP prohibits the change of discharge permit from one unit to another without the issuance of a new permit, but plausible since the reading RE-223 was always well below normal, the operator can assume that it is not functioning properly and with the change in discharge paths, the discharge can continue.

B **CORRECT:** See above.

C **INCORRECT:** The first part is incorrect, but plausible RE-223 alarmed as this would automatically occur. The second part is a correct statement.

D **INCORRECT:** The first part is incorrect, but plausible RE-223 alarmed as this would automatically occur. The second part is incorrect, RAM 3.1.1 will require the current permit closed out and a new permit be issued.

Learning Objective:

DESCRIBE the procedures which govern operation of the Liquid Waste Disposal System. Description should include significant prerequisites, precautions, and notes associated with each operating procedure.
(051.04.LP0063.004)

99. 2021 NRC 099

Given the following:

- Entry conditions for the following procedures are met:
  - CSP-S.1, Response to Nuclear Power Generator/ATWS
  - CSP-C.1, Response to inadequate Core Cooling

Which of the following describes:
(1) Which procedure is required be entered first?
AND
(2) Why?

A. (1) CSP-C.1
(2) To minimize the production of energy in the fuel

B. (1) CSP-C.1
(2) To provide adequate reactor coolant for heat removal from the fuel

C.✓ (1) CSP-S.1
(2) To minimize the production of energy in the fuel

D. (1) CSP-S.1
(2) To provide adequate reactor coolant for heat removal from the fuel

SRO Tier 3

Source:
Bank

Question History:
2012 PNB 99

SRO:
10CFR55.43(b)(5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on it cannot be answered solely by knowing system knowledge, immediate operator actions, knowing entry condition for AOPs or plant parameters which direct entry into major EOPs, the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and determine the procedure to mitigate with knowledge of administrative procedures that specify implementation, and coordination requirements.

K/A:
G2.4.40 Emergency Procedures / Plan
Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.
(Imp 3.4)

Justification for K/A Match:
Matches the K/A by requiring the examinee determine which safety function need to be prioritized, by determining the required monitoring time.

Cognitive Level:
Comprehensive 3-SPR: The examinee must understand the initial conditions, determine the required path to mitigate the event, and then recall the required monitoring time for the status trees based on this.

10 CFR Part 55 Content:
55.41 7
55.41 10
55.43 3
55.45 12

Reference:
OM 3.7, AOP and EOP Procedure Usage for Response to Plant Transients, Rev 33

Proposed reference to be provided to the applicants during examination:
None

Original Question:

The following conditions exist following a LOCA on Unit 2:
- Source Range NI's 2.0 X 10E4 cps and LOWERING
- Core Exit TC's 295°F and LOWERING
- RCS Subcooling 69°F and STABLE
- RCPs Tripped
- RVLIS NR 26 ft and LOWERING
- Total AFW flow 230 gpm
- Narrow Range SG levels 30% (A) 34%(B) and RISING
- RCS Pressure 190 psig and LOWERING
- Cold leg Temp (Current) 312°F and LOWERING
- Cold leg Temp (Hour ago) 541°F and STABLE
- Containment Pressure 22 psig and RISING
- Containment Sump 'B' Level 48 in and RISING

Based on the above conditions, which of the following states the scanning requirements for the CSF Status Tree's per OM 3.7, AOP and EOP Procedure Use and Adherence?

A. Continuously
B. 3 - 5 minute intervals
C. 10 - 20 minute intervals
D. Monitoring can be stopped

Proposed answer: B

Justification:

Per OM 3.7, the hierarchy and sequence to utilize the CSPs is: Subcriticality, Core Cooling, Heat Sink, Integrity, Containment, and Inventory
And the overall mitigative strategy for CSP-S.1 is to minimize the production of energy in the fuel.

A **INCORRECT:** The first part is wrong, plausible if the examinee does not recall the required procedure hierarchy. The second part is correct, plausible as this is the highest priority to issue in the CSP network.

B **INCORRECT:** The first part is wrong, plausible if the examinee does not recall the required procedure hierarchy. The second part is wrong, plausible as this is the strategy for this procedure.

C **CORRECT:** See above.

D **INCORRECT:** The first part is correct. The second part is wrong, plausible as the CSP does this, but it is not the reason.

Learning Objective:

Implement the critical safety function status tree and critical safety procedure rules of usage.
(043.03.LP1995.013)

100. 2021 NRC 100

In accordance with EPIP 1.1, Course of Actions, which of the following identifies an action that may be delegated by the Shift Manager while they are acting as Emergency Coordinator?

A. Approval of dose extensions

B. Authorizing the use of potassium iodide

C. Issuing Protective Action Recommendations

D.✓ Directing assembly, accountability and evacuation

SRO Tier 3

Source:
Modified

Question History:
2015 PBNP SRO 100

Justification for SRO-ONLY Question:
This is an SRO-ONLY question based on the responsibility of duties that cannot be delegated that are the responsibility of the SRO.

K/A:
G2.4.40 Emergency Procedures / Plan
Knowledge of SRO responsibilities in emergency plan implementation.
(Imp 4.5)

Justification for K/A Match:
Matches the K/A by requiring the examinee to recall which responsibilities are non-delegable duties and must be performed by the Emergency Director.

Cognitive Level:
Knowledge 1-P: The examinee must know requirements for which actions/responsibilities can be delegated by the Emergency Director (ED)

10 CFR Part 55 Content:
55.41 10
55.43 5
55.45 11

Reference:

EPIP 1.1, Course of Action, Section 8, 9, 10, 11, and 12 Attachment A, Rev 84 - **Withheld from public disclosure**

Proposed reference to be provided to the applicants during examination:

None

Original Question:

Based on stem change where the SM is the ED, making it a situation specific question where the examinee would perform that function, vice an Emergency Director in the EOF or Emergency Coordinator in the TSC, where duties change and personnel other than SRO perform the duty, and the modification of one distractor.

In accordance with EPIP 1.1, Course of Actions, which of the following identifies an action that may be delegated by Emergency Director (ED)?

A. Approval of dose extensions

B. Authorizing the use of potassium iodide

C. Issuing Protective Action Recommendations

D. Directing assembly, accountability and evacuation

Proposed answer: D

Justification:

This is an action/duty that the Emergency Coordinator can delegate, (Attachment A, Command and Control Turnover Sheet)

A **INCORRECT:** The request for federal assistance is **not** an activity that can be delegated. Plausible if the student has a misconception of actions/duties which may be delegated by the ED.

B **INCORRECT:** The authorization of potassium iodide use is **not** an activity that can be delegated. Plausible if the student has a misconception of actions/duties which may be delegated by the ED.

C **INCORRECT:** The issuing of protective action recommendations **not** an activity that can be delegated. Plausible if the student has a misconception of actions/duties which may be delegated by the ED.

D **CORRECT:** See above.

Learning Objective:

Learning objectives were derived from the tasks contained in NUREG-1122 Rev 2, Knowledge and Abilities Catalog for Nuclear Power Plant Operator: Pressurized Water Reactors.
(2.4.40)