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1	K/A Importance: 3.8/4.0			Points: 1.00
R01	Difficulty: 2.00	Level of Knowledge: HIgh	Source: BANK	81066

A plant startup was in progress with reactor power at 85% when a transient occurred. The following plant conditions now exist:

- Reactor power cycling .....59-69 %
- Core Flow .....45 Mlb/hr
- RR MG set A speed 0%
- RR MG set B speed 69%
- RPV Master Level Controller.....in Auto at 197"

The P603 Operator selects CR 30-27 and notes LPRM downscale and upscale conditions are occurring periodically. Given these plant indications, (1) which of the following conditions exist, and (2) which operator action is required by plant procedures?

A. (1) RRMG set is operating in speed oscillation region.
(2) Insert the Cram Array.

B. (1) Neutron flux instability.
(2) Insert the Cram Array.

C. (1) RRMG set is operating in speed oscillation region.
(2) Raise RR MG set B speed to exit oscillation region.

D. (1) Neutron flux instability.
(2) Place the Mode Switch in Shutdown.

Answer: D

Answer Explanation:
24.000.01, Att 34b, describes this as an indication of neutron flux instability. The attachment also states "If Neutron Flux Instability is observed, immediately place the Reactor Mode Switch to SHUTDOWN."

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The candidate will recall that 23.138.01 has the P&L 3.3.5 Because of RR MG Set speed oscillation, avoid the steady-state operation of the RR MG Sets in the 22% to 26% and the 49% to 54% speed ranges. Recirculation Loop Jet Pump flows may be mismatched, within Technical Specification Limits, to transition through these speed ranges. If the speed were in the range of the P&L, the oscillations would be reflected in LPRMS. However, the stem does not indicate the correct speed ranges and inserting the cram array would not correct the oscillation problem.
B. While Neutron flux instability is indicated the action to "insert the Cram Array" is not the correct action. This answer is plausible because Insert the Cram Array is the way to reduce power rapidly when in the Exit region per 24.000.01 and is used in several other plant events for the same purpose.
C. The candidate will recall that 23.138.01 has the P&L 3.3.5 Because of RR MG Set speed oscillation, avoid the steady-state operation of the RR MG Sets in the 22% to 26% and the 49% to 54% speed ranges. Recirculation Loop Jet Pump flows may be mismatched, within Technical Specification Limits, to transition through these speed ranges. If the speed were in the range of the P&L, the oscillations would be reflected in LPRMS. However, the stem does not indicate the correct speed ranges. Raising RR MG Set speed would be a possible action if the RR MG Sets was in the 22% to 26% and the 49% to 54% speed ranges.

Reference Information:
24.000.01 Att 34b
23.138.01 P&L 3.3.5

Plant Procedures
20.138.01
24.000.01

NUREG 1123 KA Catalog Rev. 2
295001 Partial or Complete Loss of Forced Core Flow Circulation
G2.1.32 Ability to explain and apply system limits and precautions

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (1) Fundamentals of reactor theory, including fission process, neutron multiplication, source effects, control rod effects, criticality indications, reactivity coefficients, and poison effects.

NRC Exam Usage
ILO 2019 Exam
LOR 2009 Exam
LOR 2015 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):
Reactor Operator
Performance Enabler
Without reference to procedures, perform AOP immediate actions.

2	K/A Importance: 3.8/4.0*			Points: 1.00
R02	Difficulty: 2.00	Level of Knowledge: Low	Source: BANK	81086

A Station Blackout (SBO) has occurred. The Start Pushbutton for CTG11-1 has been depressed and CTG11-1 is coming up to rated speed and voltage.

What is one purpose of stripping DC loads when responding to the Station Blackout (SBO)?

A. Protects the FLEX battery chargers from overload.

B. Extends battery life by removing unnecessary loads.

C. Protects CTG11-1 from overload when available to re-energize SST 64.

D. Prevents damage to the ESF batteries due to cell reversal cause by the high load of the Static Inverters during low battery voltage conditions.

Answer: B

Answer Explanation:
Per 20.300.SBO and SBO BASES
Eliminating all unnecessary 260 VDC and 130 VDC loads from BOP, Div 1, and Div 2 Batteries will prolong the following:

- BOP Battery loads are stripped to extend life of UPS system.

Distractor Explanation:

A. Protects the FLEX battery chargers from overload is plausible distractor, and is incorrect because there are no FLEX battery chargers in the switch gear rooms. This distractor is also incorrect because the FLEX procedure, 29.400.01 FLEX, will not be performed until 45 minutes have elapsed since SBO was entered or it is determined that a source of AC power will not be restored within 45 minutes, which is not a valid assumption given that the stem of the question states CTG 11-1 is coming up to rated speed and voltage.
C. This distractor is plausible because performance of Attachment 1 is directed by Action I.2, of Condition I of 23.300.SBO, when the Blackstart Unit Startup Sequence Complete light comes on, signifying it is available to carry loads (as stated in distractor C). Attachment 1 is the pre-energization breaker alignment for components that will be energized when SST 64 is energized. This distractor is plausible if the examinee incorrectly recalls that DC loads are stripped off, by the performance of Attachment 1, prior to closing the CTG 11-1 output breaker in Action I4. This distractor is incorrect because Attachment 1 does not contain steps for stripping DC loads but instead is used to align plant equipment control switches to the de-energized/off state in preparation for bus re-energization by the CTG.
D. This is plausible because subjecting a discharged cell to a current in the direction which tends to discharge it further to the point the positive and negative terminals switch polarity causes a condition called cell reversal. This can occur when a battery made of several cells connected in series is deeply discharged. The problem occurs due to the different cells in a battery having slightly different capacities. When one cell reaches discharge level ahead of the rest, the remaining cells will force the current through the discharged cell. However this distractor is not correct because all of the Static inverters that draw from DC systems at fermi have a low-voltage cutoff (100VDC) that prevents the static inverters from drawing power from the battery during low voltage conditions that might cause cell reversal.

Reference Information:
20.300.SBO Condition AA and AC.
29.FSG.01, FLEX DC.
R31-XX, DBD for DC Electrical, Page 77 (DC INPUT BREAKER UV TRIP SETPOINT)

Plant Procedures
20.300.SBO Loss of Offsite and Onsite Power
29.FSG.01 Flex DC

NUREG 1123 KA Catalog Rev. 2
295003 AK1. Knowledge of the operational implications of the following concepts as they apply to PARTIAL OR COMPLETE LOSS OF A.C. POWER :
295003 AK1.01 Effect of battery discharge rate on capacity

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
DC Electrical Distribution (R3200 & S3102)

Cognitive Enabler

Identify abnormal and emergency operating procedures associated with the DC Electrical Distribution System.

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3	K/A Importance: 3.2/3.2			Points: 1.00
R03	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	81106

Following a loss of 120 KV, both EDG 11 and EDG 12 are running and loaded. What is the status of the ESF 130VDC Electrical Distribution System, and what actions, if any, are required to restore?

A. Both DIV 1 and DIV 2 130VDC Chargers are supplying loads. No operator actions required.

B. DIV 1 130VDC Batteries and DIV 2 130VDC Chargers are supplying loads. Place tripped Div 1 130VDC Battery Chargers in OFF/RESET, then ON.

C. DIV 1 130VDC Chargers and DIV 2 130VDC Batteries are supplying loads. Place tripped Div 2 130VDC Battery Chargers in OFF/RESET, then ON.

D. Both DIV 1 and DIV 2 130VDC Batteries are supplying loads. Place tripped DIV1 and Div 2 130VDC Battery Chargers in OFF/RESET, then ON.

Answer: B

Answer Explanation:
Div 1 130VDC Battery Chargers 2A-1 and 2A1-2 are both powered from MCC 72B-2A and Battery Charger 2A-1 is powered from MCC 72C-3A, which are immediately powered by the EDGs. Upon the initial loss of power, the CR1 relay will drop out preventing the automatic restart of the battery charger. Therefore once the EDGs supplies power to the busses, all that is required to restart the battery chargers are to take the CMC to Off/Reset, then ON.

Distractor Explanation:
A. is incorrect because DIV 1 chargers lose power, do not auto sequence back on, and must be restored within 4 hours.
C. is incorrect because this would be true for a loss of 345KV.
D. is incorrect because this would be true for a Loss of Offsite Power.

Reference Information:
Reference: 20.300.120kv, page 25

Plant Procedures
20.300.120kv

NUREG 1123 KA Catalog Rev. 2
295004 Partial or Complete Loss of D.C. Power
295004 AK2.01 3.1/3.1 Battery charger

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2012 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):
Integrated Electrical Events
Cognitive Enabler
Given a copy of electrical AOPs, analyze and determine which equipment has the highest priority for restoration.

4	K/A Importance: 3.3/3.3			Points: 1.00
R04	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	81786

After a Main Turbine Trip and the plant is stable 20.109.01, "TURBINE/GENERATOR TRIP" directs the following:

- Open Cutout Switch TCO/6.
- Open 2A and 2B 345kV Disconnects (CI-A and CI-B).
- Close 345kV Breakers CF and CM (23.300.02).
- Shutdown Main Turbine (23.109).

What is the reason for the realignment of the electrical system?

A. (1) Cutout Switch TCO/6 must be opened to allow 345kV Breakers CF and CM to be closed due to a trip signal from the open Main Generator Field Breaker.

(2) 2A and 2B 345kV Disconnects (CI-A and CI-B) must be open to prevent motorizing the generator after its shutdown when CF and CM are reclosed

B. (1) Cutout Switch TCO/6 must be opened to allow 345kV Breakers CF and CM to be closed due to a trip signal from the open Main Generator Field Breaker.

(2) 2A and 2B 345kV Disconnects (CI-A and CI-B) must be open to satisfy an interlock to allow closure of 345kV Breakers CF and CM.

C. (1) Cutout Switch TCO/6 must be opened so that the Main Turbine Trip can be reset allowing the Shutdown Main Turbine to be completed.

(2) 2A and 2B 345kV Disconnects (CI-A and CI-B) must be open to prevent motorizing the generator after its shutdown when CF and CM are reclosed.

D. (1) Cutout Switch TCO/6 must be opened so that the Main Turbine Trip can be reset allowing the Shutdown Main Turbine to be completed.

(2) 2A and 2B 345kV Disconnects (CI-A and CI-B) must be open to satisfy an interlock to allow closure of 345kV Breakers CF and CM.

Answer: A

Answer Explanation:
(1) TCO/6 must be opened to prevent tripping of CM and CF breakers when the Field Breaker is open. (20.109.01 Note 1 Pg 4)
(2) When 345kV Breakers CF and CM are reclosed, if CI-A or CI-B are closed this would result in the motorizing the generator (SD-2500-01)

Distractor Explanation:
The distractors are incorrect and plausable because:
(1) While TCO/6 does cuttout a "TRIP" signal related to this plant event it does not effect the Main Turbine Trip.
(2) The intermediate switchyard disconnects are interlocked to not operate electrically with either 345kV breaker CM or CF closed. This prevents tripping the unit due to the inadvertent opening of disconnects CI-A or CI-B while the generator is online. This interlock also prevents motorizing the generator after its shutdown, by only allowing CI-A or CI-B to be electrically closed while CM and CF are open. However this does NOT effect the operation of 345kV breaker CM or CF.

Reference Information:
20.109.01 (Note 1 Pg 4)
SD-2500-01 (G4/G3)

Plant Procedures
20.109.01

NUREG 1123 KA Catalog Rev. 2
295005 AK3 Knowledge of the reasons for the following responses as they apply to MAIN TURBINE GENERATOR TRIP:
295005 AK3.06 Realignment of electrical distribution

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (5) Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
NRC Early Review
RO

Associated objective(s):
120/345KV Switchyards (C3600, S1400, S2000 & S3100)
Cognitive Enabler
List the interlocks associated with 120/345KV Switchyards components.

5	K/A Importance: 4.2.*/4.2*			Points: 1.00
R05	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	82266

The plant is in a refueling outage with the following conditions:

- Reactor Mode Switch position is REFUEL.
- All four RPS Shorting Links are REMOVED.

An SRM detector failure results in the following indications:

- SRM A - 1.0×10^2 CPS
- SRM B - 5.0×10^2 CPS
- SRM C - 1.0×10^6 CPS
- SRM D - 9.0×10^2 CPS

What is the status of the eight blue Pilot Scram Valve Solenoid lights on the H11-P603?

Blue lights for Trip System A are __(1)__.
Blue lights for Trip System B are __(2)__.

A. (1) NOT lit.
(2) NOT lit.

B. (1) NOT lit.
(2) lit.

C. (1) lit.
(2) NOT lit.

D. (1) lit.
(2) lit.

Answer: A

Answer Explanation:
Source: Cooper 2017 ILT Exam - BANK.

Per ARP 3D55, SRM Upscale/Inop, the SRM Upscale Trip occurs at a setpoint of 2.0 10E5 CPS. Also per this ARP, the result of exceeding this setpoint is a Full Scram if RPS Shorting Links are removed.

Therefore, the examinee must first recognize that a SCRAM condition exists and then determine that the 8 blue lights, which monitor status of power to the RPS A Trip System and RPS B Trip System Pilot Scram Valve Solenoids, will NOT be lit.

Distractor Explanation:
The distractors are incorrect and plausible because:
(B) This is how RPS functions for most other scrams in that a trip of just one instrument, such as one IRM, would only generate a half scram. The examinee that associates SRM C with the RPS A Trip System will select this distractor. This is incorrect because, with the Shorting Links removed, a FULL Scram will result with only one SRM above its Upscale Trip setpoint.
(C) This is how RPS functions for most other scrams in that a trip of just one instrument, such as one IRM, would only generate a half scram. The examinee that associates SRM C with the RPS B Trip System will select this distractor. This is incorrect because, with the Shorting Links removed, a FULL Scram will result with only one SRM above its Upscale Trip setpoint.
(D) This is how RPS would function if the Shorting Links were installed, which is how RPS normally functions since the Shorting Links are rarely removed. This is incorrect because, with the Shorting Links removed, a FULL Scram will result with only one SRM above its Upscale Trip setpoint.

Reference Information:
3D55, SRM Upscale/Inop
23.602 SRM System SOP.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295006 SCRAM
295006 AA1 Ability to operate and/or monitor the following as they apply to SCRAM:
295006 AA1.01 RPS

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
NRC Early Review
RO

Associated objective(s):
Reactor Protection System (C7100)
Cognitive Enabler
Discuss effective monitoring of the Reactor Protection System using local, remote, computer displays and alarms.

6	K/A Importance: 3.5/3.7			Points: 1.00
R06	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	83851

During the implementation of 20.000.19, "Shutdown from Outside the Control Room" the following actions from Condition E are directed:

E.1 Position CMC switches on H21-P100 to match Control Room position.

E.2 Place the following in ON (H21-P100):
- C3500-M130, Div 2 DC Transfer switch.
- C3500-M131, BOP Transfer switch.
- C3500-M134, Swing Bus Transfer switch.
- C3500-M132, Div 1 DC Transfer switch.
- C3500-M133, Div 1 AC Transfer switch.

The reasons for performing these actions are:

A. (E.1) Any misalignment of these switches will prevent equipment operation.

(E.2) Transfers control power from the normal source to an alternate source, for remote service.

B. (E.1) Any misalignment of these switches will prevent equipment operation.

(E.2) Precludes simultaneous operation of the reactor plant from two locations.

C. (E.1) Any mispositioned CMC switches will either start or shutdown equipment unnecessarily.

(E.2) Transfers control power from the normal source to an alternate source, for remote service.

D. (E.1) Any mispositioned CMC switches will either start or shutdown equipment unnecessarily.

(E.2) Precludes simultaneous operation of the reactor plant from two locations.

Answer: D

Answer Explanation:
Per 20.000.19 Bases
(E.1) The operation of CMC switches on the Remote Shutdown Panel to match the position of the Main Control Room is in preparation of operation of the transfer switches on the Remote Shutdown Panel. Once these transfer switches are repositioned, control of the equipment is transferred to the Remote Shutdown Panel, any mispositioned CMC switches will either start or shutdown equipment unnecessarily.

(E.2) The requirement for a transfer switch exists to preclude simultaneous operation of the reactor plant from two locations. These switches must be in the ON position for operation of equipment from the Remote Shutdown Panel. Power supplies for the Remote Shutdown System equipment and components shall be consistent with that used by the interfacing system. Control power shall be the normal power serving this equipment or components. The Remote Shutdown System provides an alternate means for control of equipment and not an alternate means for supplying power to it. As a result, transfer of control power from the normal source to an alternate source is not provided.

Distractor Explanation:
The distractors are incorrect and plausible because:
"(E.1) Power is from the normal power serving this equipment or components, misalignment of this switch will prevent proper operation." - while Power does come from the normal source, misalignment will not prevent operation, just start or shutdown equipment unnecessarily.

"(E.2) Transfers of control power from the standard source to an alternate source, for remote service." Control power is not realigned just control itself to the new remote location.

Reference Informaton:
20.000.19 Bases

Plant Procedures
20.000.19
20.000.19 Bases

NUREG 1123 KA Catalog Rev. 2
295016 AK3. Knowledge of the reasons for the following responses as they apply to CONTROL ROOM ABANDONMENT :
295016 AK3.03 Disabling control room controls

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (5) Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.

NRC Question Use (ILO 2019)
Low
NEW
RO

Associated objective(s):
Remote Shutdown System (C3500)
Cognitive Enabler
Discuss design considerations, capabilities, and limitations related to Remote Shutdown System component operation.

7	K/A Importance: 3.4/3.6			Points: 1.00
R07	Difficulty: 2.00	Level of Knowledge: High	Source: BANK	82268

The plant is operating at 100% power with the following conditions:

- #2 & #5 GSW Pumps are running.
- #3 GSW Pump is OOS for motor replacement.
- #4 GSW Pump has just tripped.
- #6 GSW Pump is OOS for discharge strainer leak repair.
- GSW Header Pressure steady at 70 psig.
- P4100-F841, GSW Bypass Line Pressure Ctrl Vlv is 50% open.
- P4100-F840, GSW Flow Test Pressure Ctrl Vlv is closed.
- RBCCW Heat Exchanger outlet temperature is 90°F and rising.

Which **ONE** of the following actions is required to stabilize the above conditions?

A. Dispatch an operator to throttle closed P4100-F841, GSW Bypass Line Pressure Ctrl Vlv, in order to raise GSW header pressure and restore adequate cooling water flow.

B. Dispatch an operator to throttle open P4100-F840, GSW Flow Test Pressure Ctrl Vlv, in order to raise GSW header pressure and restore adequate cooling water flow.

C. Scram the reactor, trip the main turbine and initiate Div 1 and 2 EECW in order to establish cooling to safety related equipment and restore GSW header pressure to normal band.

D. Increase cooling water flow using P42-F400, RBCCW Temp Control Vlv in AUTO, or MANUAL if necessary, in order to restore RBCCW Heat Exchanger outlet temperature and GSW header pressure in band.

Answer: A

Answer Explanation:
P4100-F841, GSW Bypass Line Pressure Ctrl Vlv is a dump, or backpressure, control valve. Prior to the transient and trip of #4 GSW Pump, this valve was required to be open to maintain GSW header pressure due to 3 pumps being in excess of the plant cooling water requirements. With only 2 GSW pumps running, closing this valve will raise GSW header pressure and increase cooling water flow to the CCW heat exchangers cooled by GSW thereby lowering CCW cooling temperatures, such as the elevated RBCCW Heat Exchanger outlet.

Distracter Explanation:
B. Is incorrect and plausible because the examinee could incorrectly determine that, since the P4100-F841, GSW Bypass Line Pressure Ctrl Vlv, is at its 50% open limit then pressure control would logically transfer to the P4100-F840, GSW Flow Test Pressure Ctrl Vlv. This would be correct for a high pressure condition. The examinee could also incorrectly determine that GSW pressure control valves are throttled OPEN to raise GSW header pressure, however, the valves are actually backpressure control valves and must be throttled CLOSED to raise GSW header pressure and increase cooling water flow to supported CCW heat exchangers.
C. Is incorrect and plausible because the candidate could incorrectly conclude that GSW header pressure is below the pressure necessitating a plant and Main Turbine Trip and EECW initiated, as directed by the loss of GSW AOP. However, the loss of GSW AOP override statement only requires a plant scram if GSW header pressure cannot be restored AND MAINTAINED above 65 psig. The examinee should determine that throttling capacity exists to restore GSW header pressure without the need for these drastic actions.
D. Is incorrect and plausible because the candidate could incorrectly determine that throttling open the P42-F400, RBCCW Temp Control Vlv in AUTO, or MANUAL, would correct the elevated RBCCW Heat Exchanger outlet temperature condition. Although this action is directed by ARP 2D120, RBCCW HX DISCH TEMPERATURE HIGH/LOW for a High Temperature condition, the action is accompanied by a conditional statement to make the adjustments while monitoring GSW header pressure. With GSW header pressure already degraded, this action would not be prudent.

Reference Information:

ARP 7D14 (pg 1) GSW pressure low actions
23.131 (pg 23-25) GSW pressure control

Plant Procedures
02D120
07D14
23.127
23.131

NUREG 1123 KA Catalog Rev. 2
295018 AK2. Knowledge of the interrelations between PARTIAL OR COMPLETE LOSS OF COMPONENT COOLING WATER and the following:
295018 AK2.02 Plant operations

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (5) Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.

NRC Exam Usage
ILO 2015 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):
General Service Water (P4100)

Cognitive Enabler

Describe general General Service Water System operation, including component operating sequence, normal operating parameters, and expected system response.

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8	K/A Importance: 3.6/3.7			Points: 1.00
R08	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	83852

The plant is operating at 100% power with the following Station Air Compressor lineup:

- East Station Air Compressor ..... Off
- Center Station Air Compressor ..... Running
- West Station Air Compressor ..... Auto

Following a seismic event, Bus 72A has been de-energized, and both Control Air Compressors auto start due to lowering air pressure. At 83 psig, all air header pressures begin to recover. Assuming no operator action, what is the status of the following Station Air valves?

	P50-F401 STATION AIR TO TB HDR ISO VLV	P50-F402 STATION AIR TO NIAS ISO VLV	P50-F440 DIV 1 CONTROL AIR ISO VLV
A.	OPEN	OPEN	OPEN
B.	CLOSED	OPEN	OPEN
C.	CLOSED	CLOSED	OPEN
D.	CLOSED	CLOSED	CLOSED

Answer: B

Answer Explanation:
Per AOP 20.129.01, Control Air Compressors start at 85 psig therefore system press has to go to below 85 psi and then, per the questions stem pressure recovers. Based on this the 401 will get a closed signal and the Station Air loads will be lost. Since air pressure recovers at 83 psig, the 402 and 440 will NOT get close signals (they close at 75psig Station Air Header Pressure), therefore the safety related loads will remain supplied from their normal air sources.

Distracter Explanation:

Distracter are plausible based on not understanding setpoints or power supplies/auto-starts of compressors

A. Is incorrect because 401 will get close signal at 85 psig. This answer is plausible if the examinee incorrectly assumes the system pressure did not go low enough to cause isolations.

C. Is incorrect because 402 will not get close signal until 75 psig and air header only went to 83 psig. This answer is plausible if the examinee incorrectly assumes the system pressure did go low enough to cause isolations.

D. Is incorrect because 402 & 440 will not get close signal until 75 psig and air header only went to 83 psig. This answer is plausible if the examinee incorrectly assumes the system pressure did go low enough to cause isolations.

Reference Information:
20.129.01 (pg 3) System actuation based on pressure per action statement.

Plant Procedures
20.129.01

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295019 AA2. Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF INSTRUMENT AIR :
295019 AA2.02 Status of safety-related instrument air system loads (see AK2.1 - AK2.19)

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2015 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):
Compressed Air Systems (P5001 & P5002)
Cognitive Enabler
List the automatic features of Compressed Air System operations.

9	K/A Importance: 3.6/3.7			Points: 1.00
R09	Difficulty: 2.00	Level of Knowledge: Low	Source: BANK	80688

Which one of the following is the LOWEST RPV water level which will maintain natural circulation within the RPV during a loss of shutdown cooling?

A. 173 inches.

B. 214 inches.

C. 220 inches.

D. 255 inches.

Answer: C

Answer Explanation:
23.205, RHR System SOP, 20.205.01, Loss of SDC AOP, and GOP 22.000.04, Plant Shutdown from 25% Power, as specify the minimum RHR SDC level is 220" and GOP 22.000.04 specifically calls this the Minimum Natural Circulation Level. Water level at this point allows direct communication, for warmer water exiting the core, with the downcommer via the steam separators.

Therefore, the examinee must recall that 220" is the LOWSET RPV level which will maintain natural circulation.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This is the level at which RHR will isolate when in Shutdown Cooling (SDC) and the level above which the RPV must be restored to allow SDC isolations to be reset and RHR pumps restarted in the SDC mode. This is incorrect because, although this elevation would allow the RHR pumps to be restarted, it does not support natural circulation.
B. This is the top of the normal RPV level control band (173 - 214") when not in SDC and this number also corresponds with the elevation of the Level 8 trip of the RFPs and Main Turbine, so the examinee could confuse this important number with the Minimum Natural Circulation Level. However, 220" is the correct RPV level that supports natural circulation.
D. This is the top of the RPV level control band (220 - 255") when in SDC so the examinee could confuse this number with the elevation required to support natural circulation. However, although an RPV level of 255" would support natural circulation, it is not the LOWEST level listed that will, which is 220".

Reference Information:

23.205, RHR System.
20.205.01, Loss of SDC.
22.000.04, Plant Shutdown from 25% Power

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295021 Loss of Shutdown Cooling
295021 AK1. Knowledge of the operational implications of the following concepts as they apply to LOSS OF SHUTDOWN COOLING:
295021 AK1.04 3.6/3.7 Natural circulation

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Residual Heat Removal (E1100)
Cognitive Enabler
Identify abnormal and emergency operating procedures associated with the RHR System.

10	K/A Importance: 3.6/3.9			Points: 1.00
R10	Difficulty: 2.00	Level of Knowledge: Low	Source: BANK	82270

An irradiated Fuel Assembly has been dropped in the Reactor Cavity, gas bubbles are rising to the surface of the pool.

Which one of the following alarms is associated with actuation of Standby Gas Treatment related to this event?

A. 16D1, RB REFUELING AREA FIFTH FLOOR HIGH RADN

B. 3D32, DIV I/II RB VENT EXH RADN MONITOR UPSCALE

C. 3D35, DIV I/II FP VENT EXH RADN MONITOR UPSCALE TRIP

D. 3D41, CONT CENTER MAKEUP AIR RADN MONITOR UPSCALE

Answer: C

Answer Explanation:
C is correct, 3D35, DIV I/II FP VENT EXH RADN MONITOR UPSCALE TRIP is associated with isolations and actuations which result from fission product detection following a dropped fuel assembly. Candidate must identify protective and nonprotective radiation monitor conditions. This causes actuation of SBGT.

Distractor Explanation:
The distractors are incorrect and plausible because:

A. 16D1, RB REFUELING AREA FIFTH FLOOR HIGH RADN is a plausible alarm for a REFUELING ACCIDENT; however, this alarm does not cause an automatic start of SGTS.

B. 3D32, DIV I/II RB VENT EXH RADN MONITOR UPSCALE is a plausible alarm for a REFUELING ACCIDENT. However, this alarm does not cause an automatic start of SGTS.

D. The ability of the CREF System to maintain the habitability of the MCR is explicitly assumed for certain accidents as An irradiated Fuel Assembly has been dropped in the Reactor Cavity. The instrumentation that ensures this Function is Reactor Vessel Water Level — Low Low, Level 2, Drywell Pressure — High, Fuel Pool Ventilation Exhaust Radiation — High, Control Center Normal Makeup Air Radiation–High. Because of this relationship 3D41, CONT CENTER MAKEUP AIR RADN MONITOR UPSCALE is a plausible alarm during a dropped Fuel Assembly. The SGTS and CCHVAC share related purpose and share the following common setpoints for automatic action:
- Low Reactor water level (Level 2).
- High Drywell pressure.
- High Reactor Building Ventilation Exhaust Radiation (Div I or Div II).

Due to this close relationship to SBGT, it is plausible that a candidate could incorrectly assume that a Control Center Normal Makeup Air Radiation–High would start SBGT and CREF.

Reference Information:
3D35

Objective Link: LP-OP-315-0151-A014

Plant Procedures
03D035

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295023 AK2. Knowledge of the interrelations between REFUELING ACCIDENTS and the following:
295023 AK2.07 Standby gas treatment/FRVS

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(11) Purpose and operation of radiation monitoring systems, including alarms and survey equipment.

NRC Exam Usage
ILO 2009 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Standby Gas Treatment System
Cognitive Enabler
List the automatic features of Standby Gas Treatment System operations.

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11	K/A Importance: 4.1/3.9			Points: 1.00
R11	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	82506

A small steam leak has occurred in the Drywell. The reactor was scrammed and all rods did not insert.

Reactor water level is being maintained 50-100 inches.
Reactor Power is 6% and slowly lowering.
Drywell pressure is 2 psig and slowly rising.

The CRS directs you to place RHR in Torus Cooling and Sprays. To accomplish this task, the switches below would need to be placed in which of the following positions?

	CONTM SPRAY 2/3 CORE HEIGHT OVERIDE	CONTAINMENT SPRAY MODE SELECT
A.	MANUAL OVERRD	MAN
B.	OFF	MAN
C.	MANUAL OVERRD	OFF
D.	OFF	OFF

Answer: B

Answer Explanation:
Per 23.205
If High Drywell Pressure or RPV Level 1 actuation exist, place the Containment Spray Mode Select switch in MANUAL.
If RPV level is below Level 0, place selected division Containment Spray 2/3 Core Height Override keylock switch in MANUAL OVERRIDE.

Therefore, the Containment Spray 2/3 Core Height Override keylock switch in OFF and Containment Spray Mode Select switch in MANUAL.

Distractor Explanation:
The distractors are incorrect and plausible based on understanding the plant conditions and the requirements of 23.205 as listed in the Answer Explanation.
Distractor (MANUAL OVERRD) for CONTM SPRAY 2/3 CORE HEIGHT OVERIDE is incorrect because RPV level 0 is not indicated in the stem and level is not low enough that an operator would ask permission to operate the 2/3 core height override when controlling level near TAF to prevent an actuation if level dropped below TAF. This answer is plausible if the candidate only associates this switch the need to spray containment and not the current RWL.

Distractor (OFF) for CONTAINMENT SPRAY MODE SELECT is incorrect because High Drywell Pressure is indicated in the stem. This answer is plausible if the candidate does not recognize the impact of High Drywell Pressure on containment spray.

Reference Information:
23.205

Plant Procedures
23.205

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295024 EA1. Ability to operate and/or monitor the following as they apply to HIGH DRYWELL PRESSURE:
295024 EA1.04 RHR/LPCI

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Residual Heat Removal (E1100)
Cognitive Enabler
List the interlocks associated with RHR System components.

12	K/A Importance: 3.6/3.7			Points: 1.00
R12	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	83887

RCIC is in operation per 23.206, "Reactor Core Isolation Cooling System" Section 7.6, "RPV Pressure Control Using RCIC"

3D168, REACTOR PRESSURE HIGH, subsequently alarms for the first time during this event.

Reactor Pressure is rising slowly at approximately 0.1 psi per minute.

RCIC __(1)__ used for RPV Pressure Control __(2)__.

A. (1) can continue to be

(2) by maintaining RCIC discharge pressure approximately 100 psi above reactor pressure by adjusting E41-F011, HPCI/RCIC Test Iso/PCV.

B. (1) can continue to be

(2) by maintaining RCIC discharge pressure approximately 100 psi below reactor pressure by adjusting E41-F011, HPCI/RCIC Test Iso/PCV.

C. (1) is not being

(2) because the RCIC system is tripped and the trip must be reset prior to use.

D. (1) is not being

(2) because Low-Low Set is now controlling pressure.

Answer: A

Answer Explanation:
Per 23.206
RCIC discharge pressure is maintained approximately 100 psi above reactor pressure for reactor RPV Pressure Control.

Distractor Explanation:
The distractors are incorrect and plausible because:
B. While RCIC can be used for pressure control here, the pressure need to be set to 100 psi ABOVE
C. The step conditions do not prove a RCIC trip, however the candidate may incorrectly associate plant conditions with 1D94 RCIC Turbine Tripped.
D. 3D168 REACTOR PRESSURE HIGH setpoint is below the setpoint for SRV open, which is required to enable LOW-LOW SET. However, the candidate may incorrectly associate the setpoint of 3D168 REACTOR PRESSURE HIGH with SRV open.

Reference Information:
23.206
3D168

Plant Procedures
03D168
23.206

NUREG 1123 KA Catalog Rev. 2
295025 EK3. Knowledge of the reasons for the following responses as they apply to HIGH REACTOR PRESSURE
295025 EK3.05 RCIC operation: Plant-Specific

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (5) Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Reactor Core Isolation Cooling
Cognitive Enabler
Identify abnormal and emergency operating procedures associated with the RCIC System.

13	K/A Importance: 4.1/4.2			Points: 1.00
R13	Difficulty: 4.00	Level of Knowledge: High	Source: NEW	83987

A RCIC run is in progress that is adding heat to the Torus.

Below are the indications available on the T23-R800, Torus Water Temperature Rec, on H11-P601:

- T23N001 DegF: 97.54
- T23N002 DegF: 92.32
- T23N003 DegF: 93.34
- T23N004 DegF: 96.56
- T23N005 DegF: 98.38
- T23N006 DegF: 65.00
- T23N007 DegF: 94.56
- T23N008 DegF: 93.89

Point T23N006 has been declared INOPERABLE.

Which of the following is the current value of Torus Water Average Temperature**?**

A. 95.23°F.

B. 95.62°F.

C. 97.07°F.

D. 101.25°F.

Answer: B

Answer Explanation:
Per 29.ESP.01, Section 15.0 Torus Water Average Temperature Calculation, the examinee must recall that the inoperable instrument point must be replaced with the highest reading temperature of the operable instrument points to determine average temperature.

Since Point 6 is INOP, it must be replaced by the highest reading of the operable instrument points, which is Point 5. Therefore, to determine Average Torus Water Temperature, the examinee must perform the following calculation:
(Point 1 + Point 2 + Point 3 + Point 4 + Point 5 + **Point 5** + Point 7 + Point 8)/8

This results in the following:
(97.54 + 92.32 + 93.34 + 96.56 + 98.38 + **98.38** + 94.56 + 93.89)/8 = **95.62°F**.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This is the correct answer if the examinee performed the average calculation using only the 7 operable points to determine Average Torus Water Temperature. This would result in the following calculation:
(97.54 + 92.32 + 93.34 + 96.56 + 98.38 + 94.56 + 93.89)/7 = **95.23°F**. This distractor is incorrect because Point 6 is INOP and the calculation must be performed as described above.

C. This is the correct answer if 29.ESP.01 only required adding 45°F to the calculation with an INOP rather than replacing the inoperable instrument point with the highest reading temperature of the operable instrument points. This would result in the following calculation:
(97.54 + 92.32 + 93.34 + 96.56 + 98.38 + 65.00 + 94.56 + 93.89 +45°F)/8 = **97.07°F**. This distractor is incorrect because 29.ESP.01 requires the inoperable instrument point be replaced with the highest reading temperature of the operable instrument points, thus the calculation must be performed as described above.

D. This is the correct answer if 29.ESP.01 required adding 45°F to the calculation, ANY time heat is being added to the Torus, in addition to substituting the INOP point with the highest reading temperature of the operable instrument points. This would result in the following calculation:
(97.54 + 92.32 + 93.34 + 96.56 + 98.38 + **98.38** + 94.56 + 93.89 + 45°F)/8 = **101.25°F**. This distractor is incorrect because 29.ESP.01 requires the inoperable instrument point be replaced with the highest reading temperature of the operable instrument points and ONLY requires adding the additional 45°F if an SRV had opened in the previous 48 hours, thus the calculation must be performed as described above.

Reference Information:

29.ESP.01, Supplemental Information, Section 15.0 Torus Water Average Temperature Calculation.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295026 Suppression Pool High Water Temperature
295026 EA2. Ability to determine and/or interpret the following as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE:
295026 EA2.01 4.1*/4.2* Suppression pool water temperature

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Emergency Support Procedures
Performance Terminal
Calculate Torus average water temperature with one or more points unknown, with and without a Safety Relief Valve open.

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14	K/A Importance: 4.1/4.2			Points: 1.00
R14	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	83986

With Drywell Temperature being held at the HIGHEST temperature that can be read in the Main Control Room, which of the following is the LOWEST Drywell Pressure that would allow initiating Drywell Sprays?

A. 2.68 psig.

B. 7.90 psig.

C. 8.37 psig.

D. 11.80 psig.

Answer: C

Answer Explanation:
Per 29.100.01, Sheet 6 – Curves, Cautions and Tables, the highest temperature that can be read in the Main Control Room on normally installed plant equipment, as indicated by the blue-dashed DWSIL-Lim line on the curve, is 400°F. This can be read on the T47-R803A(B) – Division I(II) Drywell Cooling Area Temperatures Recorders.

With Drywell Temperature at 400°F, Drywell Sprays can occur at ANY Drywell Pressure above 8.37 psig.

Therefore, the examinee must determine that, of the Drywell Pressures listed, the LOWEST pressure that would permit Drywell Sprays is 8.37 psig.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The DWSIL calculation starts at 2.68 psig and this could be interpreted as being the LOWEST allowable Drywell Pressure for spraying the drywell. This is not correct because, with Drywell Temperature at 400F, the lowest pressure that allows Drywell Sprays is 8.37 psig.
B. The instruments normally used to read Drywell Temperatures in the Main Control Room are the T47-R803A(B) – Division I(II) Drywell Cooling Area Temperatures Recorders. These recorders have a range of 0-360°F. If these were the only available Drywell Temperature instruments in the MCR, then this would define the conditions of the stem of the question and, since the DWSIL curve crosses 360°F at approximately 7.90 psig, this would be the LOWEST Drywell Pressure that would allow initiating Drywell Sprays. However, T23-R800 – Torus Water Temperatures Recorder only allows monitoring Torus Water Temperature, unlike recorders T50-R800A/B, Div 1/2 PC Air And Water Temperature Recorders, which allow monitoring BOTH Torus Water AND Drywell Temperatures up to their maximum range limit of 400°F, which in turn allows spraying the Drywell down to only 8.37 psig.
D. The DWSIL calculation stops at 600°F and this could be interpreted to mean that this is the highest Drywell Temperature that can be monitored in the MCR, which makes 11.80 plausible because it is the Drywell Pressure at this temperature on the curve. This is incorrect because, although Drywell Sprays could occur at 11.80 psig and 400°F, it is not the LOWEST listed allowable Drywell Pressure.

Reference Information:

29.100.01, Sheet 6 – Curves, Cautions and Tables.
DC-5964, Vol. 1, Rev. A – Drywell Spray Initiation Limit (DWSIL) Design Calculation.
I-2976-29 CR and RSD Instrument Scale Details.

Question Use
ILO
Open Reference provided on NRC Exam - ***29.100.01, Sheet 6, "Curves, Cautions, and Tables" (without the Cautions)***
RO

NUREG 1123 KA Catalog Rev. 2
295028 High Drywell Temperature
295028 EA2. Ability to determine and/or interpret the following as they apply to HIGH DRYWELL TEMPERATURE :
295028 EA2.04 Drywell pressure

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Cautions, Curves, and Calculations
Cognitive Enabler
Discuss the definition of and reason for the shape of the following graphs/curves:
a. Boron Injection Initiation Temperature Curve
b. Core Spray Net Positive Suction Head (NPSH) Limit
c. Core Spray Vortex Limit
d. Heat Capacity Limit
Deleted
f. Deleted
g. RHR Low Pressure Coolant Injection (LPCI) NPSH Limit
h. RHR LPCI Vortex Limit
i. RPV Saturation Temperature
j. SRV Tail Pipe Level Limit
k. Drywell Spray Initiation Limit
l. Pressure Suppression Pressure
m. Primary Containment Pressure Limit
n. HPCI NPSH Limit
o. RCIC NPSH Limit

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15	K/A Importance: 4.6/4.6			Points: 1.00
R15	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	85166

Which of the responses below accurately completes the following statement regarding the impact of lowering Torus Water Level on the instruments used to monitor Torus Water Temperature?

When Torus Water Level drops below __(1)__, Torus Water Temperature must be obtained from __(2)__. Prior to reaching this level, either instrument may be used.

A. (1) -11"
(2) T23-R800, Torus Water Temperature Rec (H11-P601)

B. (1) -16"
(2) T23-R800, Torus Water Temperature Rec (H11-P601)

C. (1) -11"
(2) T50-R800A/B, Div 1/2 PC Air and Water Temperatures Rec (H11-P601/P602)

D. (1) -16"
(2) T50-R800A/B, Div 1/2 PC Air and Water Temperatures Rec (H11-P601/P602)

Answer: C

Answer Explanation:
Per 29.100.01, Sheet 6 – Curves, Cautions and Tables, Caution 6, with Torus Water Level below -11”, torus water temperature MUST (emphasis added) be obtained from T50-R800A/B, Div 1/2 PC Air and Water Temperatures Rec (H11-P601/P602), Points 11 and 12. The reason for this is the thermocouples for the primary Torus Temperature Monitoring Instrument, namely T23-R800, Torus Water Temperature Recorder, become uncovered below -11” making them inaccurate and unavailable for Torus Water Temperature monitoring.

Therefore, the examinee must recall that this switchover occurs at -11” at which point the T23-R800, Torus Water Temperature Rec (H11-P601) can no longer be used for Torus Water Temperature monitoring.

Distractor Explanation:

Distractors are incorrect and plausible because:

The incorrect part (1) would be correct if Caution 6 stated that the switchover occurred at -16" vice -11". This is plausible because Caution 4 warns the operator that below -16” operation of LPCI, CS, HPCI or RCIC above the NPSH or vortex limit may result in equipment damage, and the examinee could confuse the Torus Water Levels in the two cautions. This is incorrect because Caution 6 applies to Torus Water Level below -11.

The incorrect part (2) would be correct if Caution 6 required that Torus Water Temperature monitoring shift FROM the T50-R800A/B, Div 1/2 PC Air and Water Temperatures Rec (H11-P601/P602), Points 11 and 12 TO T23-R800, Torus Water Temperature Recorder, rather than the other way around. This is incorrect because the T23-R800, Torus Water Temperature Recorder cannot be used below -11".

Reference Information:
29.100.01, Sheet 6 – Curves, Cautions and Tables.

Plant Procedures
29.100.01 SH 6

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2

295030	Low Suppression Pool Water Level
G2.1.20	Ability to interpret and execute procedure steps

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b)(10)	Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
RO

Associated objective(s):

16	K/A Importance: 4.6/4.7			Points: 1.00
R16	Difficulty: 2.00	Level of Knowledge: Low	Source: BANK	84006

If the Standby Feedwater (SBFW) pumps are the only source injecting, which one of the following represents (1) the minimum RPV water level where Adequate Core Cooling (ACC) exists, and (2) the maximum expected clad temperature?

A. (1) -25"
(2) 1500°F

B. (1) -43"
(2) 1500°F

C. (1) -25"
(2) 1800°F

D. (1) -43"
(2) 1800°F

Answer: A

Answer Explanation:
Adequate core cooling Heat removal from the reactor sufficient to prevent rupturing the fuel clad. Within the EPGs, three viable mechanisms for establishing adequate core cooling are defined—core submergence, spray cooling, and steam cooling.
Steam cooling is relied upon only if RPV water level cannot be restored and maintained above the top of the active fuel, cannot be determined, or must be intentionally lowered below the top of the active fuel. The core is adequately cooled by steam if the steam flow across the uncovered length of each fuel bundle is sufficient to maintain the hottest peak clad temperature below the appropriate limiting value—1500°F if makeup can be injected (basis for the MSCRWL calculation), 1800°F if makeup cannot be injected (basis for the MZIRWL calculation). The covered portion of the core remains cooled by boiling heat transfer and generates the steam which cools the uncovered portion.

The Minimum Steam Cooling RPV Water Level (MSCRWL) is defined as the lowest RPV water level at which the covered portion of the reactor core will generate sufficient steam to preclude any clad temperature in the uncovered portion of the core from exceeding 1500°F. At Fermi 2 it is calculated to be -25".

Therefore, the examinee must recognize that, with injection via the SBFW system, ACC exists (and will maintain clad temperature <1500°F) if RPV Water Level remains above -25".

Distracter Explanation:

All distracters are incorrect and plausible if the examinee does not understand the MSCRWL requirements or if the examinee confuses the basis for the Minimum Zero-Injection RPV Water Level (MZIRWL) with the MSCRWL.

The Minimum Zero-Injection RPV Water Level (MZIRWL) is defined to be the lowest RPV water level at which the covered portion of the reactor core will generate sufficient steam to preclude any clad temperature in the uncovered portion of the core from exceeding 1800°F with NO injection. Adequate Core Cooling is ensured if RPV water level can be maintained at or above -43", which is the calculated value of the MZIRWL and Fermi 2.

Reference Information:

BWROG EPG, Appendix B, Definition of ACC (pg B-3-1)
BWROG EPG, Appendix B, (pg B-18-58) MSCRWL
BWROG EPG, Appendix B, (pg B-18-60) MZIRWL

Plant Procedures
BWROG EPG App B

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295031 EK1. Knowledge of the operational implications of the following concepts as they apply to REACTOR LOW WATER LEVEL:
295031 EK1.01 Adequate core cooling

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2015 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Introduction to Emergency Operations Procedures
Exam Objectives
Cognitive Enabler
Describe the two methods of assuring adequate core cooling.

Introduction to Emergency Operations Procedures
Cognitive Enabler
Describe the differences between steam cooling with injection into the Reactor Pressure Vessel (RPV) and without injection into the RPV.

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17	K/A Importance: 3.4/3.8			Points: 1.00
R17	Difficulty: 3.00	Level of Knowledge: Low	Source: BANK	83927

For which of the following conditions will shutdown margin be sufficient to allow 29.100.01 Sheet 1A – RPV Control ATWS, to be exited without obtaining concurrence from Reactor Engineering?

A. 184 control rods full-in and one center control rod is at position 48.

B. 184 control rods at position 02 and one peripheral control rod is at position 48.

C. Cold Shutdown Boron weight has been injected with ten control rods at position 48.

D. Hot Shutdown Boron weight has been injected with five control rods at position 48.

Answer: A

Answer Explanation:
Per BWROG EPGs/SAGs Appendix B, positive confirmation that the reactor will remain shutdown under all conditions without boron is best obtained by determining that no control rod is withdrawn beyond the Maximum Subcritical Banked Withdrawal Position (Position 02 at Fermi 2). Other criteria can also be used to demonstrate that the reactor will remain shutdown including the existence of the core design basis shutdown margin with the single strongest control rod full-out and all other control rods full-in and compliance with Technical Specification requirements governing control rod position and the allowable number of inoperable control rods.

Therefore, the examinee must recall that proper shutdown margin is obtained with only one control rod full-out and all other control rods fully inserted, and this condition would allow exit from the ATWS EOP.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. This distractor would be true if the one peripheral control rod was at 02 or if 184 control rods were full-in with the one peripheral rod at position 48. It is a common misconception to confuse the requirement to have all control rods inserted to at least position 02 with the SDM requirement to have all control rods inserted, except for one that is full-out. Candidates often assume that, if 184 rods are inserted to at least Position 02, that one can still be full-out. This distractor is incorrect because NO control rod can be inserted beyond the Maximum Subcritical Banked Withdrawal Position (MSBWP) of 02 for 29.100.01 Sheet 1A – RPV Control ATWS, to be exited.
C. This distractor would be true if the question asked under what conditions the RPV can be de-pressurized following an ATWS. Injection of the Cold Shutdown Boron Weight (CSBW) allows for cooldown of the RPV on the FS/P leg of 29.100.01 Sheet 1A and the examinee could confuse this strategy with the conditions that allow exit from Sheet 1A – ATWS. This is a common misconception because step FSP-4 (the step on the FS/P leg that allows cooldown) has an addition condition that allows cooldown if the “Reactor is Shutdown with no boron injection.” Examinees often confuse that verbiage with the shutdown margin verbiage allowing exit of Sheet 1A – ATWS that states “Reactor will remain Shutdown under ALL conditions without boron,” which, for Fermi 2 means all but one control rod fully inserted. This distractor is incorrect because, as stated above, injection of the CSBW is not a condition that would allow exiting Sheet 1A.
D. This distractor would be true if the question asked under what conditions RPV water level can be restored to normal following an ATWS. Injection of the Hot Shutdown Boron Weight (HSBW) allows for the normal RPV level control band to be established (exit from the Level/Power Control strategy) on the FS/L leg of 29.100.01 Sheet 1A and the examinee could confuse this strategy with the conditions that allow exit from Sheet 1A – ATWS. This distractor is incorrect because injection of the HSBW is not a condition that would allow exiting Sheet 1A.

Reference Information:

29.100.01 Sheet 1A – RPV Control ATWS.
BWROG EPGs/SAGs Appendix B description of conditions that allow for determination that the reactor will remain shutdown under all conditions without boron.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2

295037	SCRAM Condition Present and Reactor Power Above APRM Downscale or unknown.
295037 EK1.	Knowledge of the operational implications of the following concepts as they apply to SCRAM CONDITION PRESENT AND REACTOR POWER ABOVE APRM DOWNSCALE OR UNKNOWN:
295037 EK1.07	3.4/3.8 Shutdown margin

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b) (2)	General design features of the core, including core structure, fuel elements, control rods, core instrumentation, and coolant flow.
10 CFR 55.41(b)(10)	Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
RPV Control

Performance Terminal
State the indication you would use and the criteria for determining the reactor will remain shutdown following a reactor scram.

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18	K/A Importance: 3.6/3.8			Points: 1.00
R18	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	82527

Following a Main Steam Line Break from full power, the Offsite Release Rate has been exceeded. 3D45, CONT CENTER MAKEUP AIR RADN MONITOR UPSCALE TRIP alarms.

- Div 1 CCHVAC Makeup Air Radiation Monitor, D11-K809 reads 600 cpm.
- Div 2 CCHVAC Makeup Air Radiation Monitor, D11-K813 reads 700 cpm.

Which one of the following actions is correct?

A. OPERATE CCHVAC in the Purge Mode to maximize dilution.

B. SHUTDOWN BOTH CCHVAC Emergency Makeup Fans to reduce the Main Control Room pressure.

C. OPERATE CCHVAC in the Recirculation Mode using ONE Emergency Makeup Fan to optimize filtration.

D. OPERATE CCHVAC in the Recirculation Mode using BOTH Emergency Makeup Fans to maximize filtration.

Answer: C

Answer Explanation:
Per ARP 3D45
AUTO ACTIONS
Both divisions of CCHVAC shift into Recirculation Mode.

Set points:

D11-K809 Div 1 CCHVAC Makeup Air Radiation Monitor	150 cpm increasing
D11-K813 Div 2 CCHVAC Makeup Air Radiation Monitor	300 cpm increasing

High radiation conditions require CCHAVC in RECIRC Mode. Since the emergency fans are sized for 100% capacity, filtration is optimized by operating ONE make up Fan. Directed per 20.000.02 Condition C

Distractor Explanation:
Distractors are incorrect and plausible because:
A. Would be true for a smoke condition in the control room.
B. Normal CCHVAC intake fans are shut down to reduce radioactivity intake.
D. Because AOP Bases state that dual fan operation reduces radionuclide residence time in the Charcoal Filter Trains, reducing filtration.

Reference Information:
20.000.02, page 5
APR 3D45

Plant Procedures
03D045
20.000.02

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295038 EA1. Ability to operate and/or monitor the following as they apply to HIGH OFF-SITE RELEASE RATE :
295038 EA1.07 Control room ventilation: Plant-Specific

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2012 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):
Control Center HVAC (T4102)

Cognitive Enabler

Discuss the effects of changing environmental conditions on operation of the Control Center HVAC system.

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19	K/A Importance: 4.2/.4.1			Points: 1.00
R19	Difficulty: 3.00	Level of Knowledge: Low	Source: BANK	82546

EDG 11 is running after a Loss of Power (LOP) event. The following subsequently occur:

- 16D27 FIRE ALARM alarms in the Main Control Room.
- A fire is confirmed in the EDG 11 Engine Room.
- The CO_2 System automatically actuated.

EDG 11 is ___(1)___ and the ventilation system ___(2)___.

A. (1) running
(2) fans and dampers are aligned to vent the Engine room

B. (1) tripped
(2) fans will shut down, and dampers will isolate the Engine room

C. (1) tripped
(2) fans and dampers are aligned to vent the Engine room

D. (1) running
(2) fans will shut down, and dampers will isolate the Engine room

Answer: D

Answer Explanation:
The CO_2 actuation is not an essential trip for the running EDG. The RHR Complex is protected with Wet-pipe Sprinkler, Standpipe Hose Station, and CO_2 Fire Suppression Systems. After CO_2 discharges into an EDG room, the associated ventilation system fans will shut down, and dampers will isolate the affected room.

Distracter Explanation:
All distracters are plausible if the examinee does not completely understand the interlocks associated with fan operation.
A. Is incorrect because the fans and dampers will not align to vent the Engine room
B. Is incorrect because the EDG will not trip.
C. Is incorrect because the EDG will not trip or fans and dampers align.

Reference Information:
23.307
23.501.02
16D27 FIRE ALARM

Plant Procedures
23.307
23.501.02

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
600000 AA1. Ability to operate and / or monitor the following as they apply to PLANT FIRE ON SITE:
600000 AA1.05 Plant and control room ventilation systems.
G2.4.31 Knowledge of annunciators alarms, indications, or response procedures

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2015 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Emergency Diesel Generator (R3000)
Cognitive Enabler
List the automatic features of Emergency Diesel Generator System operations.

20	K/A Importance: 3.9/4.2			Points: 1.00
R20	Difficulty: 3.00	Level of Knowledge: Low	Source: BANK	83849

Thermal Power is 40% RTP.

A grid disturbance causes a Generator Trip.

(1) How is the reactor scram initiated, and (2) what does the scram mitigate for this event?

A. (1) The Turbine Protection system provides input via four voter channels to the RPS trip system.

(2) The reactor SCRAM mitigates the impact on LHGR.

B. (1) The Turbine Protection system provides input via four voter channels to the RPS trip system.

(2) The reactor SCRAM mitigates the impact on MCPR.

C. (1) Turbine Stop Valve Closure signals are initiated from position switches located on each of the four TSVs, these switches provide input to the RPS trip system.

(2) The reactor SCRAM mitigates the impact on MCPR.

D. (1) Turbine Stop Valve Closure signals are initiated from position switches located on each of the four TSVs, these switches provide input to the RPS trip system.

(2) The reactor SCRAM mitigates the impact on LHGR.

Answer: C

Answer Explanation:
(1) Turbine Stop Valve Closure signals are initiated from position switches located on each of the four TSVs, these switches provide input to the RPS trip system.
From BASIS 3.3.1.1 Pg B 3.3.1.1-17
Turbine Stop Valve Closure signals are initiated from position switches located on each of the four TSVs. Two independent position switches are associated with each stop valve. One of the two switches provides input to RPS trip system A; the other to RPS trip system B. Thus, each RPS trip system receives an input from four Turbine Stop Valve Closure channels, each consisting of one position switch. The logic for the Turbine Stop Valve Closure Function is such that three or more TSVs must be closed to produce a scram. This function must be enabled at THERMAL POWER > 29.5% RTP. This is normally accomplished automatically by pressure transmitters sensing turbine first stage pressure of > 161.9 psig; therefore, to consider this function OPERABLE, the turbine bypass valves must remain shut at THERMAL POWER > 29.5% RTP.

(2) The reactor SCRAM mitigates the reduction in MCPR.
In this case, the Turbine Trip is driven from a generator trip. This trip results in a pressure and level event. This event will result in a reduction in MCPR in the same way as the pressure regulator failure event credited in the Basis for TS 3.3.2.2
From BASIS T.S. Pg B 3.3.2.2-2
The feedwater and main turbine high water level trip instrumentation is assumed to be capable of providing a turbine trip in the design basis transient analysis for a feedwater controller failure, maximum demand event (Ref. 1). The Level 8 trip indirectly initiates a reactor scram (above 30% RTP) from the main turbine trip and trips the feedwater pumps, thereby terminating the event. The reactor scram mitigates the reduction in MCPR. Credit for this function is also taken in the analysis of the pressure regulator failure event (Ref. 1), and the decrease in reactor coolant system flow rate events described in Reference 2.

RO Question Basis:
This question is based on understanding system design. The answer explanation references TS bases, because of the TS bases is a reliable source of technical information written in a simple format, the Design Basis document is cryptic and difficult to follow.
And an additional source of technical information is the lesson plan. However, it is undesirable to provide quotes from a lesson plan as a technical base for a question on an NRC exam.
This information in ST-OP-315-0028-001 TURBINE SUPERVISORY EQUIPMENT AND PROTECTION and is supported by training objectives in the same document.

Distractor Explanation:
A. (1) Is plausible because a 4 VOTER system is used by APRM, and could be viewed as way to connect a turbine trip to RPS.
(2) Is plausible because LHGR is a Power Distribution Limit.

B. (1) Is plausible because a VOTER system is used by APRM, and could be viewed as way to connect a turbine trip to RPS.
(2) Is correct.

D. (1) Is correct.
(2) Is plausible because LHGR is a Power Distribution Limit.

Reference Information:
TSB 3.3.2.2 and 3.3.1.1

Plant Procedures
23.601

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
700000 AK3. Knowledge of the reasons for the following responses as they apply to GENERATOR VOLTAGE AND ELECTRIC GRID DISTURBANCES:
700000 AK3.01 Reactor and turbine trip criteria

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Reactor Protection System (C7100)
Cognitive Enabler
Describe the Reactor Protection System technical specification limiting conditions for operation, their bases, the associated surveillance requirement(s), and their relationship to operability.

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21	K/A Importance: 3.0/3.3			Points: 1.00
R21	Difficulty: 2.00	Level of Knowledge: High	Source: NEW	83886

The plant is operating at 15% power with MTG warming in progress when the following indications are observed:

- OG Outlet Charcoal Units Flow is 58 scfm and slowly rising
- Condenser Vacuum Slowly degrading
- Gland Sealing Steam pressure 0 psig
- Circ Water Inlet Temp 62°F

Which one of the following identifies the required operator action?

A. Start another CW pump.

B. Start a Mechanical Vacuum Pump.

C. Place additional Cooling Tower in service.

D. Throttle Gland Steam Startup Regulator Bypass Valve.

Answer: D

Answer Explanation:
Increase in off gas flow is an indication of a loss of vacuum condition. Normal pressure of the Gland sealing is 1.5 to 4 psig. Increased flow is through the seals (in leakage). By opening the Gld Stm Startup Reg Bypass valve, more steam would be applied to the seals to provide a seal and stop the in leakage.

Distractor Explanation:
Distractors are incorrect and plausible because:
B. Placing a MVP in service is only allowed with reactor power <5% and would not stop the in leakage.
A & C. CW temp must be >65 to place an additional cooling tower in service and >88 to start an additional CW pump. These actions would have no impact on the degrading vacuum caused by the in leakage from the lack of sealing steam.

Reference Information:
20.125.01
4D40 Gland Steam Pressure Trouble

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295002 AK1 Knowledge of the operational implications of the following concepts as they apply to LOSS OF MAIN CONDENSER VACUUM :
295002 AK1.04 Increased offgas flow

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Condenser and Auxiliaries (N6100)
Cognitive Enabler
Given Condenser and Auxiliaries System performance data, detect abnormalities, and determine possible causes for performance problems.

22	K/A Importance: 3.6/3.7			Points: 1.00
R22	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	83866

The plant is running at 100% power when a problem with Feedwater DCS causes the C32-R816A(B) North (South) Reactor Feed Pump Controllers to shift to Emergency Bypass. Shortly after, the P603 operator notices the following on the C32-R807, Feedwater and Steam Flow recorder:

- Steam Flow = 14.92 MLB/H steady.
- Feedwater Flow = 13.76 MLB/H slowly lowering.

For the above conditions, answer the following questions:

(1) If no operator action is taken, what is the next expected alarm at the P603 panel?

(2) What actions should the P603 operator take to prevent this alarm?

A. (1) 3D156 Reactor Water Level Low
(2) Raise output of C32-R618, Master Feedwater Level Controller

B. (1) 3D152 Reactor Water Level High
(2) Lower output of C32-R618, Master Feedwater Level Controller

C. (1) 3D156 Reactor Water Level Low
(2) Raise output of C32-R816A(B) North (South) Reactor Feed Pump Controllers

D. (1) 3D152 Reactor Water Level High
(2) Lower output of C32-R816A(B) North (South) Reactor Feed Pump Controllers

Answer: C

Answer Explanation:
The examinee should interpret that indications on the C32-R807, Feedwater and Steam Flow recorder show a “negative” Steam Flow / Feed Flow mismatch meaning there is less Feedwater input to the reactor than there is Steam Flow out of the reactor. The examinee should then determine that this mismatch will cause RPV level to lower and eventually result in (1) 3D156 Reactor Water Level Low.

The examinee should recall that, per 23.107, Reactor Feedwater and Condensate System SOP, Section 7.3.2, Shift to EMERGENCY BYPASS, when both RFP controllers are in Emergency Bypass, operators should manually adjust the output of the RFP Controllers, as required, to maintain the desired RPV water level. The examinee should determine that controller output needs to be (2) raised so that RFP speeds are raised to compensate for the indicated SF/FF mismatch and to arrest the downward lowering RPV level trend.

Lastly, the examinee should recall that, when the C32-R816A(B) North (South) Reactor Feed Pump Controllers shift to Emergency Bypass, they are placed directly in the current (control) loop for the RFPs. This means that normal DCS rate controls, input from the Master Controller, RR limiters, etc., are all bypassed and the RFP controllers are used to adjust RFP speeds directly. Therefore, the examinee must determine that RFP speeds must be raised using the individual RFP Controllers and not the Master Feedwater Level Controller.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. (1) This is correct; (2) This is how the system normally works if the C32-R816A(B) North (South) Reactor Feed Pump Controllers are in Automatic and the C32-R618, Master Feedwater Level Controller is in Manual. When in this configuration, the output of C32-R618, Master Feedwater Level Controller, is the software process variable (PV) input to C32-R616A, N Reactor Feed Pump Controller and, C32-R616B, S Reactor Feed Pump Controller so the operator would adjust the output of the Master Feedwater Level Controller to adjust N and S RFP Speeds and match SF/FF. However, when the C32-R816A(B) North (South) Reactor Feed Pump Controllers are in Emergency Bypass, they are directly in the control loop for the RFPs.
B. (1) This is the alarm that would be received if the SF/FF mismatch was “positive” meaning Feedwater Flow was greater than Steam Flow out of the reactor; (2) This is how the system normally works if the C32-R816A(B) North (South) Reactor Feed Pump Controllers are in Automatic and the C32-R618, Master Feedwater Level Controller is in Manual. When in this configuration, the output of C32-R618, Master Feedwater Level Controller, is the software process variable (PV) input to C32-R616A, N Reactor Feed Pump Controller and, C32-R616B, S Reactor Feed Pump Controller so the operator would adjust the output of the Master Feedwater Level Controller to adjust N and S RFP Speeds and match SF/FF. However, when the C32-R816A(B) North (South) Reactor Feed Pump Controllers are in Emergency Bypass, they are directly in the control loop for the RFPs.
D. (1) This is the alarm that would be received if the SF/FF mismatch was “positive” meaning Feedwater Flow was greater than Steam Flow out of the reactor; (2) These are the correct controller to use in this configuration and, if SF/FF mismatch was “positive” then lowering output on these controllers would be necessary.

Reference Information:

20.107.01, Loss of Feedwater or Feedwater Control.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295009 Low Reactor Water Level
295009 AA2. Ability to determine and/or interpret the following as they apply to LOW REACTOR WATER LEVEL :
295009 AA2.02 Steam flow/feed flow mismatch

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Feedwater Control (C3200)
Cognitive Enabler
Given Feedwater Control System performance data, detect abnormalities, and determine possible causes for performance problems.

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23	K/A Importance: 4.3/4.4			Points: 1.00
R23	Difficulty: 2.00	Level of Knowledge: High	Source: NEW	83850

8D41, DIV I Drywell Temperature High, is in Alarm.

T47-R803A, Drywell Cooling System Area Temperatures Div 1, is alarming for the following points:

- Point 1 - Fan Unit C003 Disch.
- Point 6 - Fan Unit C008 Disch.
- Point 18 - Sacrificial Shield Top 315 deg.

All DIV 1 Drywell cooling fans are in AUTO, with two speed cooling fans selected to High Speed.

The ARP will direct which of the following actions to mitigate this alarm?

A. ENTER 29.100.01 SH 2, “Primary Containment Control.”

B. ENTER 20.127.01, “Loss Of Reactor BLDG Closed Cooling Water System"

C. Place P42-K803, RBCCW TCV P42-F400 CTRLR, in manual and use the controller to throttle the valve OPEN.

D. Place P42-K803, RBCCW TCV P42-F400 CTRLR, in manual and use the controller to throttle the valve CLOSED.

Answer: C

Answer Explanation:
The purpose of the RBCCW TCV is to regulate the GSW flowing through the tubes of the RBCCW Heat Exchanger to control the RBCCW Outlet Temperature within the prescribed operating band. As the temperature starts to rise (due to adding more loads or power), the TCV opens up to allow more GSW to flow through the tubes to reduce the temperature of the RBCCW. The 8D41 directs the following:
Increase cooling water flow using P42-F400, RBCCW Temp Control Vlv in AUTO, or MANUAL if necessary, while monitoring GSW pressure on P41R809, GSW/Fire Protection Header Pressure Indicator.
Therefore the operator should throttle Open this valve.

Distractor explanation:
Distractors are incorrect and plausible because:
This Alarm has a red border, which implies that it might be an EOP entry and requires evaluation. The candidate may believe that the alarming Channels require EOP entry, however they do not. EOP entry is on channel 107, Drywell Average Air Temperature, only.
While RBCCW provides cooling for the Drywell, the stem does not specify conditions requiring entry into this AOP.
The candidate could incorrectly believe that the RBCCW TCV is located in the system to bypass flow and closing the valve would increase cooling flow vice decreasing flow, such as is the case for controlling temperature with the RHRSW system.

Reference Information:

8D41 Initial Response

23.127 System description

Plant Procedures
08D41

NUREG 1123 KA Catalog Rev. 2
295012 High Drywell Temperature
G2.1.23 Ability to perform specific system and integrated plant procedures during different modes of plant operation

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Reactor Building Closed Cooling Water Emergency Equipment Cooling Water (P4200/P4400)
Cognitive Enabler
Describe general Reactor Building Closed Cooling Water/Emergency Equipment Cooling Water System operation, including component operating sequence, normal operating parameters, and expected system response.

24	K/A Importance: 3.6/3.7			Points: 1.00
R24	Difficulty: 4.00	Level of Knowledge: Low	Source: BANK	83826

A Safety Relief Valve (SRV) has failed FULL OPEN and 20.000.25, Failed Safety Relief Valve, has been entered.

The SRV failed to close when Immediate Actions of the AOP were taken.

All subsequent actions to close the SRV have been UNSUCCESSFUL.

The CRS has directed you to place the Residual Heat Removal (RHR) System in the Torus Cooling mode.

How will you perform the task directed by the CRS and why?

A. Place one division of RHR in Torus Cooling, with inter-divisional flow, to OBTAIN localized Torus Temperature.

B. Place one division of RHR in Torus Cooling, with cross-divisional flow, to MAXIMIZE thermal mixing of the Torus Water.

C. Place both divisions of RHR in Torus Cooling to lower temperature and PREVENT exceeding the allowable Tech Spec Torus Temperature limit.

D. Place both divisions of RHR in Torus Cooling to slow the increase in temperature and PROMOTE mixing for more accurate temperature monitoring.

Answer: D

Answer Explanation:
Per 20.000.25, Failed Safety Relief Valve AOP, Action A.1 the RO should place ALL available RHR in Torus Cooling for an SRV that cannot be closed. The reason for placing both divisions of RHR in Torus Cooling can be found in the bases for this AOP:

Placing RHR in Torus Cooling (maximized) will slow the temperature increase and is part of the long-term action to restore TWT to less than 95°F within 24 hours, also per T.S. 3.6.2.1. It is important to understand that the RHR system in the Torus Cooling Mode will not be able to turn temperature until the SRV is closed. Another important benefit of torus mixing which will result in torus average temperature being more accurate (Perry Unit 1 OE#17804) which provides the operator with the best information as related to temperature dependent curves and calculations.

Note: The basis for this procedure step, in the context of the Perry OE (OE#17804) referenced above, is emphasized during Licensed Operator Training.

Therefore, the examinee must recall that both divisions of RHR must be placed in Torus Cooling and one reason for doing so is the benefit of torus mixing, which will result in a more accurate Torus average temperature reading.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This is the method that would be used to place RHR in Torus Cooling if in the EOPs and, with one division operating, taking a suction from and discharging to it's divisional 'side' of the Torus, then RHR heat exchanger outlet temperature could be used to determine local temperature. However, T.S. and TRM actions are based on obtaining accurate average temperature, not localized temperature.
B. This is the normal method of Torus Cooling that is used when not in the AOPs or EOPs. 23.205, RHR System SOP, contains a note that states: If possible, Torus Cooling flow should be routed through the E1150-F010, RHR Crosstie Vlv, and returned to the Torus through the opposite RHR division E1150-F024B, Div 2 RHR Torus Clg Iso, to promote better thermal mixing. Therefore, it is plausible to assume that only one division of RHR would be placed in service, in cross-divisional mode, to maximize thermal mixing. However, AOP 20.000.25 directs that ALL available RHR be placed in Torus Cooling for the reasons outlined above.
C. This is the method that is used when in the Failed SRV AOP and, if RHR capacity was higher, could prevent Torus Temperature from reaching the TS allowable limit. However, as stated in the BASES for 20.000.25, placing RHR in Torus Cooling will slow the temperature increase, however, it will not be able to turn temperature until the SRV is closed.

Reference Information:

20.000.25, Failed Safety Relief Valve AOP.
20.000.25, Failed Safety Relief Valve AOP - BASES.
23.205, RHR System SOP.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295013 High Suppression Pool Water Temperature
295013 AK2.01 3.6/3.7 Suppression pool cooling

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Reactor Operator
Cognitive Enabler
Explain bases for EOP/AOP actions.

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25	K/A Importance: 3.6/3.6			Points: 1.00
R25	Difficulty: 4.00	Level of Knowledge: High	Source: BANK	83811

You are the P603 Operator. The plant is operating at rated power with the West CRD Pump tagged out for repairs when the following occurs:

- 1400 – East CRD Pump trips for unknown reasons.
- 1402 – Charging water header pressure drops < 940 psig.
- 1405 – Operations and Electrical Maintenance start attempting to restore a CRD pump.
- 1410 – Accumulator for CR 18-55, which is Full-In, is declared INOPERABLE.
- 1412 – Accumulator for CR 22-47, which is Full-Out, is declared INOPERABLE.

When are you required to place the Mode Switch in Shutdown to satisfy Technical Specifications?

A. At time 1412.

B. At time 1432.

C. When an additional accumulator is declared INOPERABLE for a Full-Out Control Rod.

D. 20 minutes after an additional accumulator is declared INOPERABLE for a Full-Out Control Rod.

Answer: B

Answer Explanation:
Per Technical Specifications LCO 3.1.5, Control Rod Scram Accumulators:

? Condition B is entered when 'Two or more control rod scram accumulators inoperable with reactor steam dome pressure ≥ 900 psig.'
? Required Action B.1 requires that the operators 'Restore charging water header pressure to ≥ 940 psig'
? Completion Time for B.1 is '20 minutes from discovery of Condition B concurrent with charging water header pressure < 940 psig.'

Therefore, the examinee must first recognize that the 20-minute clock started at 1412 when the second accumulator was declared INOPERABLE concurrent with charging header pressure being <940 psig. The examinee should then determine that the Mode Switch should be placed in Shutdown at 1432.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This distractor would be true if steam dome pressure was <900 psig because TS LCO 3.1.5 Condition C requires that the Mode Switch be taken to Shutdown Immediately upon discovery of one or more control rod scram accumulators INOPERABLE, for control rods not fully inserted, with reactor steam dome pressure <900 psig concurrent with charging water pressure <940 psig. This distractor is incorrect because steam dome pressure is >900 psig at rated power.
C. This distractor would be true if steam dome pressure was <900 psig and the wording of Condition C was the same as Condition B. Condition C states 'One or more control rod scram accumulators inoperable with reactor steam dome pressure < 900 psig.' Condition B states 'Two or more control rod scram accumulators inoperable with reactor steam dome pressure ≥ 900 psig.' A common misconception is to mix-up the wording of Conditions A and B which causes operators to incorrectly recall that Condition C requires two or more INOPERABLE accumulators (associated with control rods that are not fully inserted) before the Mode Switch must be (Immediately) placed in Shutdown. If this misconception is applied here, it is plausible that the examinee could assume that the Mode Switch must be taken to Shutdown Immediately upon declaring the second withdrawn control rod INOPERABLE. This distractor is incorrect because Condition C only requires ONE (withdrawn) control rod INOPERABLE.
D. This distractor would be true if Required Action B.1 had wording like Required Action C.1 in that the action was contingent upon INOPERABLE accumulators being associated with control rods that are not fully inserted. This is another common misconception, like above, whereby operators assume that the two (or more) control rod scram accumulators INOPERABLE of Condition B must be associated with withdrawn control rods, as is required of Condition C. If this misconception is applied here, it is plausible that the examinee could determine that the 20-minute clock would not start until the second WITHDRAWN control rod accumulator was declared INOPERABLE. This is incorrect because Condition B does not require that the two or more control rods be associated with withdrawn control rods and, therefore, the 20-minute timer starts at 1412.

Reference Information:

Technical Specifications LCO 3.1.5, Control Rod Scram Accumulators.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295022 Loss of Control Rod Drive Pumps
295022 AA1. Ability to operate and/or monitor the following as they apply to LOSS OF CRD PUMPS:
295022 AA1.02 3.6/3.6 RPS

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):
Control Rod Drive Hydraulics (C1150)
Cognitive Enabler
Identify Control Rod Drive Hydraulic system related technical specifications, with emphasis on action statements requiring prompt actions (for example, one hour or less).

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26	K/A Importance: 3.5/3.9			Points: 1.00
R26	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	83787

The plant has scrammed due to a LOCA. RPV water level is being maintained with high-pressure injection sources causing Torus Water level to rise. Parameters are as follows:

- Reactor Power - 0%
- RPV Level – 10” steady.
- RPV Pressure – 500 psig slowly lowering.
- Torus Temperature – 132°F slowly rising.
- Drywell Temperature – 242°F slowly rising.
- Drywell Pressure – 20 psig slowly rising.
- Torus Pressure – 16 psig slowly rising.
- Torus Water Level – 16” rising.

The Control Room Supervisor has just directed that Emergency Depressurization (ED) be performed.
Which of the following is the reason for the ED?

A. To prevent containment failure by ensuring sufficient heat capacity is available in the torus to receive an RPV blowdown.

B. To prevent containment failure from direct pressurization of the containment due to damage to the SRV discharge lines.

C. To avoid over-pressurization of the primary containment due to loss of pressure suppression capability of the suppression chamber.

D. To avoid containment failure because vacuum breakers cannot relieve non-condensables into the drywell and equalize drywell and suppression chamber pressures.

Answer: B

Answer Explanation:
Note: 29.100.01, Sheet 6 (Only the curves) will be provided for this question.

Per 29.100.01, Sheet 6, the examinee must first determine that the plant conditions in the stem of the question indicate that the SRV Tailpipe Level Limit (SRVTPLL) curve has been exceeded. If the CRS directs an ED under these conditions, it implies that actions to restore RPV pressure and Torus Water Level less than the limits of the SRVTPLL have been unsuccessful.

Then, the examinee must recall that SRV operation with suppression pool water level above the SRVTPLL could damage the SRV discharge lines. This, in turn, could lead to containment failure from direct pressurization and damage to equipment inside the containment (ECCS piping, RPV water level instrument runs, Torus-to-dry well vacuum breakers, etc.) from pipe-whip and jet-impingement loads. The RPV is therefore not permitted to remain at pressure if suppression pool water level and RPV pressure cannot be restored and maintained below the SRVTPLL.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This distractor would be true if containment parameters exceeded the Heat Capacity Limit (HCL). The HCL is the highest suppression pool temperature from which emergency RPV depressurization will not raise (1) Suppression chamber temperature above maximum temperature capability of the suppression chamber and equipment within the suppression chamber which may be required to operate when the RPV is pressurized, or (2) Suppression chamber pressure above the Primary Containment Pressure Limit if the HCL is exceeded. Depressurizing the RPV when suppression pool temperature and RPV pressure cannot be maintained below the HCL thus avoids failure of the containment and equipment necessary for the safe shutdown of the plant. This distractor is incorrect because the HCL curve has not been exceeded by the conditions in the stem of the question.
C. This distractor would be true if containment parameters exceeded the Pressure Suppression Pressure (PSP) limit of containment. The PSP is the highest suppression chamber pressure which can occur without steam in the suppression chamber airspace. A pressure above the PSP is thus indicative of bypass leakage and impaired pressure suppression capability. Since the RPV may not be kept at pressure when pressure suppression capability is unavailable, Emergency RPV Depressurization is required. A pressure above the PSP should not be possible without bypass leakage. To avoid over-pressurization of the primary containment, the RPV is depressurized as soon as it is determined that pressure will exceed the PSP This distractor is incorrect because the PSP curve has not been exceeded by the conditions in the stem of the question.
D. This distractor would be true if an ED was performed when Torus Water Level exceeded the elevation of the bottom of the Torus-to-Drywell Vacuum breakers. If the penetrations are submerged, the vacuum breakers cannot function as designed to relieve non-condensables into the drywell and equalize drywell and suppression chamber pressures, which could cause containment failure due to excessive Torus to Drywell differential pressure. This distractor is incorrect because the bottom of the vacuum breakers at Fermi 2 is +43” Torus Water Level.

Reference Information:

29.100.01, Sheet 2 – Primary Containment Control.
29.100.01, Sheet 6 – EOP Curves, Cautions and Tables.
BWR Owners’ Group Emergency Procedure and Severe Accident Guidelines, Appendix B: Technical Basis, Volume 1.

Question Use
ILO
Open Reference provided on NRC Exam - ***29.100.01, Sheet 6, "Curves, Cautions, and Tables" (without the Cautions)***
RO

NUREG 1123 KA Catalog Rev. 2
295029 High Suppression Pool Water Level
295029 EK3. Knowledge of the reasons for the following responses as they apply to HIGH SUPPRESSION POOL WATER LEVEL :
295029 EK3.01 Emergency depressurization

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (5) Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Primary Containment Control
Performance Terminal
Using the graphs from the EOP Flowcharts, and parameter values for specific plant conditions, determine appropriate operator actions per the EOP Flowcharts.

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27	K/A Importance: 4.0/3.9			Points: 1.00
R27	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	84686

The plant is operating at 100% power with a High Rad transfer in progress in the Reactor Building when a high radiation alarm is received.

The STA is sent to the Relay Room and reports that D11-K609A, Div 1 Fuel Pool Vent Exh East Vent Duct Rad Monitor, is reading 4 mr/hr with a trip light lit. No other rad monitors indicate tripped.

Based on these indications, RBHVAC supply and exhaust fans should be tripped and _____(1)___ isolation dampers closed. The crew should enter _____(2)_____.

A. (1) ONLY the inboard
(2) 29.100.01, Sheet 5, Secondary Containment and Rad Release

B. (1) ONLY the inboard
(2) 20.000.02, Abnormal Release of Radioactive Material

C. (1) inboard AND outboard
(2) 20.000.02, Abnormal Release of Radioactive Material

D. (1) inboard AND outboard
(2) 29.100.01, Sheet 5, Secondary Containment and Rad Release

Answer: C

Answer Explanation:
The above conditions will cause 3D35 to alarm.

Per ARP 3D35:
System initiations or trips:
- SBGT initiates.
- Reactor Building HVAC fans trip and isolate.
- Control Center HVAC shifts to Recirculation Mode.

Subsequent Actions.
1. Direct an operator to RR H11-P606 to verify D11-K609A and C(B and D), Div 1(2) Fuel Pool E and W Vent Exh Duct Rad Monitors, are greater than 3 mr/hr.
2. IF Fuel Pool Vent Exh Duct Radiation is verified greater than 3 mr/hr, PERFORM 20.000.02, "Abnormal Release of Radioactive Material," concurrently with this procedure.
3. IF Fuel Pool Vent Exh Duct Radiation is verified greater than 5 mr/hr, PERFORM 29.100.01 SH 5, "Secondary Containment and Rad Release," concurrently with this procedure.
4. Verify Control Center HVAC automatic shift to RECIRC in accordance with 23.413, "Control Center HVAC."

Logic print I-2610-17 (B-4) shows that, for these conditions, T4100-F8,9,10,11 (inboard and outboard isolations) recieve a close signal when D11-K609A, Div 1 Fuel Pool Vent Exh East Vent Duct Rad Monitor, is in the trip condition.

Distractor Explanation:

A is incorrect since both I/B and O/B valves shut, and EOP entry is not required. It is plausible if the candidate does not recall that the logic for the fuel pool rad monitor trip will shut both I/B and O/B isolation valves as described above; AND if they incorrectly determine that the rad monitor reading of 4 mr/hr requires entry into the Secondary Control EOP, 29.100.01 Sheet 5. This EOP is entered when the rad monitor reaches 5 mr/hr.

B is incorrect since both I/B and O/B valves shut, and is plausible if the candidate does not recall that the logic for the fuel pool rad monitor trip will shut both the I/B and O/B isolation valves as described above.

D is incorrect since EOP entry is not required, and is plausible if the candidate incorrectly determines that the rad monitor reading of 4 mr/hr requires entry into the Secondary Control EOP, 29.100.01 Sheet 5, entry condition. This EOP is entered when the rad monitor reaches 5 mr/hr.

Reference Information:
ARP 3D35 (all)
I-2610-17 (all) to (B-4)
23.601, Page 39.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
295034 Secondary Containment Ventilation High Radiation
295034 EA1. Ability to operate and/or monitor the following as they apply to SECONDARY CONTAINMENT VENTILATION HIGH RADIATION :
295034 EA1.03 Secondary containment ventilation

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):

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28	K/A Importance: 4.2/4.6			Points: 1.00
R28	Difficulty: 4.00	Level of Knowledge: High	Source: MODIFIED	84727

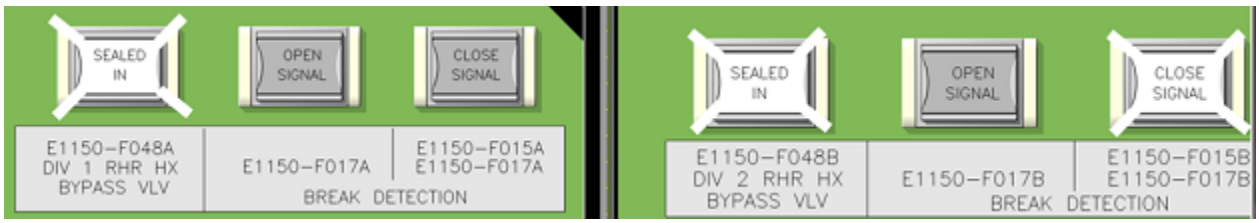
Two minutes after a large steam leak develops inside the drywell from the B Main Steam line, the following conditions exist:

- Drywell pressure is 23.0 psig.
- Reactor pressure is 350 psig and slowly lowering.
- RPV level is 170 inches and slowly rising.

Which of the following indications are correct for the current plant conditions?

A.

B.



C.

D.

Answer: A

Answer Explanation:
The conditions presented in the stem indicate that RHR LPCI Loop Select Logic will have determined the loop selected for injection since a High Drywell Pressure condition (>1.68 psig) exists. Since the source of the high drywell pressure is from a Main Steam Line, Recirc Riser DP, for both loops, will be unaffected. This will result in LPCI Loop Select Logic selecting the B Loop (Division 2 RHR) for injection because Loop A Recirc Riser DP will not be greater than Loop B Recirc Riser DP by 0.627 psig.

Since B loop is selected for injection, the A loop injection valves (E11-F015A & F017A) will get a close signal that seals in for 10 minutes, so this light will be lit on the Div 1 side.

Since RPV pressure is less than 461 psig (at 350 psig as stated in the stem of the question), LPCI Loop Select Logic will have sent an open signal to the Loop B injection valves (E11-F015B & F017B) so the light for this signal will be lit.

Answer A shows the light arrangement for the conditions described above.

Note: Conditions in stem of question were modified by dropping RPV pressure less than injection permissive pressure (461 psig) for the LPCI System. This makes A correct, which was previously incorrect, and makes D incorrect, which was previously correct.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. This distractor is plausible if the candidate incorrectly determined that LPCI Loop Select would select the A Loop for injection based on the conditions given in the stem of the question. This is possible if the candidate incorrectly recalled the logic for determining the intact loop (comparison of riser DP) or possibly if the candidate misread the stem and thought the leak was from the B Recirc Loop instead of the B Main Steam Line. This assumption is incorrect as described above.
C. This distractor is plausible if the candidate incorrectly determined that LPCI Loop Select would select the A Loop for injection based on the conditions given in the stem of the question. This is possible if the candidate incorrectly recalled the logic for determining the intact loop (comparison of riser DP) or possibly if the candidate misread the stem and thought the leak was from the B Recirc Loop instead of the B Main Steam Line. This assumption is incorrect as described above. If the candidate determined that A is the selected loop, then the F017A & F015A would be open with RPV pressure <461 psig. This assumption is incorrect, and Loop B would be the selected loop, as described above.
D. This distractor is plausible if the candidate recognized correctly that Loop B was selected for injection, thereby resulting in the E11-F017A & F015A receiving a closed signal, but failed to recognzie that RPV pressure was 350psig, or failed to recall that when pressure is <461 psig the E11-F017B & F015B would have an open signal, thus making this distractor incorrect.

Reference Information:
23.205, Residual Heat Removal System, Section 9.0 Emergency Operations
23.601, Instrument Trip Sheets, Enclosure B, Logic Sheet for LPCI Loop Select Logic.

Plant Procedures
23.205

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
203000 RHR/LPCI: Injection Mode
203000 A3. Ability to monitor automatic operations of the RHR/LPCI: INJECTION MODE (PLANT SPECIFIC) including:
203000 A3.07 Loop selection: Plant-Specific

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
MODIFIED
RO

Associated objective(s):

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29	K/A Importance: 2.7/2.8			Points: 1.00
R29	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	83646

When starting an RHR pump in the Shutdown Cooling mode of operation:

(1) Why does 23.205, RHR System, direct immediately opening the E1150-F611A(B) Div 1(2) RHR LPCI Bypass Valve?

Once the pump is started and flow established:

(2) What should you immediately verify and why?

A. (1) Prevent tripping the RHR pump due to no discharge flowpath.
(2) Flow does not exceed 10,000 gpm to prevent pump runout.

B. (1) Prevent running the RHR pump against shutoff head for too long.
(2) Flow does not exceed 10,000 gpm to prevent pump runout.

C. (1) Prevent tripping the RHR pump due to no discharge flowpath.
(2) E1150-F007A(B) Div 1(2) RHR Pump Min Flow Valve remains closed to prevent loss of RPV level.

D. (1) Prevent running the RHR pump against shutoff head for too long.
(2) E1150-F007A(B) Div 1(2) RHR Pump Min Flow Valve remains closed to prevent loss of RPV level.

Answer: D

Answer Explanation:
Per 23.205, RHR System SOP, Section 6.1, Placing Division 1 RHR in Shutdown Cooling Mode with Flushes Step 18 directs the following:

18. Continuously monitor Reactor Water Level while performing the following steps:
a. Perform the following steps in rapid order:
1) Start E1102-C002A (C), Div1 RHR Pump A (C).
2) Immediately open E1150-F611A, Div 1 RHR LPCI Bypass Vlv (orificed to flow rate of 10,000 gpm).
b. If E1150-F007A, Div 1 RHR Pmps Min Flow Vlv, opens, close or verify closed E1150-F007A when loop flow exceeds 6900 gpm.

The examinee must recall a caution before these steps that provides the reason for immediately opening the E1150-F611A once the pump is started. The Caution states: Do not run RHR Pump(s) against shutoff head for more than two minutes. The examinee must also determine that Step b is then performed to verify that the E1150-F007A(B) closes because, when this valve is open, a continuous flowpath exists between the pump suction (aligned to the RPV when in SDC mode) to the Torus, therefore RPV level will drop.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. (1) This would be correct if the pump was interlocked with valves in its discharge flow path that would cause a pump trip if a discharge path was not established in a certain time. This is plausible because the RHR pumps have several interlocks with valves in the system that cause pump trips if not open. This distractor is also plausible because it is true for other systems at Fermi 2, such as the RWCU system, which has a low-flow trip that is disabled for 10 seconds on pump start and if RWCU system flow is not established in 10 seconds, the RWCU pump will trip. It is plausible that one of these types of design features is installed to protect the pump against minimum flow by preventing it from running without a discharge path established. This distractor is incorrect because such a trip does not exist in the RHR system at Fermi 2.
(2) When in SDC the RHR pumps are more susceptible to runout conditions due to pumping against low RPV pressure (<89.5 psig maximum and normally much lower). This distractor is incorrect because the flowpath through the LPCI Bypass Valve is limited to 10,000 gpm, by orifices in the line, to prevent runout.

B. (1) This part is correct.
(2) When in SDC the RHR pumps are more susceptible to runout conditions due to pumping against low RPV pressure (<89.5 psig maximum and normally much lower). This distractor is incorrect because the flowpath through the LPCI Bypass Valve is limited to 10,000 gpm, by orifices in the line, to prevent runout.

C. (1) This would be correct if the pump was interlocked with valves in its discharge flow path that would cause a pump trip if a discharge path was not established in a certain time. This is plausible because the RHR pumps have several interlocks with valves in the system that cause pump trips if not open. This distractor is also plausible because it is true for other systems at Fermi 2, such as the RWCU system, which has a low-flow trip that is disabled for 10 seconds on pump start and if RWCU system flow is not established in 10 seconds, the RWCU pump will trip. It is plausible that one of these types of design features is installed to protect the pump against minimum flow by preventing it from running without a discharge path established. This distractor is incorrect because such a trip does not exist in the RHR system at Fermi 2.
(2) This part is correct.

Reference Information:

23.205 RHR System SOP.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
205000 RHR Shutdown Cooling Mode
205000 K4. Knowledge of SHUTDOWN COOLING SYSTEM (RHR SHUTDOWN COOLING MODE) design feature(s) and/or interlocks which provide for the following:
205000 K4.07 Pump minimum flow

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (8) Components, capacity, and functions of emergency systems.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Residual Heat Removal (E1100)
Cognitive Enabler
List the interlocks associated with RHR System components.

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30	K/A Importance: 3.0/3.2			Points: 1.00
R30	Difficulty: 2.00	Level of Knowledge: Low	Source: BANK	83490

The reactor has scrammed due to a loss of feedwater. RPV level is currently 200” and rising with injection from the HPCI system only.

What is the operational implication of the E4100-F076, HPCI Turbine Exhaust Vacuum Breaker Outboard Check Valve and the E4100-F077, HPCI Turbine Exhaust Vacuum Breaker Inboard Check Valve failing CLOSED?

A. HPCI would trip on High Exhaust Pressure.

B. Torus pressure would rise to match HPCI Exhaust Pressure.

C. If HPCI tripped, excess water could be drawn into the HPCI Turbine Exhaust piping.

D. If HPCI tripped, excess water could collect in the HPCI Turbine Exhaust line drain pot.

Answer: C

Answer Explanation:
Per E41-00, HPCI System Design Basis Document (DBD): A redundant system of check valves and isolation valves has been installed as a vacuum breaker line that connects the air space in the suppression pool with the HPCI turbine exhaust line. This eliminates any possibility of water from the suppression pool being rapidly drawn into the HPCI turbine exhaust line (water cannon water hammer).

Therefore, the examinee must recall where in the HPCI exhaust line these valves are located, along with their arrangement and how they function, determine their normal status is closed when HPCI is running, and then predict that their closure would result in excess water being rapidly drawn into the HPCI turbine exhaust line.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This would be true if the E4150-F021, HPCI Turbine Exhaust Stop Check Valve were to close during system operation since the normal steam exhaust path from the HPCI Turbine is through this valve. This distractor is incorrect because, when HPCI is operating, the E4100-F076 and E4100-F077 are normally closed, with no steam flow through them, so their closing would not cause HPCI Exhaust Pressure to rise.
B. This would be true if the E4100-F076, HPCI Turbine Exhaust Vacuum Breaker Outboard Check Valve and the E4100-F077, HPCI Turbine Exhaust Vacuum Breaker Inboard Check Valve were to fail OPEN since doing so would allow the HPCI Exhaust Line to communicate directly with the Torus air space above the water line. This distractor is incorrect because the stem of the question states that the vacuum breakers failed closed.
D. This would be true if the E4150-F022, HPCI Turbine Exhaust Pot Drain Stop Check Valve were to close during system operation since its closure would isolate drain flow from the turbine steam rings and casing, steam chest and stop valves. This drain pot functions to drain the HPCI exhaust to prevent water hammer upon HPCI initiation, which is a function that is like the function performed by the vacuum breaker check valves in the stem of the question. This distractor is incorrect because the stem of the question states that the exhaust line vacuum breakers failed closed and not the E4150-F022.

Reference Information:

M-5708-1, HPCI System FOS.
E41-00, HPCI System DBD.
ST-OP-315-0039-001, HPCI System Student Text.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2

206000	HPCI System.
206000 K5.	Knowledge of the operational implications of the following concepts as they apply to HIGH PRESSURE COOLANT INJECTION SYSTEM :
206000 K5.08	Vacuum breaker operation: BWR-2,3,4

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b) (5)	Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
High Pressure Coolant Injection
Cognitive Enabler
Discuss the function and purpose of HPCI System components, including their importance to nuclear safety.

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31	K/A Importance: 2.5/2.7			Points: 1.00
R31	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	83489

A blown fuse in MCC 72F-4A Position 4C has occurred.

Which of the following describes the impact of this fault on the low pressure ECCS injection/spray subsystems?

A. Division 1 Core Spray will not automatically align for injection.

B. Division 2 Core Spray will not automatically align for injection.

C. Division 1 RHR will not automatically align in the LPCI Mode.

D. Division 2 RHR will not automatically align in the LPCI Mode.

Answer: B

Answer Explanation:
Per 23.203, Attachment 2B - Core Spray System Division 2 Electrical Lineup, MCC 72F-4A Pos 4C is the power supply to the E2150-F005B, Division 2 Core Spray Inboard Isolation Valve.

Therefore, the examinee must recall this power supply arrangement and conclude that, since the E2150-F005B is normally closed, Division 2 Core Spray will not automatically align for injection.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The E2150-F005A, Division 1 Core Spray Inboard Isolation Valve, could be powered by 72F-4A Position 4C and, since the E2150-F005A, Division 1 Core Spray Inboard Isolation Valve is normally closed, Division 1 Core Spray would not automatically align for injection. This distractor is incorrect because the E2150-F005A is powered from MCC 72C-3A Pos 8B.
C. The E1150-F017A, Division 1 LPCI Outboard Isolation Valve could be powered from 72F-4A Position 4C and, if de-energized, could render Division 1 RHR incapable of automatically aligning in the LPCI Mode. Note: The power supply to the E1150-F017A is MCC 72C-F Pos 3A, which is very similar to the power supply for the E2150-F005A, Division 1 Core Spray Inboard Isolation Valve, which is powered by MCC 72C-3A, causing them to be easily confused. This distractor is incorrect because the E1150-F017A, Division 1 LPCI Outboard Injection Valve is powered from 72C-F Pos 3A.
D. The E1150-F015B, Division 2 LPCI Inboard Isolation Valve could be powered from 72F-4A Position 4C and, if de-energized, could render Division 2 RHR incapable of automatically aligning in the LPCI Mode. Note: The power supply to the E1150-F017B is MCC 72C-F Pos 4A, which is very similar to the power supply for the E2150-F005B, Division 2 Core Spray Inboard Isolation Valve, which is powered by MCC 72F-4A, causing them to easily be confused. This distractor is incorrect because the E1150-F015B, Division 2 LPCI Inboard Injection Valve is powered from 72C-F Pos 4A.

Reference Information:

23.203, Core Spray System.
23.205, RHR System.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2

209001	Low Pressure Core Spray System.
209001 K2.	Knowledge of electrical power supplies to the following:
209001 K2.02	Valve power

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b) (7)	Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
RO

Associated objective(s):
Core Spray System
Cognitive Enabler
Describe the normal and alternate power supplies to Core Spray System components.

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32	K/A Importance: 3.4/3.6			Points: 1.00
R32	Difficulty: 3.00	Level of Knowledge: Low	Source: BANK	83526

The plant has experienced an ATWS event.

SLC injection has been performed by rotating the C4100-M004, SLC Initiation Switch to the Pump B RUN position.

Which RWCU valve isolations should have occurred?

A. G3352-F001, RWCU Supply Inbd Iso Vlv, AND
G3352-F004, RWCU Supply Otbd Iso Vlv

B. G3352-F001, RWCU Supply Inbd Iso Vlv, AND
G3352-F220, RWCU to FW Otbd Cntm Iso Vlv

C. G3352-F004, RWCU Supply Otbd Iso Vlv, AND
G3352-F220, RWCU to FW Otbd Cntm Iso Vlv

D. G3352-F001, RWCU Supply Inbd Iso Vlv, AND
G3352-F004, RWCU Supply Otbd Iso Vlv, AND
G3352-F220, RWCU to FW Otbd Cntm Iso Vlv

Answer: C

Answer Explanation:
Per 23.601 Instrument Trip Sheets, when the SLC system is initiated (Select Switch to Pump A Run OR Pump B Run), the RWCU system Group 11 (Outboard) isolation valves (G3352-F004 and G3352-F220) will close.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The valves listed are RWCU isolation valves that close for different isolation signals. It is plausible to assume that the G3352-F001 (Inboard) and G3352-F004 (Outboard) isolation valves would close because that would seem to fully isolate the RWCU system. However, this is incorrect because the G3352-F004 and G3352-F220 close on SLC initiation.
B. The valves listed are RWCU isolation valves that close for different isolation signals. It is plausible to assume that the G3352-F001 (Inboard) and G3352-F220 (Outboard) isolation valves would close because that would seem to fully isolate the RWCU system. However, this is incorrect because the G3352-F004 and G3352-F220 close on SLC initiation.
D. The valves listed are RWCU isolation valves that close for different isolation signals. This distractor is plausible because these three valves go closed for a Reactor Vessel Low Water level - Level 2 signal to isolate the RWCU system. However, this is incorrect because the G3352-F004 and G3352-F220 close on SLC initiation.

Reference Information:
23.601, Instrument Trip Sheets, Enclosure B (Page 12 of 29) for Group 10 - RWCU System Inboard.
23.601, Instrument Trip Sheets, Enclosure B (Page 13 of 29) for Group 11 - RWCU System Outboard.

Plant Procedures
23.139

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
211000 SLC System
211000 K1. Knowledge of the physical connections and/or cause-effect relationships between STANDBY LIQUID CONTROL SYSTEM and the following:
211000 K1.05 RWCU

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (8) Components, capacity, and functions of emergency systems.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Standby Liquid Control
Cognitive Enabler
Discuss the Standby Liquid Control System interrelationships with other systems.

33	K/A Importance: 3.0/3.2			Points: 1.00
R33	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	83486

Which of the following is (1) an operational implication of the type of tank level measurement used in the Standby Liquid Control (SLC) Storage Tank and (2) the action that must be periodically taken to compensate for this?

A. (1) Buildup inside the tubing may cause false level indications and alarms.

(2) The instrument tubing is blown down to prevent buildup.

B. (1) The end of the tubing may become clogged causing high tank level indication.

(2) The SLC Storage tank is sparged to prevent clogging.

C. (1) Sodium pentaborate may precipitate out of the solution in the tubing causing false level indications and alarms.

(2) SLC Storage Tank Heater B is energized to maintain solution above saturation temperature.

D. (1) High solution concentration in the tank may cause false high tank level indication.

(2) Water is added to the SLC Storage Tank per Chemistry guidance to lower tank concentration.

Answer: A

Answer Explanation:
The SLC Storage Tank uses an open (dip) tube immersed in the tank with the open end just off the bottom. Instrument Air is forced into the tube until bubbles constantly stream from the bottom of the tube.

Since excess air pressure will bubble out of the bottom of the tube, the air pressure in the system will always be equal to the hydrostatic head of the vessel liquid at any level. With the level in the storage tank at its maximum normal height, dip tube air pressures will be higher than witnessed at lower tank levels.

Changes in air pressure are sensed by a differential pressure transmitter and an electrical signal proportional to tank level is transmitted to the Control Room.

The examinee must recall that a dip tube is used as the in-tank level sensor because it is less vulnerable to precipitate clogging than other probes; however, precipitate clogging may still occur that can cause false level indications and alarms. The examinee must recall that 23.139, Section 7.3, Blowdown of SLC Storage Tank Level Indication, is performed to prevent this buildup.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. Clogging of the instrument tubing would increase back pressure sensed by the DP transmitter and therefore level indication would increase. It is plausible that sparging the tank, which is synonymous with mixing the tank with air, would clear the end of the indicator of precipitate thus removing any clogging since SLC storage tank mixing is routinely performed by Operations IAW 23.139 Section 6.2. However, this distractor is incorrect because this action is not performed for this reason; tank sparging is only performed to aid in chemical mixing.
C. Sodium pentaborate precipitating out of solution may cause false level indications and alarms due to increased buildup in the tubing and energizing the heater in the tank would increase tank temperature. This is plausible since operators periodically energize the tank heater to support Chemistry IAW 23.139 Section 6.1. However, this distractor is incorrect because Tank Heater B is only energized to raise tank temperature above 70°F to support chemical addition and not for the tank level indication.
D. High solution concentration would tend to raise the density of the solution, which would present a higher resistance to air flow and thus a higher back pressure, which would be sensed by the DP transmitter and therefore level indication would increase and adding water to the SLC storage tank would lower tank concentration. This is plausible since water is added to the SLC Storage Tank for normal volume / concentration control IAW 23.139, Section 6.1. However, this distractor is incorrect because water is not added to the SLC Storage Tank to compensate for changes in the tank level indicator.

Reference Information:

23.139, SLC System SOP.

Question Use
Closed Reference
LOR
RO

NUREG 1123 KA Catalog Rev. 2

211000	SLC System
211000 K5.	Knowledge of the operational implications of the following concepts as they apply to STANDBY LIQUID CONTROL SYSTEM :
211000 K5.06	Tank level measurement

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b) (5)	Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.
10 CFR 55.41(b) (6)	Design, components, and function of reactivity control mechanisms and instrumentation.
10 CFR 55.41(b) (7)	Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Standby Liquid Control
Cognitive Enabler
Given Standby Liquid Control System performance data, detect abnormalities, and determine possible causes for performance problems.

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34	K/A Importance: 3.6/3.8			Points: 1.00
R34	Difficulty: 4.00	Level of Knowledge: High	Source: MODIFIED	83107

The following initial conditions exist:

- Reactor power is 75%.
- "A" RPS MG Set is tagged out-of-service for maintenance.
- "A" RPS Bus is being supplied by the alternate transformer.
- "B" RPS is being supplied by the "B" RPS MG Set.

An event results in the following:

- Trip of 72B Pos 1B, Normal feed to Bus 72B.
- Trip of 72E Pos 1B, Normal feed to Bus 72E.

Which of the following describes the impact on the Reactor Protection System?

A. A full scram will occur.

B. RPS will be unaffected.

C. A half scram will occur on RPS "A"

D. A half scram will occur on RPS "B"

Answer: D

Answer Explanation:
Per 23.316, Attachment 3A, the power supplies to RPS A are:
- 72B-4C Pos 2C - RPS MG Set A.
- 72C-2D Pos 2 - RPS Alt Pwr Supply Transformer A

Per 23.316, Attachment 3B, the power supplies to RPS B are:
- 72E-5B Pos 1C-R - RPS MG Set B.
- 72F-4B Pos 2 - RPS Alt Pwr Supply Transformer B.

The examinee must first recognize that the two breakers that tripped will result in a loss of 480V busses 72B and 72E and that, although these busses have alternate power available, no automatic throwover will take place so the busses will stay de-energized. The examinee must then determine that RPS A is unaffected by the power loss because RPS A is being powered by its Alternate Power Transformer that will not be affected by the bus losses specified in the stem of the question. The examinee must also determine that the RPS B MG Set will be de-energized due to the loss of bus 72E. Therefore, the examinee must conclude that RPS A will be unaffected and RPS B will be de-energized resulting in a half-scram on RPS B.

Distractor Explanation:
Distractors are incorrect and plausible because:
A. This is how RPS would respond if RPS A were being powered by its normal power supply, the RPS A MG set. This distractor is incorrect because the stem of the question states RPS A is powered by its Alt Power Transformer.
B. This is how RPS would respond if 72F was a lost or if RPS B was being powered from its Alternate Power Transformer. This distractor is incorrect since 72E has been lost and since RPS B is being powered from its RPS MG Set.
C. This is how RPS would respond if RPS A were being powered by its normal power supply, the RPS A MG set and if 72F was a lost, or if RPS B was being powered from its Alternate Power Transformer. This distractor is incorrect because the stem of the question states RPS A is powered by its Alt Power Transformer and since 72E has been lost and since RPS B is being powered from its RPS MG Set.

Reference Information:
23.316, RPS 120Vac and RPS MG Sets.

Plant Procedures
23.610

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
212000 RPS
212000 K6. Knowledge of the effect that a loss or malfunction of the following will have on the REACTOR PROTECTION SYSTEM:
212000 K6.01 A.C. electrical distribution

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
MODIFIED
RO

Associated objective(s):
Reactor Protection System (C7100)
Cognitive Enabler
Describe the normal and alternate power supplies to Reactor Protection System components.

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35	K/A Importance: 3.9/3.9			Points: 1.00
R35	Difficulty: 2.00	Level of Knowledge: High	Source: BANK	84891

The plant is shut down in a refueling outage with undervessel work in progress on SRM B detector. The restoration sequence of the "Mode Switch in Refuel and One Rod-Out Interlock Verification" surveillance is in progress.

- The Reactor Mode Switch is placed in SHUTDOWN.
- The Scram Reset Switch is then turned to the GP 1/4 AND GP 2/3 positions, and released.

All RPV and Containment parameters are constant.

Which of the following alarms, if subsequently received for the reason given, would cause a SECOND scram to occur?

A. 3D51, SRM PERIOD SHORT, due to moving the SRM detector.

B. 3D56, TESTABILITY LOGIC A/B RPS/PWR FAILURE, due to a blown fuse in RPS Cabinet H21-P085.

C. 3D86, MN STM LINE ISO VALVE CLOSURE CHANNEL TRIP, due to an upscale failure of a Main Steam Line Flow instrument.

D. 3D94, DISCH WATER VOL HI LEVEL CHANNEL TRIP, due to the SDV High Level Channel Trip not being bypassed before the first scram was reset.

Answer: D

Answer Explanation:
SDV High Level will initiate a second automatic reactor scram under the given conditions because the SDV instrument volume will fill, due to input from the first scram, faster than it can drain. This question is based on OE at Fermi (LER 96-021-00) involving failure to bypass the SDV High Level channel trip prior to reseting a scram during shutdown testing.

Distacter Explanation:

A. Is plausible and incorrect; this alarm could be expected during SRM B work, but is ONLY an alarm and will not cause a scram signal.
B. Is plausible and incorrect; RPS power faillure in an RPS cabinet could cause an alarm, but not a scram.
C. Is plausible and incorrect; but the MSIV Closure Trip is bypassed with the Reactor Mode Switch in SHUTDOWN.

Reference Information:

ARP 3D94
SOP 23.610 pg 10&11
LER 96-021

Plant Procedures
03D094
23.610

Operating Experience
LER 96-021 Fermi Auto Scram on SDV during Shutdown

NUREG 1123 KA Catalog Rev. 2
212000 RPS
212000 A4 04 Bypass SCRAM instrument volume high level SCRAM signal
212000 A4. Ability to manually operate and/or monitor in the control room:

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2015 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):

36	K/A Importance: 3.4/3.3			Points: 1.00
R36	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	83066

The plant is in MODE 2 with a startup in progress and the following indications on H11-P603:

- All SRMs are reading between 1500 and 2500 CPS.
- All IRMs are on Range 1 reading between 20 and 30.
- All SRM and IRM Full-In Lights are lit.

The following subsequently occur:

- IRM E fails downscale and is bypassed.
- IRM F detector is selected for movement.

What is (1) the status of the IRM E and IRM F RETRACT PERMIT lights on the H11-P603 panel and (2) how will the IRM F Full-In light respond when the detector DRIVE OUT pushbutton is depressed?

A. (1) BOTH lit.
(2) It will go out.

B. (1) BOTH lit.
(2) It will stay lit.

C. (1) ONLY E is lit.
(2) It will go out.

D. (1) ONLY E is lit.
(2) It will stay lit.

Answer: C

Answer Explanation:
Per 23.603, IRM System SOP, the IRM Retract Permit light will only light for one of the following reasons:
? The IRM is bypassed.
? The Mode Switch is in RUN.

The IRM retract permit light is not a permissive for detector movement and even if the retract permit light is not lit, the detector will still withdraw. When an IRM leaves the full-in position, a limit switch on the drive motor will open causing the full-in light to go out indicating detector movement past the full-in position. Another limit switch lights when the out, neither light will be lit.

For the correct answer the examinee must recall that the Mode Switch will be in Startup/Hot Standby in MODE 2, thereby causing the Retract Permit light to be out for all non-bypassed IRMs. Next, the examinee must determine that, with IRM E bypassed, its Retract Permit light will be the only one lit. Then, the examinee must recall that the Retract Permit light only signifies that it is permissible to withdraw an IRM detector (without causing a rod block for example) but IRM detector movement can always occur. Therefore, the examinee must conclude that the IRM detector will withdraw causing its full-in light to extinguish.

Distractor Explanation:
Distractors are incorrect and plausible because:
A. Part 1 is plausible if the IRM system worked like the SRM system. The SRM detector Retract Permit will light any time the SRM is above the downscale trip setpoint (100 cps) or it is bypassed, mode switch in RUN, etc. Since the stem of the question has the IRMs above their downscale trip setpoints (approximately 1.6 on the 0 to 40 scale of Range 1), the examinee could determine that the Retract Permit lights would be lit for all IRMs thereby allowing them to be withdrawn as necessary to keep on scale, similar to the SRMs. This is incorrect because the IRM retract permit lights only light for a bypassed IRM or when the Mode Switch is in RUN. Part 2 is correct.
B. Part 1 is plausible if the IRM system worked like the SRM system. The SRM detector Retract Permit will light any time the SRM is above the downscale trip setpoint (100 cps) or it is bypassed, mode switch in RUN, etc. Since the stem of the question has the IRMs above their downscale trip setpoints (approximately 1.6 on the 0 to 40 scale of Range 1), the examinee could determine that the Retract Permit lights would be lit for all IRMs thereby allowing them to be withdrawn as necessary to keep on scale, similar to the SRMs. This is incorrect because the IRM retract permit lights only light for a bypassed IRM or when the Mode Switch is in RUN. Part 2 is plausible if the examinee recognizes that IRM detector movement is only allowed for two conditions: (1) When the Mode Switch is in RUN or (2) when the IRM is bypassed. The examinee could conclude that, since neither of these conditions exist for IRM F, its motion will be blocked and its full-in light will remain lit. This is incorrect since the IRM will withdraw causing its full-in light to extinguish.
D. Part 1 is correct. Part 2 is plausible if the examinee recognizes that IRM detector movement is only allowed for two conditions: (1) When the Mode Switch is in RUN or (2) when the IRM is bypassed. The examinee could conclude that, since neither of these conditions exist for IRM F, its motion will be blocked and its full-in light will remain lit. This is incorrect since the IRM will withdraw causing its full-in light to extinguish.

Reference Information:

ST-OP-315-0023-001, IRM System Student Text.
23.603, IRM System SOP.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
215003 IRM System
215003 A1. Ability to predict and/or monitor changes in parameters associated with operating the INTERMEDIATE RANGER MONITOR (IRM) SYSTEM controls including:
215003 A1.01 Detector position

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (6) Design, components, and function of reactivity control mechanisms and instrumentation.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Intermediate Range Monitoring (C5111)
Cognitive Enabler
List the interlocks associated with Intermediate Range Monitoring System components.

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37	K/A Importance: 3.3/3.5			Points: 1.00
R37	Difficulty: 4.00	Level of Knowledge: High	Source: BANK	83026

A normal Reactor Startup is in progress with the following conditions:

- Reactor is critical on a stable, positive period.
- Reactor power is on range 3 of the IRMs.
- SRM detector A has a failure of its power supply causing detector voltage to rise.
- SRM A indication is 5.0 x 10E5 cps and rising.

(1) What is the impact of the above on the Source Range Monitoring (SRM) system?

(2) What procedure actions are necessary to correct the consequences of the impact on the SRM system?

A. (1) SRM Upscale Alarm ONLY.
(2) Bypass SRM A per 23.602, SRM System.

B. (1) SRM Upscale Alarm and Rod Block.
(2) Bypass SRM A per 23.602, SRM System.

C. (1) SRM Upscale Alarm ONLY.
(2) Continue startup per 22.000.02, Plant Startup to 25% Power, until the Point of Adding Heat (POAH) is reached, then place the Mode Switch in RUN.

D. (1) SRM Upscale Alarm and Rod Block.
(2) Continue startup per 22.000.02, Plant Startup to 25% Power, until the Point of Adding Heat (POAH) is reached, then place the Mode Switch in RUN.

Answer: B

Answer Explanation:
Per 3D55, SRM UPSCALE/INOP when SRM counts reach 1E5 CPS a Rod Block will occur on any un-bypassed SRM if its associated IRM Range Switches are below Range 8 and the Mode Switch is not in RUN.

The ARP provides guidance to stop withdrawing control rods, determine which SRM is alarming and then attempt to withdraw the detector to keep on scale (which will not work for the conditions provided in the stem of the question), bypass the SRM and reset the SRM drawer in the Relay Room.

Therefore, the examinee must recall that the impact of this detector failure is an SRM Upscale alarm and rod block that must be cleared by bypassing the SRM and resetting the upscale alarm.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. Part 1 is plausible because the stem of the question has all IRMs above Range 2. When the IRMs are above Range 2, the Detector Withdrawn when Not Permitted (<100 cps) rod block is automatically bypassed and a Retract Permit light is always on for the associated SRM. It is a common misconception among operators to confuse this with the fact that ALL SRM rod blocks are bypassed when the IRMs are above Range 7. This misconception could cause the examinee to determine that only the SRM Upscale Alarm will occur, which is incorrect since a rod block will occur with IRM Range Switches below Range 8. Part 2 is correct because these are the actions directed by the ARP.
C. Part 1 is plausible because the stem of the question has all IRMs above Range 2. When the IRMs are above Range 2, the Detector Withdrawn when Not Permitted (<100 cps) rod block is automatically bypassed and a Retract Permit light is always on for the associated SRM. It is a common misconception among operators to confuse this with the fact that ALL SRM rod blocks are bypassed when the IRMs are above Range 7. This misconception could cause the examinee to determine that only the SRM Upscale Alarm will occur, which is incorrect since a rod block will occur with IRM Range Switches below Range 8. Part 2 is plausible since the stem of the question states that SRM counts are increasing with a stable positive period. The examine could determine that the startup could continue until the POAH is reached, at which time the Mode Switch could be placed in Run, which would allow the SRM Rod Block to be cleared. This distractor is incorrect because rod withdrawal will be required once reactor power reaches the POAH so the SRM will have to be bypassed so that the rod block can be cleared. Additionally, although placing the Mode Switch in Run when power reaches the POAH would clear the SRM Rod Block, an APRM downscale rod block (due to power <5%) will prevent further rod withdrawal.
D. Part 1 is correct. Part 2 is plausible since the stem of the question states that SRM counts are increasing with a stable positive period. The examine could determine that the startup could continue until the POAH is reached, at which time the Mode Switch could be placed in Run, which would allow the SRM Rod Block to be cleared. This distractor is incorrect because rod withdrawal will be required once reactor power reaches the POAH so the SRM will have to be bypassed so that the rod block can be cleared. Additionally, although placing the Mode Switch in Run when power reaches the POAH would clear the SRM Rod Block, an APRM downscale rod block (due to power <5%) will prevent further rod withdrawal.

Reference Information:

3D55, SRM UPSCALE/INOP
23.602, Source Range Monitoring System.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
215004 SRM System
215004 A2. Ability to (a) predict the impacts of the following on the SOURCE RANGE MONITOR (SRM) SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations:
215004 A2.05 Faulty or erratic operation of detectors/system

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (6) Design, components, and function of reactivity control mechanisms and instrumentation.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):
Source Range Monitoring (C5110)
Cognitive Enabler
Discuss potential modes of Source Range Monitoring System component failures and any industry operating experience related to the failure.

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38	K/A Importance: 3.6/3.6			Points: 1.00
R38	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	82926

The plant is operating in MODE 1 at 100% power with APRM #4 Bypassed. Its Mode Switch is taken out of the OPER position to support troubleshooting.

What is the impact of taking the Mode Switch for APRM #2 out of the OPER position?

A. 3D103, APRM Trouble, alarms ONLY.

B. 3D99, APRM INOP, alarms and Control Rod Withdrawal is blocked.

C. 3D103, APRM Trouble, alarms and Control Rod Withdrawal is blocked.

D. 3D99, APRM INOP, alarms, Control Rod Withdrawal is blocked and a Reactor Scram occurs.

Answer: B

Answer Explanation:
Per ARP 3D99, APRM INOP, an initiating condition for this alarm is any APRM Mode switch not in the OPER (operate) position. Per the ARP Auto Actions, if the alarm is received then a Control Rod Withdrawal Block will occur. Also per the ARP Auto Actions, if the alarm is received on 2 or more APRMs, then a Reactor Scram will occur.

Therefore, the examinee must first predict that positioning the Mode switch for an un-bypassed APRM out of OPER will result in an APRM INOP condition. The examinee must then recall that this will result in a Control Rod Withdrawal block. Furthermore, the examinee must recall that this only occurs for an un-bypassed APRM and, even though APRM #4 is also out of operate, a Reactor Scram will NOT occur.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. 3D103, APRM Trouble alarms for similar conditions as 3D99. Additionally, operators commonly confuse the initiating conditions for 3D99 and 3D103 as well as the results (Auto Actions) of these two alarms. If 3D103 alarms, it is plausible for a Control Rod Withdrawal block to NOT occur since a Rod Block does not always accompany this alarm (for example, if 3D103 is received due to a non-critical self-test fault). This distractor is incorrect because 3D103 does not alarm if an APRM Mode Switch is taken out of OPER. This distractor would be correct if 3D103 alarmed due to a non-critical self-test fault.
C. 3D103, APRM Trouble alarms for similar conditions as 3D99. Additionally, operators commonly confuse the initiating conditions for 3D99 and 3D103 as well as the results (Auto Actions) of these two alarms. If 3D103 alarms, it is plausible for a Control Rod Withdrawal block to occur since some conditions that cause 3D103 (such as less than the required number of operating LPRM detectors) will result in a Control Rod Withdrawal block. This distractor is incorrect because 3D103 does not alarm if an APRM Mode Switch is taken out of OPER. This distractor would be correct if the APRM were INOP due to having less than the required number of LPRMs operating.
D. 3D99 will alarm and cause a Control Rod Withdrawal block when APRM #2 is taken out of Operate. It is plausible for a Reactor Scram to occur since APRM #4 is out of service for an LPRM Gain Adjustment and, if 2 APRMs are INOP, ARP 3D99 states that a Reactor Scram will occur. However, this distractor is incorrect because the reactor scram will not occur with APRM #4 in Bypass. This distractor would be correct if APRM #4 were not bypassed.

Reference Information:

3D99, APRM INOP.
3D103, APRM Trouble.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
215005 APRM/LPRM
215005 A1. Ability to predict and/or monitor changes in parameters associated with operating the AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM controls including:
215005 A1.03 Control rod block status

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Power Range Neutron Monitoring (C5112, C5113 & C5114)
Cognitive Enabler
List the interlocks associated with Power Range Neutron Monitoring System components.

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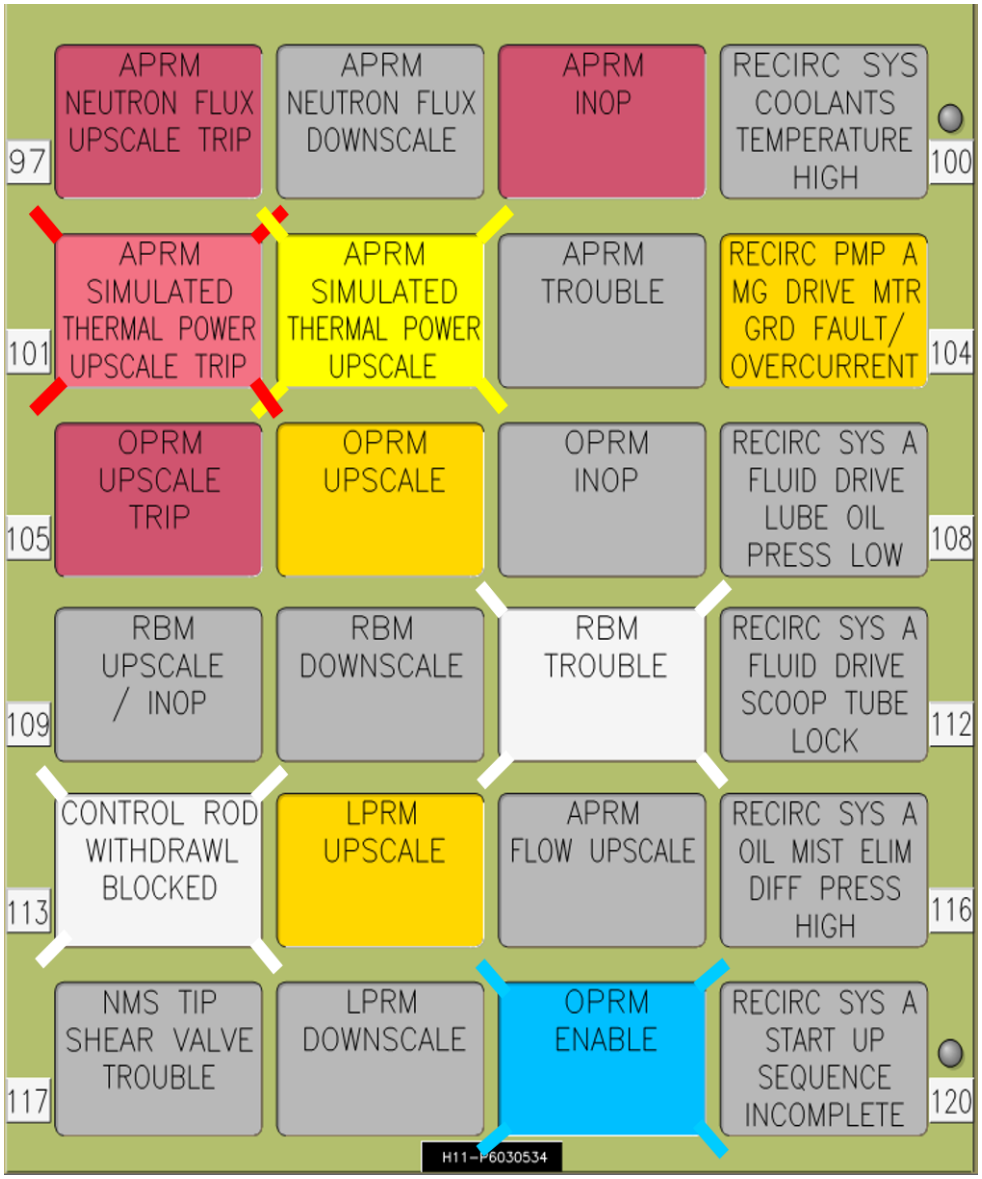
39	K/A Importance: 4.1/4.3			Points: 1.00
R39	Difficulty: 4.00	Level of Knowledge: High	Source: NEW	82906

With the plant operating at 100% CTP, the following alarms were received on the H11-P603:



Monitoring the H11-P603 panel reveals:

- B31-R617, Recirc A Loop Flow Indicator 39,153 GPM.
- B31-R613, Recirc B Loop Flow Indicator 39,156 GPM.
- B31-R614, Recirc Loops Flow Recorders Loop A 0.0 GPM, Loop B 39,156 GPM.

Which of the following annunciator actions has the highest priority now?

A. Bypass APRM #1 per 3D111, RBM Trouble.

B. Verify Reactor Scrams per 3D101, APRM Simulated Thermal Power Upscale Trip.

C. Verify the Reactor is not exhibiting Thermal Hydraulic Instability per 3D119, OPRM Enable.

D. Reduce reactor power by inserting in-sequence Control Rods per 3D102, APRM Simulated Thermal Power Upscale.

Answer: A

Answer Explanation:
The APRM Flow Function consists of eight differential pressure sensor/transmitters which input into the APRM instrument. The Flow Functions are performed by the APRM and RBM hardware. The APRM 4 instrument provides Loop A and Loop B Flow signals for meters B31-R617 and B31-R613. The APRM 1 instrument provides Loop A and Loop B Flow signals for a two-pen flow recorder B31-R614. All APRM instruments provide their Recirculation Flow data to the RBM instruments. The RBM instruments relay the flow data to IPCS. Flow data is available to the operator from front panels and the ODAs of the APRM and RBM instruments. Each APRM instrument powers and processes the signals for one sensor/transmitter monitoring loop A and for one sensor/transmitter monitoring loop B.

The examinee must prioritize the alarms shown and determine that the correct actions to take are specified in the ARP for 3D111, RBM Trouble, due to the fact that the RBM houses the flow comparator circuit for the APRMs.

Per ARP 3D111, IF the alarm is due to APRM Flow Compare, the correct actions are to:

Monitor APRM displays and confirm flow deviation exists >10% between any two flow signals.
IF necessary, bypass affected APRM in accordance with 23.605.

The examinee must monitor the alarms and indications and then interpret that the alarms and indications shown are consistent with failure of the flow input to APRM #1 from the A Recirc Loop. The examinee must then prioritize the correct action to bypass APRM #1.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. 3D101, APRM Simulated Thermal Power Upscale Trip would alarm if actual Recirculation Loop Flow was low for the given power level and the correct response for an actual condition would be to verify a Reactor Scram Occurs. This distractor is incorrect because actual flow is not low as shown on B31-R617 and B31-R613, so an actual Reactor Scram would not occur.
C. 3D119, OPRM Enable, comes in when Recirculation Flow is less than 60% power, with APRM power >27.5%, at which time the OPRM Upscale Trip is enabled. The correct action to take when the OPRM enables, for an actual low flow condition, is to verify the Reactor Core is not exhibiting Thermal Hydraulic Instability. This distractor is incorrect because actual flow is not low as shown on B31-R617 and B31-R613, so a THI condition would not occur.
D. 3D102, APRM Simulated Thermal Power Upscale would alarm if actual Recirculation Loop Flow was low for the given power level and the correct response for an actual condition, per the ARP, is to reduce reactor power by either reducing Recirculation Flow or inserting Control Rods for a confirmed APRM Upscale condition. This distractor is incorrect because actual flow is not low as shown on B31-R617 and B31-R613, so an actual APRM upscale condition does not exist and reducing reactor power is not necessary.

Reference Information:

3D111, RBM Trouble.
3D101, APRM Simulated Thermal Power Upscale Trip.
3D119, OPRM Enable.
3D102, APRM Simulated Thermal Power Upscale.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
215005 APRM/LPRM
G2.4.45 Ability to prioritize and interpret the significance of each annunciator or alarm

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Power Range Neutron Monitoring (C5112, C5113 & C5114)
Cognitive Enabler
Identify alarm response procedures associated with the Power Range Neutron Monitoring System.

40	K/A Importance: 3.7/3.7			Points: 1.00
R40	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	82886

While operating at 100% CTP, a Station Blackout occurs. RCIC is operating controlling vessel level, which is at 200” and slowly rising. 1D56, RCIC Logic Bus Power Failure, alarms due to Loss of RCIC Logic B Bus.

What is the effect of the loss of RCIC Logic Bus B on RPV Water Level?

A. RPV level will rise until RCIC automatically trips on Level 8.

B. RPV level will rise beyond Level 8 until an operator manually stops RCIC.

C. RPV level will lower until E5150-F045, RCIC Turb Steam Inlet Vlv, is re-opened.

D. RPV level will lower until an operator starts another High Pressure injection system.

Answer: B

Answer Explanation:
Per ARP 1D56, RCIC Logic Bus Power Failure, the alarm comes in for loss of either RCIC Logic Bus A (Powered from 2PA2-5 Pos 3) or Logic Bus B (Powered from 2PB2-5 Pos 10.

Loss of Logic A Bus results in:
RCIC will not auto start.
- E5150-F008, RCIC Stm Line Otbd Iso Vlv, will not auto isolate.
- E5150-F062, RCIC Exh Vac Bkr Otbd Iso Vlv, will not auto isolate.
- RCIC will not isolate with RCIC Logic A Manual Isolation Pushbutton.
- RCIC Suction will not shift to Torus on Low CST Level.
- E5150-F010, RCIC Pump CST Suction Iso Valve, will not auto open or auto close.
- E5150-F045, RCIC Turb Steam Inlet Vlv, closes, if open.
- E5150-F013, RCIC Disch To Fw Inbd Iso Valve, closes, if open.
- E5150-F095, RCIC Turb Stm Inlet Byp Vlv, closes, if open.

Loss of Logic Bus B results in:
- E5150-F007, RCIC Stm Line Inbd Iso Vlv, will not auto isolate.
- E5150-F084, RCIC Exh Vac Bkr Inbd Iso Vlv, will not auto isolate.
- RCIC L-8 and Isolation Logic B trip will not function.

The stem of the question states that the alarm was caused by loss of Logic B Bus, therefore, the examinee must determine that RCIC will continue to operate, and RPV level will continue to rise, until RCIC is manually shut down by the operator.

Distractor Explanation:
Distractors are incorrect and plausible because:
A. The examinee could determine that loss of Logic B Bus does not impact the Level 8 trip function, which is plausible because Loss of Logic A Bus does not impact the Level 8 trip and alarm 1D56 comes in for Loss of Logic Bas A also. This could lead the examinee to conclude that, since RCIC is already running, it will not trip due to the Logic power failure but will still trip when RPV level reaches Level 8. This is incorrect because loss of Logic B Bus prevents the Level 8 trip function from working so RCIC will keep running when Level 8 is reached.
C. The examinee could determine that loss of Logic B Bus causes the E5150-F045, RCIC Turb Steam Inlet Vlv, to close, if open, and the RPV level would lower until the F045 valve was reopened. This is plausible because Loss of Logic A Bus does close the F045 valve, if open. This is incorrect, however, because Loss of B Bus does not cause the F045 valve to close, therefore RCIC would remain running and RPV level would continue to rise.
D. The examinee could determine that Loss of B Bus causes RCIC to trip, isolate or steam valves to close, thereby causing RPV level to lower. This is plausible because Loss of Logic A Bus causes several steam valves to close which would cause RCIC to stop injecting and RPV level to lower. This is incorrect, however, because Loss of Logic B Bus does not cause RCIC to stop running.

Reference Information:

ARP 1D56, RCIC Logic Bus Power Failure.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
217000 RCIC System
217000 K3. Knowledge of the effect that a loss or malfunction of the REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) will have on following:
217000 K3.01 Reactor water level.

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Reactor Core Isolation Cooling
Cognitive Enabler
Identify alarm response procedures associated with the RCIC System.

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41	K/A Importance: 3.8/3.7			Points: 1.00
R41	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	82607

A Reactor Scram and loss of feedwater has occurred from 100% power. The following conditions exist:

- RPV Level has dropped to 100".
- HPCI has failed to inject.
- On startup, RCIC Exhaust Pressure rises to a maximum value of 55 psig.

(1) How will the RCIC system respond?

(2) Assuming the above condition has been corrected, and all procedural requirements have been met for this condition, how would you recover the RCIC system?

A. (1) E5150-F059, RCIC Turbine Trip Throttle Valve will trip.
(2) Close the E5150-F059 and then open the E5150-F059.

B. (1) E5150-F045, RCIC Turbine Steam Inlet Valve will close.
(2) Open E5150-F095, RCIC Turb Stm Inlet Byp Vlv, and after approximately 15 seconds, open E5150-F045.

C. (1) E5150-F007 (F008), RCIC Stm Line Inbd (Otbd) Iso Valves will close.
(2) Turn E5100-M088 (M098) RCIC Logic A (B) Iso Trip Reset SW, keylock switches to RESET.

D. (1) E5150-F059, RCIC Turbine Trip Throttle Valve will trip.
(2) Dispatch an operator to reset the E5150-F059 trip mechanism locally then re-open it from the Main Control Room.

Answer: A

Answer Explanation:
The examinee must recall that, as stated in 23.206, Section 7.2, Recovery from a Trip, the RCIC Turbine will trip on High Turbine Exhaust Pressure of 50 psig. From Step 2, the E5150-F059 will trip closed for any Turbine Trip other than a Level 8 trip.

Then, the examinee must recall that, from 23.206, Section 7.2 Step 5, if the Trip is NOT from Level 8, once the initiating signal and condition has been cleared (as stated in the stem of the question), the examinee must determine that the E5150-F059 must be closed to latch the Trip Throttle Valve and then re-opened to recover the RCIC system.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. These are the results, and actions that are taken, if the RCIC turbine tripped due to RPV water level reaching Level 8. However, if RPV level is below Level 2, as stated in the stem of the question, the E4150-F045 will still be open and, if RCIC trips due to high exhaust pressure, the E5150-F059 will unlatch to the tripped position, which requires it to be reset to recover RCIC.
C. These are the indications and actions taken to recover RCIC from an isolation on High Exhaust Pressure. This is plausible because High RCIC Exhaust Pressure above 10 psig, between the rupture diaphragms, will initiate an isolation signal. This is incorrect, however, because the Exhaust Diaphragm rupture disks (E5150-D001 and E5150-D002) do not rupture until 140 psig so the High Exhaust Pressure isolation will not have taken place with the conditions given in the stem of the question.
D. The E5150-F059 will trip on High Exhaust Pressure. However, these are the actions that need to be taken if the Trip Throttle Valve trips on an overspeed condition since local actions are necessary to re-latch the valve. This is incorrect because the Trip Throttle Valve can be re-latched from the Main Control Room, and therefore local operator action is not necessary, for a high exhaust pressure trip that would occur due to the conditions given in the stem of the question.

Reference Information:

23.206, Reactor Core Isolation Cooling System SOP.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
217000 RCIC System
217000 A2. Ability to (a) predict the impacts of the following on the REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations:
217000 A2.02 Turbine trips

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
NRC Early Review
RO

Associated objective(s):
Reactor Core Isolation Cooling

Cognitive Enabler

Describe general RCIC System operation, including component operating sequence, normal operating parameters, and expected system response.

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42	K/A Importance: 4.2/4.3			Points: 1.00
R42	Difficulty: 4.00	Level of Knowledge: High	Source: MODIFIED	82006

Following a Loss of Offsite Power and LOCA, the following conditions occur at the listed times:

- 12:00 Reactor Scram occurred, all Control Rods are inserted.
- 12:01 ONLY EDG 14 has started and loaded.
- 12:05 Drywell Pressure is 1.7 psig and rising.
- 12:10 RPV Water Level is 64 inches, lowering 4 inches per minute.

Given these conditions:

(1) Which of the following describes the response of the Automatic Depressurization (ADS) System?

(2) What are the operator actions that should be taken to prevent ADS initiation?

A. (1) ADS will OPEN Safety Relief Valves at 12:20.
(2) Place the ADS Inhibit Sw Logic A (B) key switches in INHIBIT.

B. (1) ADS will OPEN Safety Relief Valves at 12:27.
(2) Place the ADS Inhibit Sw Logic A (B) key switches in INHIBIT.

C. (1) ADS will OPEN Safety Relief Valves at 12:20.
(2) Simultaneously depress the ADS Division I (II) Timer Logic RESET pushbuttons.

D. (1) ADS will OPEN Safety Relief Valves at 12:27.
(2) Simultaneously depress the ADS Division I (II) Timer Logic RESET pushbuttons.

Answer: A

Answer Explanation:
With Drywell Pressure above 1.68 psig, the 7-minute ADS timer is bypassed so the 105 second countdown occurs ass soon as L1 is reached in 8 minutes. 8 minutes + 2 minutes = 10 minutes. 12:10 + 10 minutes = 12:20.

23.201, Section 5.4 gives specific direction for preventing ADS initiation by placing the ADS Inhibit Sw Logic A and B key switches in INHIBIT. These are the actions that the operator would take if directed by the CRS to inhibit ADS per the EOPs.

Note: Question was modified by raising drywell pressure above the initiation setpoint of 1.68 psig (previous version drywell pressure was 0.9 psig). This changes the timing of ADS logic such that a previously incorrect distractor (A) is now correct and the previously correct answer (B) is now an incorrect distractor.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. This distractor is plausible because, if NO High Drywell Pressure signal was present, L1 (31.8 inches) would cause the ADS Timer to initiate in 7 minutes. The ADS Timer lasts 105 seconds or 2 minutes. A total of 9 minutes later, SRVs will OPEN. L1 will be reached in 8 minutes. 8 minutes + 9 minutes = 17 minutes 12:10 + 17 minutes = 12:27. NOTE: This was the previously (before being MODIFIED) correct answer in the bank. The second part is correct.
C. This distractor is plausible because the first part of this distractor (timing of ADS initiation) is correct. The second part is plausible because these actions would cause the ADS 105 second timer to reset and start counting down again. However, it is incorrect because these actions would not prevent ADS initiation nor are they the actions that an operator is expected to take when directed by the CRS, per the EOPs, to prevent ADS initiation. These push buttons are only used to RESET ADS logic, following initiation, in the ADS System Shutdown Section (Section 6.3) of 23.201.
D. The first part of this distractor is plausible because, if NO High Drywell Pressure signal was present, L1 (31.8 inches) would cause the ADS Timer to initiate in 7 minutes. The ADS Timer lasts 105 seconds or 2 minutes. A total of 9 minutes later, SRVs will OPEN. L1 would be reached in 8 minutes. 8 minutes + 9 minutes = 17 minutes 12:10 + 17 minutes = 12:27. The second part is plausible because these actions would cause the ADS 105 second timer to reset and start counting down again. However, it is incorrect because these actions would not prevent ADS initiation nor are they the actions that an operator is expected to take when directed by the CRS, per the EOPs, to prevent ADS initiation. These push buttons are only used to RESET ADS logic, following initiation, in the ADS System Shutdown Section (Section 6.3) of 23.201

Reference Information:
23.201, SRV and ADS System, Section 5.4 Automatic Depressurization System Operation.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
218000 ADS
218000 A2. Ability to (a) predict the impacts of the following on the AUTOMATIC DEPRESSURIZATION SYSTEM; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations:
218000 A2.06 ADS initiation signals present

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (5) Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
MODIFIED
RO

Associated objective(s):
Automatic Depressurization System (B2104)
Cognitive Enabler
Describe general ADS operation, including component operating sequence, normal operating parameters, and expected system response.

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43	K/A Importance: 3.4/3.6			Points: 1.00
R43	Difficulty: 4.00	Level of Knowledge: High	Source: NEW	82026

The plant is operating at 850 psig with all Main Steam Isolation Valves (MSIVs) and Main Steam Line Drain Valves open to support the startup.

A steam leak occurs in the Reactor Building Steam Tunnel concurrent with a malfunction of the Primary Containment Isolation System (PCIS) that results in the indications shown below:

How will the Main Steam System respond?

A. ALL MSIVs and BOTH drain valves will close.

B. ALL MSIVs and ONLY the Inboard Drain Valve will close.

C. ALL MSIVs and ONLY the Outboard Drain Valve will close.

D. Only the Outboard MSIVs and Outboard Drain Valve will close.

Answer: B

Answer Explanation:
Per 23.601, Group 1 – Main Steam System – Isolation Logic is as follows:
(any A or any C) and (any B or any D) = Isolation of MSIVs
(any A and any B) = Isolation of B2103-F016, Inbd Drain Isolation Valve
(any C and any D) = Isolation of B2103-F019, Otbd Drain Isolation Valve

The examinee must recognize that, with a failure of the C Logic String of Primary Containment Isolation Logic, that MSIV Isolation logic is still met and only Inboard Main Steam Line Drain logic is met.

Therefore, the examinee must conclude that (1) All MSIVs will go closed and (2) ONLY the Inboard Main Steam Line Drain Valve will close.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. the examinee could conclude that all Main Steam Valves will close. This is plausible since MSIV Isolation Logic is (any A or any C) and (any B or any D) = Isolation of MSIVs, and the examinee could incorrectly determine that the Drains use the same isolation logic as the MSIVs. This is incorrect since failure of the C channel to trip will prevent the Outboard Drain Valve from receiving and isolation signal.
C. the examinee could conclude that the Outboard Main Steam Line Drains will close instead of the Inboard. This is plausible because of how the isolation logic is shown on the screen shot provided. With the A&C logic strings on the left, and B&D on the right, it is plausible that the candidate could assume that A&C are needed to trip Inboard logic while B&D are needed to trip Outboard logic. If the examinee made this assumption, it is plausible that the candidate could determine that only the Outboard Drain Valve will close, which is incorrect because of the logic arrangement described above.
D. the examinee could conclude that both the Outboard MSIVs and the Outboard Main Steam Line Drains will close. This is plausible because of how the isolation logic is shown on the screen shot provided. With the A&C logic strings on the left, and B&D on the right, it is plausible that the candidate could assume that A&C are needed to trip Inboard logic while B&D are needed to trip Outboard logic. If the examinee made this assumption, it is plausible that the candidate could determine that the Outboard MSIVs and Drain Valves will close, which is incorrect because of the logic arrangement described above.

Reference Information:

23.601, Instrument Trip Sheets, Enclosure B, Page 3 – Group 1 Main Steam System Logic Sheet.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
223002 PCIS/NSSS
223002 K3 Knowledge of the effect that a loss or malfunction of the PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF will have on following:
223002 K3.09 Main steam system

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
NRC Early Review
RO

Associated objective(s):
Primary Containment Isolation System
Cognitive Enabler
List the automatic features of Primary Containment Isolation System operations.

44	K/A Importance: 3.6/4.5			Points: 1.00
R44	Difficulty: 3.00	Level of Knowledge: Low	Source: BANK	81986

Which of the following design features, associated with the plant's Safety Relief Valves (SRVs), is required by the facility license to mitigate containment loads caused by reopenings of an SRV by reducing the frequency of subsequent SRV actuations following the initial SRV opening.

A. Two-Stage design of SRVs.

B. SRV discharge line T-quenchers.

C. Low-Low Set relief feature of SRVs.

D. Vacuum-relief valves located in each SRV discharge line.

Answer: C

Answer Explanation:
The examinee should correctly determine that it is the LLS relief feature of two of the plant's SRVs that serve to allow time for the water leg that forms in the SRV discharge piping following SRV closure (from discharge piping residual steam condensation) to clear. The examinee should conclude that eliminating the water leg reduces the loading from subsequent SRV actuations to acceptable levels.

Distracter Explanation:

A. Is incorrect but plausible because the examinee could incorrectly determine that use of two-stage Target Rock valves at Fermi 2 was done to allow proper blowdown time in order to allow the water leg to drain from the SRV discharge piping prior to a subsequent discharge. The examinee could incorrectly assume that the LLS Relief function and use of Two-stage Target Rock valves work in conjunction to perform this function when, in fact, they work together to meet the requirements of NUREG-0737 to reduce the frequency of stuck open safety relief valve events at Fermi 2.

B. Is plausible because the SRV discharge line T-quenchers are part of the overall SRV design that limits loading forces on containment and the examinee could incorrectly determine that the holes in the T-quencher are what limits the leg of water in the SRV tailpipe and forget that the purpose of the SRV T-quenchers is to limit valve outlet pressure to 40 percent of maximum valve inlet pressure through the use of the holes drilled in the termination pipe.

D. Is plausible because the vacuum relief feature (vacuum breakers) of the SRV discharge lines are part of the overall SRV design that limits forces on containment and the examinee could incorrectly conclude that the vacuum breakers allow time for the leg of water to clear without recalling that the vacuum relief valves provided on each SRV discharge line prevent drawing an excessive amount of water up into the line as a result of steam condensation following termination of relief operation.

Reference Information:

T.S.B 3.6.1.6 Low-Low Set (LLS) Valves (pg B 3.6.1.6-1 to 2) APPLICABLE SAFETY ANALYSES
This information is taught to ROs using lesson LP-OP-315-0005, Nuclear Boiler System, on slide 48.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
239002 SRVs
G2.2.38 Knowledge of conditions and limitations in the facility license.

Technical Specifications
3.6.1.6 Low-Low Set (LLS) Valves

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2015 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Nuclear Boiler System (B1100, B2100, B2103, B2104, N1100 & N3017)
Cycle 13-5 Objectives (new objectives only)

Cognitive Enabler

Describe the Nuclear Boiler system technical specification limiting conditions for operation, their bases, the associated surveillance requirement(s), and their relationship to operability.

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45	K/A Importance:			Points: 1.00
R45	Difficulty: 2.00	Level of Knowledge: Low	Source: NEW	83906

Which of the following describes a cause and effect relationship between loss of the Instrument Air System and its impact on the ability to control Reactor Pressure Vessel (RPV) water level?

A. The Startup Level Control Valve (SULCV) may fail closed causing RPV level to lower.

B. The RFP Discharge Isolation Valves may not realign on a scram causing the RPV to overfill.

C. The RFP Minimum Flow Valve(s) may fail closed causing RFP trips and RPV level to lower.

D. Reactor Feedwater Pump (RFP) capacity may become inadequate, causing RPV level to lower.

Answer: D

Answer Explanation:
Per 20.129.01, Loss of Station and/or Control Air, in the Override IF statement, a loss of air that causes a loss of adequate pumping capacity due to loss of RFP control associated with the loss of IAS requires the Mode Switch be taken to Shutdown. Per the 20.129.01 BASES, the basis for this portion of the Override is "A malfunction of the Feedwater Control system could lead to a decrease in RFPT speed, which would result in a lowering level and possible RPV Level 3 scram. Therefore, to place the plant in a safe condition the Mode switch is placed in Shutdown."

Therefore, the examinee must recognize that a loss of air to the feedwater control system could cause a inadequate RFP capacity thus requiring the Mode Switch be taken to Shutdown.

Distractor Explanation:
Distractors are incorrect and plausible because:
A. The Startup Level Control Valve (SULCV) is listed in the AOP as being impact by a loss of IAS. This distractor is plausible because the SULCV is an air supplied valve and, if the valve failed closed under startup conditions, could cause RPV level to lower. This distractor is incorrect, however, because the SULCV fails open on a loss of air as stated in CAUTION 1 of the AOP.
B. It is plausible to assume that RFP discharge isolation valves, if not motor operated, would be air-operated and designed such that they would fail open on a loss of air to ensure Feedwater flow was maintained to the RPV on a loss of air. Therefore it is plausible that the examinee could determine that these valves failing open would prevent the system from aligning to the SULCV on a scram and lead to overfilling the RPV. However, this distractor is incorrect because the RFP discharge isolation valves are not air-operated but hydraulically operated.
C. The RFP Minimum Flow Valves (N21-F400A/B) are air-operated and are impacted by a loss of IAS. This distractor is plausible because, as stated in the basis for the Override statement, the RFP minimum flow valves are air supplied valves and, if the valves failed closed under startup conditions, could cause RFP damage due to overheating and thus RFP trip. This distractor is incorrect, however, because the RFP minimum flow valves fail open on a loss of IAS.

Reference Information:

20.129.01, Loss of Station and/or Control Air.
20.129.01 Loss of Station and/or Control Air BASES.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
259002 Reactor Water Level Control System
259002 K1 Knowledge of the physical connections and/or cause effect relationships between REACTOR WATER LEVEL CONTROL SYSTEM and the following:
259002 K1.06 Plant air systems

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
RO

Associated objective(s):
Reactor Feedwater (N2100)
Cognitive Enabler
Discuss the Reactor Feedwater system interrelationships with other systems.

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46	K/A Importance: 2.6/2.8			Points: 1.00
R46	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	85246

Standby Gas Treatment System (SGTS) division 1 is currently aligned to vent the drywell to attempt to maintain drywell pressure below 1.68 psig per 29.ESP.07, Primary Containment Venting. SGTS division 2 is in a normal standby lineup.

Drywell pressure subsequently rises above 1.68 psig.

Standby Gas Treatment System (SGTS) will now be aligned to minimize offsite dose rates by...

A. removing fission product gasses drawn from PRIMARY AND SECONDARY containment via ion exchange.

B. allowing fission product gasses drawn from PRIMARY AND SECONDARY containment to decay prior to release.

C. removing fission product gasses drawn from SECONDARY containment ONLY via ion exchange.

D. allowing fission product gasses drawn from SECONDARY containment ONLY to decay prior to release.

Answer: D

Answer Explanation:
SGTS can be manually aligned to take a suction from primary containment IAW 29.ESP.07, as is the case in the initial conditions for this item. This procedure does NOT defeat the automatic initiation signal for SGTS, since venting is started with DWP BELOW 1.68 psig. Once an automatic initiation signal occurs (>1.68 psig DWP in this instance) both divisions of SGTS will automatically align to take suction from secondary containment only.

The examinee must recognize that the auto signals are NOT defeated in this instance, and SGTS will automatically initiate following receipt of LOCA signals, and RE-ALIGN to take suction from the SECONDARY containment atmosphere.

As a result, in this instance, BOTH divisions of SGTS will be aligned to secondary containment ONLY following the receipt of the HDWP signal.

Per 23.404, Standby Gas Treatment System SOP, Section 1.1 System Description, each SGTS Division contains a Charcoal Adsorber - an impregnated charcoal adsorber bed utilized to delay the passage of radioactive iodine to the atmosphere. This delay (retention time) allows for decay of the radioactive iodine. The Charcoal Adsorber has a rated efficiency of at least 99.9% for radioactive and non-radioactive iodine.
When initiated following a LOCA signal, radioactive gasses present in the SC atmosphere are drawn through the charcoal adsorber beds, consisting of a fine network of tunnels extending through its volume. The porosity provides a large surface area per unit volume for iodine adsorption. The iodine molecules attach themselves to, or are adsorbed by, the carbon. Most adsorbed iodine will decay into a particulate while trapped in the charcoal.

Distractor Explanation:
Distractors are incorrect and plausible because:
A and B: Although SGTS div 1 had been manually aligned to primary containment, it will re-align to secondary containment following the HDWP signal. A & B are, therefore, incorrect since both divisions will auto start and align to secondary containment only, and div 1 will no longer process primary containment atmosphere. This is plausible if candidates do not recall that SGTS will re-align while manually aligned to the drywell, or incorrectly assume that the 29.ESP.07 signal defeats will have been installed, and wrongly determine that SGTS div 1 will remain as is.

B and C: The SGT system does not utilize an ion exchange process (see correct answer description above). The candidate may incorrectly assume that SGTS uses ion exchange, which is plausible since many systems in the plant, such as RWCU filter demineralizers, Condensate Filter Demineralizers, and Rad Waste Filter Demineralizers, DO utilize ion exchange as a means of removing radioactive impurities. Additionally, candidates may not have a thorough understanding of the adsorbtion mechanism used by SGTS to allow radioactive gasses to decay prior to release.

Reference Information:

23.404, Standby Gas Treatment System.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
261000 Standby Gas Treatment System
261000 K4. Knowledge of STANDBY GAS TREATMENT SYSTEM design feature(s) and/or interlocks which provide for the following:
261000 K4.05 Fission product gas removal

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
RO

Associated objective(s):

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47	K/A Importance: 3.1/3.4			Points: 1.00
R47	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	81867

With a loss of Battery 2B-1, and its associated charger, which of the following will result?

A. Breakers on 480V Busses 72C and 72EB will require manual operation.

B. Breakers on 4160V Busses 65E and 13EC will lose remote indications.

C. MCC 72CF Feed will auto throw-over from 72C Pos 3C to 72F Pos 5C.

D. C11-F110B, Scram Pilot Air Header Backup Scram Valve, will actuate.

Answer: B

Answer Explanation:
Per 20.300.260VESF, Loss of 130/260V Battery Busses AOP, Page 6 NOTE 5, Div 2 Battery 2B-1, and its associated charger, supplies Circuit Breaker Control Power to 4160V Busses 65E and 13EC and 480V Busses 72E and 72EC. The examinee should recall this relationship and determine that, without control power, breakers on the impacted busses will lose remote indication.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. this distractor would be true if the impacted battery was 2A-2, since this is the control power source to Busses 72C and 72EB and, if battery 2A-2 was lost, breakers on these busses would require manual operation without control power per NOTE 4 on Page 4 of 20.300.260VESF. This distractor is incorrect because control power to busses 72C and 72EB comes from battery 2A-2 and not 2B-1.
C. the examinee could fail to correctly recall how Bus 72CF, the LPCI Swing Bus, responds to a loss of Control Power to 72F. This is plausible because 20.300.260VESF, Loss of 130/260V Battery Busses AOP, Page 6 NOTE 7 states that loss of Div 2 batteries and chargers will cause a loss of Control Power to 72F Bus and the resultant impact on the 72CF bus. This distractor is incorrect, however, because loss of Control Power to 72F does not cause an automatic throwover of 72CF, it prevents it from occurring.
D. the examinee could fail to recall the normal configuration of Backup Scram Valve C11-F110B and assume that the valve actuates on a loss of DC power. This is plausible because some DC powered valves, such as the DC solenoids for the MSIVs, are normally energized and will actuate upon a loss of DC power. This distractor is incorrect, however, as stated in 20.300.260VESF, Loss of 130/260V Battery Busses AOP, Page 6 NOTE 5, which states the C11-F110B actuation will be prevented due to loss of the Division 2 batteries and chargers.

Reference Information:

20.300.260VESF, Loss of 130/260V Battery Busses AOP.

Plant Procedures
20.300.260VESF

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
262001 AC Electrical Distribution
262001 K6. Knowledge of the effect that a loss or malfunction of the following will have on the A.C. ELECTRICAL DISTRIBUTION:
262001 K6.01 D.C. power

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2008 Exam
ILO 2019 Exam
LOR 2011 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):
4160/480V Electrical Distribution (R1100, R1200, R1400 & R1600)
Cognitive Enabler
Discuss the 4160/480V Electrical Distribution System interrelationships with other systems.

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48	K/A Importance: 3.4/3.4			Points: 1.00
R48 - V2	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	83067

You are preparing to perform 23.321 Section 6.3.3, “Manual Operation of ESF-EDG Bus Tie Breaker B8 to ESF Bus 64B when EDG Bus 11EA Power is Being Supplied by EDG 11.” The following conditions exist:

- ESF Bus 64B is being supplied from System Service Transformer #64.
- EDG Bus 11EA is being supplied from EDG 11.
- ESF-EDG Bus Tie Breaker B8 is open.

When you place the Synchronize Switch for ESF-EDG Bus Tie Breaker Pos. B8 in ON, you observe:

NOTE: The Synchroscope is stationary at the position shown.

Which of the following adjustments are necessary to close ESF-EDG Bus Tie Breaker Pos. B8?

A. (1) The EDG Governor Control Switch would have to be operated in the LOWER direction.

(2) The EDG Voltage Control Switch would have to be operated in the LOWER direction.

B. (1) The EDG Governor Control Switch would have to be operated in the RAISE direction.

(2) The EDG Voltage Control Switch would have to be operated in the LOWER direction.

C. (1) The EDG Governor Control Switch would have to be operated in the LOWER direction.

(2) The EDG Voltage Control Switch would have to be operated in the RAISE direction.

D. (1) The EDG Governor Control Switch would have to be operated in the RAISE direction.

(2) The EDG Voltage Control Switch would have to be operated in the RAISE direction.

Answer: D

Answer Explanation:
Per 23.321 Section 6.3.3, the following conditions must be established prior to closing the breaker:

? With EDG 11 Governor Control Switch, adjust EDG speed until Synchroscope is rotating slowly in FAST direction.
? With EDG 11 Voltage Control Switch, adjust Starting Voltage until it is equal to or slightly higher than Running Bus Voltage indication.

Also from 23.321: **NOTE**: Synchroscope may be in phase and only show slight movement at first. Changing EDG frequency slightly will rotate scope

Therefore, the examinee must determine that the Synchroscope is not set correctly and, because it is stationary, it is in phase with the other source. Therefore, the examinee must determine that EDG speed must be raised and therefore the Governor Control Switch must be placed in the RAISE direction. The examinee must also determine that Starting Voltage represents the EDG's voltage and Running Voltage represents the bus' voltage. The examinee must recognize that EDG (starting) voltage is lower than the bus (running voltage) and therefore determine that the Voltage Control Switch must be placed in the Raise position.

Distractor Explanation:
Distractors are incorrect and plausible because:
A. (1) The examinee could misunderstand how the synchroscope works and determine that it must be stationary in the desired position prior to closing the desired breaker. This could lead the examinee to conclude that the EDG is running a little beyond the 5-minutes past 12 position conclude that its speed must be lowered by placing the Governor Control Switch in the Lower Position. This is incorrect because the EDG speed must be slightly higher than the bus so the synchroscope must be rotating slowly in the Fast direction and therefore the Governor Control Switch must be placed in the RAISE direction. (2) The examinee could confuse the difference between Running and Starting Voltage and assume that EDG output voltage is represented as Running Voltage. This could lead the examinee to conclude that EDG voltage is higher than it needs to be, since the procedure specifies that it should be slightly higher than bus voltage, and determine that EDG Voltage must be lowered by placing the Voltage Control Switch in the Lower position. This is incorrect since EDG Voltage is represented by Starting Voltage and therefore must be raised by placing the Voltage Control switch in the Raise position.
B. (1) This part is correct. (2) The examinee could confuse the difference between Running and Starting Voltage and assume that EDG output voltage is represented as Running Voltage. This could lead the examinee to conclude that EDG voltage is higher than it needs to be, since the procedure specifies that it should be slightly higher than bus voltage, and determine that EDG Voltage must be lowered by placing the Voltage Control Switch in the Lower position. This is incorrect since EDG Voltage is represented by Starting Voltage and therefore must be raised by placing the Voltage Control switch in the Raise position.
C. (1) The examinee could misunderstand how the synchroscope works and determine that it must be stationary in the desired position prior to closing the desired breaker. This could lead the examinee to conclude that the EDG is running a little beyond the 5-minutes past 12 position conclude that its speed must be lowered by placing the Governor Control Switch in the Lower Position. This is incorrect because the EDG speed must be slightly higher than the bus so the synchroscope must be rotating slowly in the Fast direction and therefore the Governor Control Switch must be placed in the RAISE direction. (2) This part is correct.

Reference Information:

23.321, Engineered Safety Features Auxiliary Electrical Distribution System, Section 6.3.3 Manual Operation of ESF-EDG Bus Tie Breaker B8 to ESF Bus 64B when EDG Bus 11EA Power is Being Supplied by EDG 11.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
262001 AC Electrical Distribution
262001 A4. Ability to manually operate and/or monitor in the control room:
262001 A4.02 Synchroscope, including understanding of running and incoming voltages

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
NRC Early Review
RO

Associated objective(s):
4160/480V Electrical Distribution (R1100, R1200, R1400 & R1600)
Cognitive Enabler
Identify associated remote and local instrumentation, indications, alarms, and controls for the 4160/480V Electrical Distribution System.

49	K/A Importance: 2.8/3.0			Points: 1.00
R49	Difficulty: 4.00	Level of Knowledge: Low	Source: BANK	81869

Which of the following identifies the Main Control Room plant parameter indications impacted if a system malfunction results in the LOSS of Uninterruptible Power Supply (UPS) B?

A. C32-R603B & D MSL Flow
C11-J601, Rod Worth Minimizer
C32-R605B, Div II RPV Pressure

B. C32-R605A, Div I RPV Pressure
C32-R607, Reactor Flow Recorder
RPIS indications on Full Core Display

C. B31-N028D, Recirc Pump B Discharge Pressure
B31-N601B, Recirc Pump B Suction Temperature
B31-N006B, Recirc Pump B Seal Cavity #1 Pressure

D. B21-R610, RPV Core Level Recorder
B21-R623A, Post Accident Monitoring Recorder
B21-R604A, Wide Range Reactor Water Level Indicator

Answer: A

Answer Explanation:
Per ARP 3D22, C32-R603B & D MSL Flow, C11-J601, Rod Worth Minimizer, and C32-R605B, Div II RPV Pressure are all powered from UPS B.

Instruments with C32 prefix are all instruments associated with and/or input to Feedwater Distributed Control System (DCS), aka Feedwater Level Control at Fermi 2.
Loss of C32-R603B will impact FW DCS because these instruments are utilized when in 3-Element Control.

Distractor Explanation:
Distractors are incorrect and plausible because:
B. the loads listed are all powered by UPS A.
C. the loads listed are all important Control Room indications, however, they are not powered by UPS B.
D. the loads listed are all important Control Room indications, however, they are not powered by UPS B.

Reference Information:

3D22, UPS Unit A/B Trouble.

Plant Procedures
23.308.01

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2

262002	UPS (AC/DC)
262002 K1.	Knowledge of the physical connections and/or cause-effect relationships between UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) and the following:
262002 K1.01	Feedwater level control: Plant-Specific

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b) (7)	Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2012 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):

50	K/A Importance: 3.3/3.5			Points: 1.00
R50	Difficulty: 2.00	Level of Knowledge: High	Source: NEW	83908

The plant is operating at 70% power performing a normal power reduction to 45% due to high Main Turbine vibrations. EDG 11 has just been started for surveillance testing and is coming up to 900 rpm.

The following occurs:

- The output fuse for 2PA2-14 Position 6, supply to Bus 64B Control Power, blows.

What is the effect of this blown control power fuse on Bus 64B?

Bus 64B will …

A. de-energize and remain de-energized.

B. remain energized via the 64B-B8, 4160V X-Tie to Bus 11EA.

C. remain energized via the 64B-B6, 4160V Normal Feed to Bus 64B.

D. de-energize then re-energize via the 64B-B8, 4160V X-Tie to Bus 11EA.

Answer: C

Answer Explanation:
Per 20.300.260VESF, Loss of ESS 130/260v Battery Busses AOP, Note 3 on page 4, Div 1 Battery 2A-1 supplies Circuit Breaker Control Power to 4160V Busses 64B and 11EA and 480V Busses 72B and 72EA. Breakers on these busses require manual operation without control power.

Therefore, the examinee must determine that breakers on 64B will remain as-is due to inability to energize the Trip Coil to trip and therefore 64B will remain energized from is normal feed, which is Breaker 64B-B6.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This is true if all breakers on bus 64B tripped open due to load shedding because of the loss of DC control power, which is plausible because the Load Shed string is DC powered. This is incorrect, however, because DC control power is needed to energize the Trip Coil and trip open breakers when load shed occurs, so 64B bus will remain energized.
B. This is true if breaker 64B-B6 tripped open with EDG 11 running in parallel with offsite power because, with EDG 11 running in parallel on the bus, it would shift to Isochronous mode and take on load from bus 64B via the 64B-B8 breaker. This is incorrect because breaker 64B-B6 will not trip open, so bus 64B will remain energized from its normal feeder breaker, which is breaker 64B-B6.
D. This is true if breaker 64B-B6 tripped open with EDG 11 not yet powering, or synchronized to, the bus because EDG 11 would automatically start, its output breaker would close, and EDG 11 would restore power to Bus 64B via 4160V X-Tie to Bus 11EA breaker 64B-B8. This is incorrect because breaker 64B-B6 will not trip open, so bus 64B will remain energized from its normal feeder breaker, which is breaker 64B-B6.

Reference Information:

20.300.260VESF, Loss of ESS 130/260v Battery Busses AOP.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
263000 DC Electrical Distribution
263000 A4. Ability to manually operate and/or monitor in the control room:
263000 A4.01 Major breakers and control power fuses: Plant-Specific

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):
DC Electrical Distribution (R3200 & S3102)
Cognitive Enabler
Discuss effective monitoring of the DC Electrical Distribution System using local, remote, computer displays and alarms.

51	K/A Importance: 3.4/3.5			Points: 1.00
R51	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	81847

EDG 13 has started and loaded due to Loss of Power.

A High Drywell Pressure condition subsequently occurs due to a Loss of Coolant Accident.

How will the EDG 13 Automatic Load Sequencer respond to the above conditions?

A. It will shift to the Emergency Mode and start sequencing on loads.

B. It will trip open the EDG Output Breaker, causing Load Shed to occur, and then the EDG 13 Output Breaker will reclose.

C. It will send a permissive signal to all emergency loads allowing manual loading onto the EDG, at the operator's discretion, if adequate EDG load capacity exists.

D. Selected emergency loads will automatically start, which will cause the EDG Output Breaker to trip on under frequency, which will then cause the load sequencer to initiate a Load Shed and reclose the EDG 13 Output Breaker.

Answer: B

Answer Explanation:
Per R30-00, EDG Design Basis Document (DBD), Section 2.2.4.2, Emergency Modes:

The following events occur when a 4160-V AC ESS bus undervoltage condition is present:
- The EDG unit(s) automatically starts.
- Concurrent with the EDG unit(s) start-up, the B6 and B9 breakers and the ESS load breakers (i.e., individual components and MCC breakers) on the load shedding string automatically trip open.
- The EDG output breaker(s) automatically close(s) as the associated EDG unit(s) approaches rated speed and voltage.
- Selected ESS loads (equipment necessary for a LOOP condition) are sequentially loaded onto the EDG(s) by automatic load sequencer(s).

If a LOCA signal occurs either during or after the automatic loading sequence, the EDG output breaker(s) automatically trip open which results in an undervoltage condition with subsequent load shed. The EDG loading sequence restarts with selected ESS loads required for a LOCA/LOOP condition. This assures sufficient EDG capacity to start large ESS loads without overloading the EDG.

Therefore, the examinee must recognize that the EDG 13 output breaker will trip open, resulting in a load shed signal, and, since the EDG is at rated speed and voltage, its output breaker will reclose which will initiate load sequencing.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. the examinee could assume that, since the EDG is already running and carrying loads on the bus, the Load Sequencer would simply start loading emergency loads on the EDG if a LOCA signal were to occur. This is plausible because this is how an EDG load sequencer would respond if an EDG were running loaded, in parallel with offsite power, such as for testing purposes, when a LOCA signal was received. This is incorrect, however, since a Loss of Power (LOP) signal is already present, a LOP followed by a LOCA causes the load sequencer to trip the EDG Output Breaker as described above.

C. the examinee could assume that, since the EDG is already running and carrying loads on the bus, the Load Sequencer will send permissive signals that will allow emergency loads to be started, rather than starting emergency loads. This is plausible because this is how the load sequencer responds for non-emergency loads following a LOCA. From the DBD Section 2.2.4.2: "When a LOCA occurs, BOP loads can be manually loaded onto the EDG the EDG at the operator's discretion if adequate EDG load capacity exists or is made available by selective manual load shedding." This answer is incorrect, however, since a Loss of Power (LOP) signal is already present, a LOP followed by a LOCA causes the load sequencer to trip the EDG Output Breaker as described above.

D. the examinee could assume that, with the EDG already running and carrying loads on the bus, that emergency loads will respond as if a LOP has not occurred and will start when requested to do so by the respective emergency system start logic. This is plausible because this is how emergency systems respond to a LOCA, without a LOP. At Fermi 2, the ESF transformers are sized to permit loading of safety related loads without the need for load sequencers. Therefore, the examinee could assume that the safety related loads will start on the EDG but that an EDG overload condition will occur, thereby causing an underfrequency and load shed condition as stated in the distractor. This is also how an EDG will respond to a Loss of Power (LOP) if the EDG is already running in parallel with offsite power, such as for surveillance testing. With an EDG Output Breaker closed, bus under-voltage relaying is bypassed (to prevent spurious under voltage relaying trips and thus load shed) and a bus under-frequency relay is enabled. If an EDG is running in parallel with offsite power and a LOP occurs, the EDG will respond by attempting to pick up all loads, which will result in an under-frequency trip of the EDG output breaker (NOT the EDG itself), which will then enable the under-voltage relaying that will in turn sense the bus under-voltage condition, thereby initiating a load-shed, that will then prepare the bus for subsequent re-closing of the EDG output breaker. This answer is incorrect, however, since, with a Loss of Power (LOP) signal already present, a LOP followed by a LOCA causes the load sequencer to directly trip the EDG Output Breaker as described above, rather than relying on the non-safety related under-frequency relay.

Reference Information:

R30-00, EDG Design Basis Document (DBD).

Question Keyword
4160/480V ELEC
EDG

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
264000 Emergency Generators (Diesel/Jet)
264000 A3. Ability to monitor automatic operations of the EMERGENCY GENERATORS (DIESEL/JET) including:
264000 A3.05 Load shedding and sequencing

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (8) Components, capacity, and functions of emergency systems.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Emergency Diesel Generator (R3000)
Cognitive Enabler
List the automatic features of Emergency Diesel Generator System operations.

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52	K/A Importance: 2.9/2.9			Points: 1.00
R52	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	81827

The plant is operating at 100% power with the following auxiliary equipment lineup:

- East Station Air Compressor running; Center in Auto
- South H2 Seal Oil Pump running; North in Auto
- North RFPT West Lube Oil Pump running; East in Auto
- North and Center TBCCW pumps running; South in Standby.

The 51 Device (Overcurrent Relay) for Bus 65L Position L6, 4160V Feed to Bus 72N, actuates due to an internal fault.

What is the appropriate operator response to this event?

A. Start the South TBCCW Pump.

B. Perform a rapid power reduction.

C. Start both SBFW pumps and inject at 1200 gpm.

D. Verify the Center Station Air Compressor has automatically started.

Answer: D

Answer Explanation:
The examinee should recognize the effect of actuation of an over current relay is the breaker it supplies will trip open. The candidate should then recall that 65L Position L6 supplies power to Bus 72N and that Bus 72N supplies power to the East Station Air Compressor. The operator must then determine that the correct action is to verify the Center Station Air Compressor auto starts as per 20.300.72N Condition B.

Distracter Explanation:

A. is plausible because the Center TBCCW Pump is powered from Bus 72N, so it will trip off and the examinee could fail to correctly recall the power supply to the South TBCCW Pump. This distractor is incorrect because the South TBCCW pump is also powered from Bus 72N.
B. is incorrect but plausible because the examinee could incorrectly determine that this action is required based on only a single TBCCW pump being available
C. is incorrect but plausible because the examinee could incorrectly determine the loss of the North RFPT Lube oil pump and possible North RFPT trip.

Reference Information:

AOP 20.300.72N, Loss of Bus 72N AOP.

Plant Procedures
20.300.72N

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
300000 Instrument Air System
300000 K6. Knowledge of the effect that a loss or malfunction of the following will have on the INSTRUMENT AIR SYSTEM:
300000 K6.12 Breakers, relays and disconnects

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (4) Secondary coolant and auxiliary systems that affect the facility.
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2015 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):
Compressed Air Systems (P5001 & P5002)
Cognitive Enabler
Describe the normal and alternate power supplies to Compressed Air System components.

53	K/A Importance: 2.9/2.9			Points: 1.00
R53	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	81806

If a loss of 120kV offiste power occurs, when will the P4400-F603A, Div 1 EECW Supply Iso Valve and the P4400-F601A, Div 1 EECW Return Iso Valve, CLOSE?

A. Only after offsite power is restored to Bus 72C.

B. Only after offsite power is restored to Bus 72F.

C. Immediately after EDG 12 Output Breaker closes.

D. Immediately after EDG 14 Output Breaker closes.

Answer: C

Answer Explanation:
Note: Information on Automatic Initiation of Div 1 EECW can be found in 23.127 Section 5.12. Information on Div 1 EECW Valve Power can be found in 23.137 Attachment 2A.

Per 23.127 Attachment 2A, the P4400-F603A and P4400-F601A are powered from Motor Control Center (MCC) 72C-3A which is fed from 480V ESF Bus 72C. Bus 72C is powered from EDG 12, via 4160V Bus 64C, following a loss of power event.

Per the second NOTE in 23.127 Section 5.12, under emergency electric power distribution conditions, Division I Isolation Valves will reposition immediately after the EDG Output Breaker closes.

Therefore, the examinee must recall that the 2 valves in the stem of the question are powered by Bus 72C, which will be de-energized on a loss of 120kV Offsite Power. The examinee must then recall that power to the valves will be restored, and the valves will close, when the EDG 12 output breaker closes to restore power to Bus 72C.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The examinee could correctly determine that the valves listed are powered from an MCC that is fed off of bus 72C. The examinee could then determine that the MCC that powers the valves listed does not get sequenced back on by the EDG load sequencer, which is plausible because several breakers and MCCs off of bus 72B do not get sequenced back on with the EDG. This could lead the candidate to determine that power to these valves will only be restored upon re-energization of the MCC when offsite power is restored. This is incorrect because the MCC that powers these valves does get sequenced back on and will be re-energized when the EDG Output Breaker closes as described in 23.127 Section 5.12.
B. The examinee could determine that the valves listed are powered from an MCC that is fed off of bus 72F, which is plausible because P4400-F607A, Div 1 EECW DW Otbd Supply Vlv, is powered by MCC 72F-4A. The examinee could then determine that the MCC that powers the valves listed does not get sequenced back on by its EDG load sequencer, which is plausible because several breakers and MCCs off of bus 72F do not get sequenced back on with the EDG. These could lead the candidate to determine that power to these valves will only be restored upon re-energization of the MCC when offsite power is restored to bus 72F. This distractor is incorrect because the valves listed are powered off of an MCC powered by bus 72C, which will be restored when the EDG 12 Output Breaker closes.
D. The examinee could determine that the valves listed are powered by Bus 72F, which will be restored when the EDG 14 Output Breaker closes. This is plausible because P4400-F607A, Div 1 EECW DW Otbd Supply Vlv, is powered by MCC 72F-4A, which will be restored when the EDG 14 Output Breaker closes. This distractor is incorrect because the valves listed are powered by Bus 72C via MCC 72C-3A, which will be restored when the EDG 12 Output Breaker closes.

Reference Information:

23.327, Reactor Building Closed Cooling Water / Emergency Equipment Closed Cooling Water System SOP.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
400000 Component Cooling Water System
400000 K2. Knowledge of electrical power supplies to the following:
400000 K2.02 CCW valves

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (4) Secondary coolant and auxiliary systems that affect the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
RO

Associated objective(s):
Reactor Building Closed Cooling Water Emergency Equipment Cooling Water (P4200/P4400)
Cognitive Enabler
Describe the normal and alternate power supplies to Reactor Building Closed Cooling Water/Emergency Equipment Cooling Water System components.

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54	K/A Importance: 3.3/3.3			Points: 1.00
R54	Difficulty: 3.00	Level of Knowledge: Low	Source: BANK	81746

The plant is conducting a Reactor Startup with power low in the Power Range. Control Rod 10-19 is being withdrawn continuously from position 00 to 48.

As Control Rod 10-19 is withdrawing past position 32, the following occurs:

- The Rod Out Notch Override (RONOR) Switch is released and spring returns to OFF.
- The Rod Movement Control Switch remains in Out Notch.

Which one of the following correctly describes the response of Control Rod 10-19?

	Control Rod 10-19...	**Settles**
A.	Continues to 48	No
B.	Continues to 48	Yes
C.	Stops at 34	Yes
D.	Stops at 34	No

Answer: C

Answer Explanation:
Per Section 1.1.2 of 23.623, the RONOR Switch interrupts the operation of the timer to halt it at a position in its cycle such that continuous insertion or withdrawal of the drive will occur. When either the Rod Movement Control Switch or the RONOR Switch is released, the timing sequence is resumed to complete the motion and settle the drive into the next notch.

Therefore, the examinee must recognize that the design feature that has been installed to allow continuous rod motion is the RONOR switch and, if this switch is released, continuous withdrawal of the control rod will cease.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. the examinee could determine that, if continuous withdrawal were started with the RONOR switch, the RONOR switch could be released and control rod withdrawal would continue, which is plausible because this is how rod withdrawal would continue if both switches were held. This is incorrect, however, because, once the RONOR switch is released, the timer bypass function goes away and the timer would then impose notch-only rod withdrawal. The examinee could determine that, once the control rod reached the full-out position, the settle function would not occur, which is plausible because this is how the RMCS would respond if both switches were continuously held when the full-out position is reached.
B. the examinee could determine that, if continuous withdrawal were started with the RONOR switch, the RONOR switch could be released and control rod withdrawal would continue, which is plausible because this is how rod withdrawal would continue if both switches were held. This is incorrect, however, because, once the RONOR switch is released, the timer bypass function goes away and the timer would then impose notch-only rod withdrawal. The examinee could determine that, once the control rod reaches full-out, with the RONOR swtich released, the normal settle function would occur, which is plausible because the normal settle function is restored once the RONOR switch is released.
D. the examinee could determine that control rod 10-19 will stop at position 34 if the RONOR switch is released, which is correct. The examinee could also determine that the settle function would not occur, which is plausible because, as described in Section 1.1.2 of 23.623, the settle function does not occur if the RONOR switch is used in the opposite (Emergency-In) position. This is incorrect because, when the RONOR switch is released, the timing sequence is resumed, which includes the settle function.

Reference Information:

23.623, Reactor Manual Control System SOP.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
201002 Reactor Manual Control System
201002 K4.05 Notch override rod withdrawal

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (6) Design, components, and function of reactivity control mechanisms and instrumentation.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Reactor Manual Control System (C1107)
Cognitive Enabler
List the automatic features of Reactor Manual Control System operations.

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55	K/A Importance: 3.1/3.1			Points: 1.00
R55	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	81726

The reactor was operating at 100% power with the following conditions:

- A RRMG Set Speed is 80% in a normal configuration.
- B RRMG Set Speed is 80% with its scoop tube locked due to speed oscillations.
- Recirculation and Feedwater DCS logic is available.

A trip of the North Reactor Feedwater Pump (RFP) subsequently occurs. Reactor power is currently 75%.

(1) What is the current speed of the B RRMG set?
(2) What action should be taken under these conditions?

A. (1) 37%
(2) Verify position on the Power/Flow Map.

B. (1) 37%
(2) LOCK the Scoop Tube for the B RRMG Set.

C. (1) 80%
(2) Trip the B RRMG set.

D. (1) 80%
(2) RESET the Scoop Tube lock.

Answer: D

Answer Explanation:
Per 20.107.01, Loss of Feedwater AOP, with a scoop tube lock in place, the B RRMG set will not run back. Therefore, the examinee must (1) recognize that B RRMG Set Speed will remain at 80%. Since the RRMG set will not run back, the examinee must recognize that 20.107.01, Condition F requires the examinee to (2) RESET the scoop tube lock, verify the B RRMG set runs back, and then re-LOCK the scoop tube.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. part (1) would be correct if the Recirculation Distributed Control System (DCS) will automatically unlock a locked RRMG set scoop tube when a RR limiter is in effect, which would allow the B RRMG set to run back to 37% (setting for the #2 RR Limiter). This is plausible because Recirc DCS has many features that perform functions such as DCS lock, enforcing RR limiters, application of electrical stops, etc. Therefore, is it plausible to assume that DCS has the capability to also automatically unlock a locked scoop tube, which is incorrect. Part (2) is correct because, IF the RRMG sets ran back to 37%, then the correct action is to verify position on the P/F map.
B. part (1) would be correct if the Recirculation Distributed Control System (DCS) will automatically unlock a locked RRMG set scoop tube when a RR limiter is in effect, which would allow the B RRMG set to run back to 37% (setting for the #2 RR Limiter). This is plausible because Recirc DCS has many features that perform functions such as DCS lock, enforcing RR limiters, application of electrical stops, etc. Therefore, is it plausible to assume that DCS has the capability to also automatically unlock a locked scoop tube, which is incorrect. Part (2) is plausible because, IF DCS unlocked the scoop tube to allow the B RRMG set to run back to 37%, then it is plausible that the correct action is to re-LOCK the B RRMG set scoop tube, which is the correct action to take after running back the B RRMG set manually. This is incorrect, however, because DCS does not unlock the scoop tube automatically.
C. part (1) is correct. Part (2), is correct IF the B RRMG set speed cannot be lowered to the 2/3 limiter as specified in step I of 20.107.01, Loss of Feedwater AOP. It is also the correct action per Immediate Action IB of 20.138.03, Uncontrolled Recirc Flow Change, which requires that the affected RRMG set be tripped if a speed increase of >10% occurs. Since, with the B RRMG Set scoop tube locked, a >10% deviation in RRMG set speeds will exist, it is plausible that the correct action is to trip the RRMG set that did not run back. This is incorrect, however, because the correct action is to unlock the scoop tube and allow the B RRMG set to run back.

Reference Information:

20.107.01, Loss of Feedwater / Feedwater Control AOP.
20.138.03 Uncontrolled Recirc Flow Change AOP.

Plant Procedures
20.107.01

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
202002 A2. Ability to (a) predict the impacts of the following on the RECIRCULATION SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations:
202002 A2.05 Scoop tube lockup: BWR-2,3,4

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Reactor Recirculation System
Cycle 13-2 Objectives
Cognitive Enabler
Identify abnormal and emergency operating procedures associated with the Reactor Recirculation system.

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56	K/A Importance: 4.4/4.7			Points: 1.00
R56	Difficulty: 4.00	Level of Knowledge: High	Source: BANK	81706

The plant is operating at 100% power. A fire in the Reactor Building is reported affecting both Reactor Pressure Vessel (RPV) Level Instrument racks.

If only the Wide Range RPV level instruments' reference leg temperatures become elevated due to the fire, which one of the following correctly completes the following statement indicating the effect on the RPV level actuations as compared to the RPV level trip setpoint under normal temperature conditions?

Due to the elevated temperature in the level instrument reference legs, ACTUAL RPV water level for a __(1)__ would be __(2)__ than INDICATED RPV water level when the actuation occurred.

A. (1) reactor scram
(2) higher

B. (1) reactor scram
(2) lower

C. (1) core spray logic actuation
(2) higher

D. (1) core spray logic actuation
(2) lower

Answer: D

Answer Explanation:
Heating of the reference legs of any RPV level instrument would cause the indicated level to increase due to the density change of the water in the reference leg. Based on the lowering density in the reference leg, the reference leg would have less mass as compared to the variable leg (actual level) thus making actual RPV level lower for any setpoint initiated actuation or trip.
The wide range instruments also provide core spray (ECCS) actuations.

Distracter Explanation:

A. Is incorrect but plausible because the examinee could incorrectly determine that wide range instruments provide reactor scram functions. The reactor scram functions are provided by narrow instruments. The instrument malfunction due to the elevated temperatures is indicated only if the variable leg temperatures were affected and not the reference leg which would be an incorrect assessment.
B. Is incorrect but plausible because the examinee could incorrectly determine that wide range instruments provide reactor scram functions. The instrument malfunction due to the elevated temperatures is commensurate with the elevated reference leg temperature and would be an accurate assessment of the effect.
C. Is incorrect but plausible because the examinee could incorrectly determine the instrument malfunction due to the elevated temperatures is indicated only if the variable leg temperatures were affected and not the reference leg which would be an incorrect assessment.

Reference Information:

BC07Sr4_Sensors May 2011 Explains temperate variations on instruments.
23.601 (pg 16) Core Spray actuation from these instruments / logic
I2rprod-CECO - Identifies the instruments listed in 23.601 as the wide range instruments.

Plant Procedures
23.601
29.ESP.01

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
216000 Nuclear Boiler System
G2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (5) Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.

NRC Exam Usage
ILO 2015 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
RO

Associated objective(s):
Reactor Pressure Vessel Instrumentation (B2100)

Cognitive Enabler

Discuss the effects of changing environmental conditions on operation of the Reactor Pressure Vessel Instrumentation.

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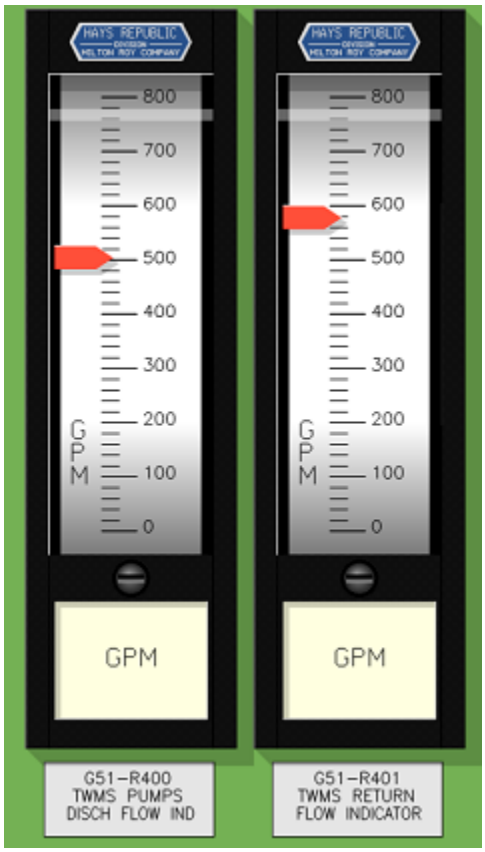
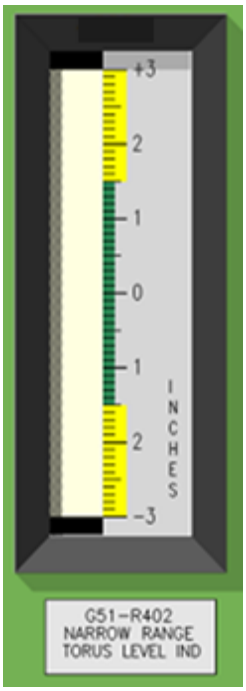
57	K/A Importance: 3.5/3.6			Points: 1.00
R57	Difficulty: 4.00	Level of Knowledge: High	Source: NEW	82608

The Torus Water Management System (TWMS) is operating in the Cleanup Mode with both TWMS pumps running and the flows indicated below:

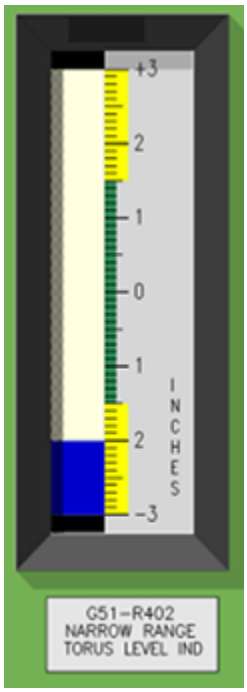


Assuming the Torus is LEAK TIGHT, and NO OPERATOR ACTION is taken, what will Torus Water Level ultimately indicate, as displayed on G51-R402, Narrow Range Torus Level Indicator?

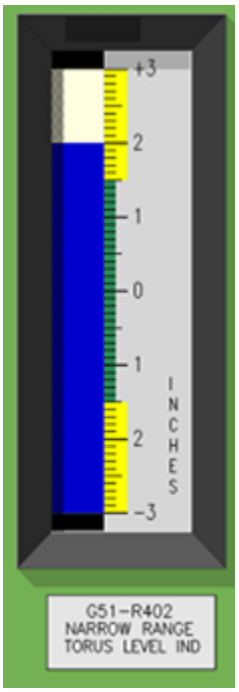
A.



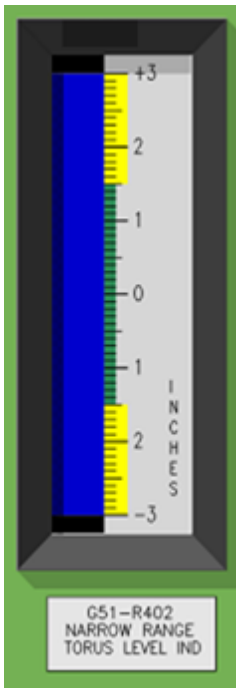
B.



C.



D.



Answer: B

Answer Explanation:
The examinee must recognize that the unbalanced flow condition shown will result in rising Torus Water Level (TWL).

Per 23.144, Torus Water Management System (TWMS) SOP, Precaution 3.3, “While operating in the Cleanup Mode, if Annunciator 7D71, TORUS WATER LEVEL TROUBLE, alarms High-High (+2.0 inches increasing), G5100-F611, TWMS Cond to Torus Makeup Vlv (Throttle Valve), will receive a CLOSE signal for as long as the High-High condition exists. If this High-High alarm has been received, TWMS influent and effluent flows must be monitored. G5100-F611, TWMS Cond to Torus Makeup Vlv, will need to be throttled open to balance flows once the High-High alarm clears”.

The examinee must recall that, when TWL reaches +2” due to the unbalanced flow, the F611 will close to stop the TWL rise and return flow will lower to 0 gpm. With no operator action and no return flow TWL will then lower until the TWMS pumps trip at -2.0” where TWL will remain due to the torus being leak tight as stated in the stem of the question.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This distractor would be correct if the F611 closed when TWL rose to +2”, as it does, but nothing happened to stop TWL from lowering out of the indicating range (-3”). This is incorrect because the TWMS pumps will trip at -2” thereby stopping the TWL drop.
C. This distractor would be correct if, in addition to the F611 closing when TWL rose to +2”, the TWMS pumps tripped at this level. In that case, with the F611 closed and the TWMS pumps tripped, and with the torus being leak tight as stated in the stem of the question, it is plausible that TWL would end up at +2”. This is incorrect since the TWMS pumps do not trip at +2” TWL.
D. This distractor would be plausible if the F611 did not close on high TWL because, with the flow imbalance shown, TWL would rise until the level indicator shown was high out of band (greater than +3.0”). This is incorrect because the F611 closes at +2” TWL.

Reference Information:

23.144, Torus Water Management System (TWMS) SOP.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
223001 Primary Containment and Auxiliaries
223001 A1. Ability to predict and/or monitor changes in parameters associated with operating the PRIMARY CONTAINMENT SYSTEM AND AUXILIARIES controls including:
223001 A1.08 Suppression pool level

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b) (5)	Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.
10 CFR 55.41(b) (7)	Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Torus Water Management System (G5100)
Cognitive Enabler
List the automatic features of Torus Water Management System operations.

58	K/A Importance: 2.8/2.9			Points: 1.00
R58	Difficulty: 2.00	Level of Knowledge: High	Source: NEW	82609

A Loss of Coolant Accident (LOCA) coincident with a loss of 345KV offsite power has occurred.

All equipment responded as expected with the following exceptions:

- EDG 11 failed to start.
- 65F Positions F6 and F8 indicate TRIPPED.

Which of the following lists ALL of the RHR pumps that are available to support placing RHR in the Torus Spray Mode?

A. B ONLY.

B. B and C ONLY.

C. A, B and C ONLY.

D. A, B, C and D.

Answer: C

Answer Explanation:
Per AOP 20.300.345kV Note 5, the examinee must recognize that, if Bus 65F Pos F6 and F8 are open, a 65F bus fault has occurred and determine that the associated EDG (EDG 14) is designed not to start on a bus fault. Since 345kV offsite power supplies the Division 2 ESF busses, the examinee must determine that bus 65F is not available. The examinee must then recall that bus 65F powers RHR Pump D.

Therefore, the examinee must determine that only RHR Pumps A, B and C are available to support placing RHR in the Torus Spray Mode.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The examinee could see the failure of EDG 11 as a loss of 64B bus since EDG 11 can supply power to this bus on a loss of power. Since bus 64B powers bus 72B, the examinee could recall that bus 72B supplies power to the Division 1 Torus Spray Valve, E1150-F027A. This could lead the examinee to conclude that Division 1 RHR is not available for Torus Sprays and conclude that only RHR Pump B is available to support Torus Sprays. This is incorrect because the failure of EDG 11 to start on a LOCA signal will not impact the associated bus until offsite power is lost. With Div 1 offsite power available, RHR pumps A and C are still available.
B. The examinee could see the failure of EDG 11 as a loss of 64B bus since EDG 11 can supply power to this bus on a loss of power. Since bus 64B powers RHR Pump A, the examinee could conclude that only RHR Pumps B and C are available to support Torus Sprays. This is incorrect because the failure of EDG 11 to start on a LOCA signal will not impact the associated bus until offsite power is lost. With Div 1 offsite power available, RHR pump A is still available.
D. The examinee could fail to recognize the significance of 65F Pos F6 and F8 being open and conclude that all four RHR pumps are available for Torus Sprays. This is plausible because 65F Pos F6 is normally tripped on a loss of offsite power due to load shed. The examinee could remember seeing this and incorrectly recall that the F8 position also normally indicates tripped on a loss of offsite power, which is incorrect.

Reference Information:

AOP 20.300.345, Loss of 345kV.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
230000 RHR/LPCI: Torus/Suppression Pool Spray Mode
230000 K2. Knowledge of electrical power supplies to the following:
230000 K2.02 Pumps

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Residual Heat Removal (E1100)
Cognitive Enabler
Describe the normal and alternate power supplies to RHR System components.

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59	K/A Importance: 3.4/3.7			Points: 1.00
R59	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	82610

You are the P603 operator. The plant is in MODE 5 with the following conditions:

- The Mode Switch is in REFUEL.
- The Refueling Bridge is over the Reactor Vessel loaded with a spent fuel bundle.
- 3D113, CONTROL ROD WITHDRAWAL BLOCKED, has CLEARED.

Which one of the following actions is correct and why?

A. Continue fuel movements after ALL Control Rods are verified fully inserted.

B. Continue fuel movements because this is a normal indication for this condition.

C. Suspend fuel movements because a Control Rod withdrawal error during refueling is no longer prevented.

D. Suspend fuel movements because Refueling Platform Frame and Trolley Hoist operation is electrically prevented.

Answer: C

Answer Explanation:
Per TS Bases for 3.9.1, Refueling Interlocks, refueling equipment interlocks restrict the operation of the refueling equipment or the withdrawal of control rods to reinforce unit procedures that prevent the reactor from achieving criticality during refueling. The refueling interlock circuitry senses the conditions of the refueling equipment and the control rods. Depending on the sensed conditions, interlocks are actuated to prevent the operation of the refueling equipment or the withdrawal of control rods. With the MODE Switch in the Refuel position, the refueling equipment located over the core and loaded with fuel inserts a control rod withdrawal block in the Control Rod Drive System to prevent withdrawing a control rod.

During refueling, it is a normal Operations Department practice to select a control rod and verify that 3D113 remains locked-in any time the conditions above are met. Thus, this alarm will come in and clear as the refuel bridge traverses between the core and spent fuel pool and/or loads/unloads fuel when over the core region. It is imperative that the P603 operator understand the condition of the refueling bridge/equipment at all times and be able to monitor the status of the Control Rod Drive system by observing the status of 3D113.

Therefore, the examinee must recognize that 3D113 clearing under the conditions given in the stem of the question is abnormal and indicative of an inoperable condition. The examinee must then recall that the correct course of action per TS 3.9.1 Condition A.1 is to immediately suspend in-vessel fuel movement since the withdrawal of a control rod is no longer prevented during fuel loading.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The examinee could remember that Tech Spec 3.9.1 Action A.2.2 allows for verifying that all control rods are fully inserted as part of the actions required for inoperable refueling equipment interlocks. This distractor is incorrect, however, because A.2.2 is only half of what is required since A.2.1 also requires that a control rod withdrawal block be inserted. With 3D113 clear, A.2.1 is not met.
B. The examinee could fail to recall the condition under which 3D113 would remain lit and, more importantly, when it would clear. This distractor is plausible since, as described above, 3D113 will come in and clear several times throughout the shift as refueling equipment status changes. This distractor is incorrect because, with the bridge still over the core and loaded with fuel, as described in the stem of the question, 3D113 should be lit.
D. The examinee could recall that an electrical interlock exists between the Control Rod Block Function and the refueling platform. This is plausible because the All Rod In function IS interlocked with the refueling platform, which enables operation of the refueling equipment over the RPV while loaded. This is incorrect, however, because no such interlock currently exists between the refueling platform and the Control Rod Block.

Reference Information:

Tech Spec LCO 3.9.1, Refueling Equipment Interlocks, and its associated BASES.
3D113, Control Rod Withdrawal Blocked.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
234000 Fuel Handling
234000 A4. Ability to manually operate and/or monitor in the control room:
234000 A4.02 Control rod drive system

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Refueling
(F1500)
Cognitive Enabler
List the interlocks associated with Refueling System components.

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60	K/A Importance: 3.8/3.9			Points: 1.00
R60	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	82611

The plant is operating at 80% power when the in-service Reactor Pressure Regulator fails HIGH.

How will Reactor Steam FLOW respond to this failure?

A. Decrease rapidly until manual operator actions are taken.

B. Increase rapidly until manual operator actions are taken.

C. Decrease slightly until the backup Pressure Regulator takes control.

D. Increase slightly until the backup Pressure Regulator takes control.

Answer: B

Answer Explanation:
If the in-service Pressure Regulator fails high, the Pressure Regulator will see 52" Manifold Pressure as being above setpoint and a maximum demand signal will be sent to the Main Turbine Control Valves and Main Turbine Bypass Valves. This will result in the Turbine Control Valves and Bypass Valves moving to a full-open position and a rapid increase of steam flow out of the reactor.

This event will be terminated when the Immediate Actions of 20.109.02 are taken to trip the Main Turbine and Bypass Valves, which are being driven open by the failed pressure regulator.

Therefore, the examinee must determine that the failure given in the stem of the question will result in a rapid increase of steam flow out of the reactor which will be terminated upon completion of the required Immediate Actions.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The examinee could fail to correctly conclude how the failure in the stem of the question will cause the Pressure Regulator and, therefore, Steam Flow to respond. This is plausible since the Pressure Regulator can fail in both the high and low directions and operator candidates commonly confuse how the plant will respond to various failures. This distractor is correct if the indicated failure were to cause the Turbine Control and Bypass Valves to failed closed. This answer is incorrect because the failure described in the stem of the question will cause a rapid increase in steam flow due to the Turbine Control and Bypass Valves going open.
C. The examinee could fail to correctly conclude how the failure in the stem of the question will cause the Pressure Regulator and, therefore, Steam Flow to respond. This is plausible since the Pressure Regulator can fail in both the high and low directions and operator candidates commonly confuse how the plant will respond to various failures. This distractor is also plausible because if the examinee concluded that the failure given will cause a decrease in steam flow, then the candidate could determine that the backup pressure regulator would take control to stop the pressure decrease. This answer is incorrect because the failure described in the stem of the question will cause a rapid increase in steam flow.
D. The examinee could correctly conclude how the failure in the stem of the question will cause the Pressure Regulator and, therefore, Steam Flow to respond. However, the candidate could incorrectly assume that the backup Pressure Regulator will take control, after a slight increase in steam flow. This is plausible because failure in the high direction can cause excessive pressure reduction and violation of cooldown rate limits so the examinee could conclude that the system is designed to prevent this from occurring. This distractor is incorrect, however, because the backup pressure regulator is designed to take over for failures in the LOW direction to prevent over-pressure events from occurring.

Reference Information:

20.109.02, Reactor Pressure Controller Failure AOP.
20.109.02 BASES, Reactor Pressure Controller Failure AOP BASES.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
241000 Reactor/Turbinie Pressure Regulating System
241000 K3. Knowledge of the effect that a loss or malfunction of the REACTOR/TURBINE PRESSURE REGULATING SYSTEM will have on the following:
241000 K3.04 Reactor steam flow

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b) (5)	Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.
10 CFR 55.41(b) (7)	Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Governor/Pressure Control (N3012)
Cognitive Enabler
Discuss potential modes of Governor/Pressure Control System component failures and any industry operating experience related to the failure.

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61	K/A Importance: 2.6/2.6			Points: 1.00
R61	Difficulty: 2.00	Level of Knowledge: Low	Source: NEW	84666

While operating at 92% Power, alarms were received on the H11-P804 panel. Among them is 4D102, Turbine Valve Position Abnormal.

Upon investigation, the CRLNO reports that the following valves are both CLOSED:

- N3021-F013E, #5 Low Pressure Intercept Valve (LPIV) to the South LP Turbine.
- N3021-F013F, #6 Low Pressure Intercept Valve (LPIV) to the South LP Turbine.

Plant power level increased to 93%.

Which of the following actions is required?

A. Reduce Reactor Power to <65%.

B. Reduce Reactor Power to <91.5%.

C. Scram the reactor and trip the main turbine.

D. Maintain the remaining open LP Intercept Valves <82% open.

Answer: C

Answer Explanation:
Per ARP 4D102, Turbine Valve Position Abnormal, if both steam inlet lines to any one LP Turbine are isolated by a closed Stop or Intercept Valve, manually trip Main Turbine.

Therefore, the examinee must recall that, from ARP 4D102, the operational impact of closure of two steam inlets to the same LP turbine is to trip the main turbine. Due to the initial power level, the Reactor must also be scrammed.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. Closure of LP steam inlets to two LP Turbines by closed Stop or Intercept Valves (two outlets from one MSR) requires the operator to immediately reduce Reactor Power to < 65% in accordance with ARP 4D102. This distractor is incorrect because the valve lineup given indicates closure of two low pressure inlets to the same LP turbine from different MSRs, not two LP inputs to different turbines from the same MSR.
B. Closure of a Turbine Control Valve requires reactor power be lowered to 91.5% or lower in accordance with 23.109, Turbine Operating Procedure Section 7.1 On-Load Closure of a Turbine Control Valve. This distractor is incorrect because the valve lineup given requires the turbine to be tripped.
D. Closure of a Turbine Control Valve requires turbine load to be controlled such that the remaining high pressure control valves are maintained <82% to minimize valve oscillations in accordance with 23.109, Turbine Operating Procedure Section 7.1 On-Load Closure of a Turbine Control Valve. This distractor is incorrect because the valves given are low pressure control valves and not high pressure and because 4D102 requires a turbine trip.

Reference Information:

4D102, Turbine Valve Position Abnormal.
23.109, Turbine Operating Procedure.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
245000 Main Turbine Generator and Auxiliary System
245000 K5. Knowledge of the operational implications of the following concepts as they apply to MAIN TURBINE GENERATOR AND AUXILIARY SYSTEMS:
245000 K5.03 Hydraulically operated valve operation

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (5) Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.

NRC Question Use (ILO 2019)
Low
NEW
RO

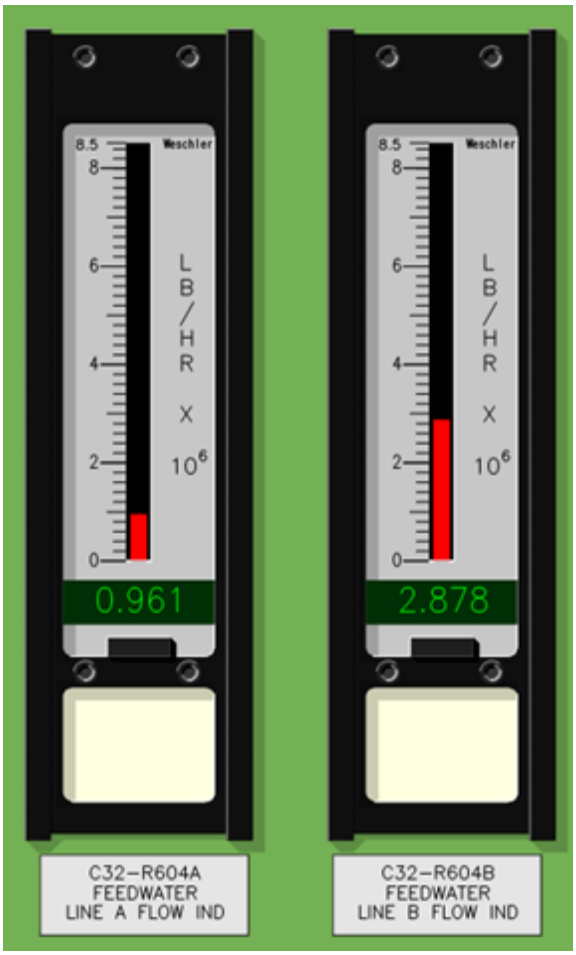
Associated objective(s):

62	K/A Importance: 3.6/3.8			Points: 1.00
R62	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	81666

The Mode Switch has been taken to shutdown following a High Drywell Pressure condition caused by a Reactor Recirculation line break inside the Drywell. Plant conditions are as follows:

- Drywell Pressure is 8.5 psig and rising
- RPV Pressure is 740 psig and lowering
- RPV Level is 180” and rising
- Lowest RPV level encountered during the transient was 149”

Why is there a difference in Feedwater Flow as shown below?



A. RCIC is injecting at 650 gpm.

B. HPCI is injecting as 5250 gpm.

C. RCIC has failed to automatically initiate.

D. HPCI has failed to automatically initiate.

Answer: B

Answer Explanation:
HPCI automatically starts and injects on High Drywell Pressure. 60 seconds after the scram, Post-Scram Feedwater Logic will set RFP speeds to ~2650 rpm and, with RPV pressure at 740 psig and RPV level below 197", feedwater injection will occur through the SULCV. HPCI injection occurs at 5250 gpm, through the A Feedwater Line. Since the HPCI flow controller is set to inject at 5250 gpm, its injection pressure will be higher than RFP discharge pressure which is set at a fixed value due to a fixed turbine speed. Another key point for this answer is that HPCI (and RCIC) both discharge downstream of the flow indicators (differential pressure cells) that drive the feedwater flow indicators shown. Therefore, the indicators will not show HPCI or RCIC flow.

Therefore, the examinee must evaluate the plant conditions, and apply his/her knowledge of the physical connections between HPCI and feedwater line A, to determine that the feedwater flow indicated is a direct result of HPCI injecting through the A feedwater line.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The examinee could fail to correctly recall the physical connections between the RCIC and Feedwater system and conclude that RCIC injects upstream of the D/P cell on the B Feedwater line. This distractor is plausible because the examinee could determine that RCIC has started and is injecting at its normal flow. This answer is incorrect because RCIC does not start on High Drywell Pressure and RCIC injects downstream of the D/P cell that drives the C32-R604B.
C. The examinee could correctly recall that RCIC discharges downstream of the D/P cell that drives the C32-R604B and deteremine that the reason it reads higher than the C32-R604A is because RCIC failed to automatically initiate and therefore is providing less resistance to flow (backpressure) on the feedwater system than it should. This is plausible because it is a common misconception that RCIC starts on Low RPV Level AND High Drywell Pressure like HPCI does. This distractor is incorrect because RCIC has not yet received an Auto Start signal, which only occurs on low RPV Level (Level 2 or 110.8").
D. The examinee could fail to correctly recall the physical connections between the HPCI and Feedwater systems. This distractor is plausible because the examinee could conclude that HPCI connects to the A Feedwater line upstream of the D/P cell for the C32-R604A and therefore determine that the reason A Feedwater Flow is lower than B is because HPCI failed to start and inject. This distractor is incorrect because HPCI injects downstream of the flow indicator D/P cell and the indications shown are normal for HPCI injection.

Reference Information:

M-2023, Feedwater System Diagram, Grid F-2 showing physical connection between HPCI and Feedwater and Grid C-2 showing location of Feedwater Flow instrumentation.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
259001 Reactor Feedwater System
259001 K1. Knowledge of the physical connections and/or cause-effect relationships between REACTOR FEEDWATER SYSTEM and the following:
259001 K1.02 HPCI: Plant-Specific

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Reactor Feedwater (N2100)
Cognitive Enabler
Discuss the Reactor Feedwater system interrelationships with other systems.

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63	K/A Importance: 3.3/3.2			Points: 1.00
R63	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	84046

The plant is operating at 8% power coming out of the most recent refueling outage with the Mode Switch in RUN.

Which of the following annunciators will result from of all four (4) Main Steam Line Radiation Monitors detecting radiation levels at 3,500 mr/hr?

3D86, Mn Stm Line Iso Valve Closure Channel Trip.
4D100, Motor Tripped.

A. 3D86 due to the Main Steam Isolation Valves closing.

B. 4D100 due to ONLY a Gland Seal Exhauster tripping.

C. 4D100 due to ONLY a Mechanical Vacuum Pump tripping.

D. 4D100 due to BOTH a Mechanical Vacuum Pump and a Gland Seal Exhauster tripping.

Answer: B

Answer Explanation:
Per 3D82, Mn Stm Line Ch A/B/C/D Radn Monitor Hi-Hi, the Main Steam Line Rad Monitors trip at a Hi-Hi setpoint of 3,100 mr/hr to 3,400 mr/hr. Also per this ARP, and per 23.601 Instrument Trip Sheets page 46, the tripped Main Steam Line Radiation Monitors will cause the running Mechanical Vacuum Pump (MVP) and Gland Seal Exhauster (GSE) to trip.

Per 23.125, Condenser Vacuum System, Precaution and Limitation 3.4, the MVPs shall NOT be operated when the Reactor is operating at greater than 5% thermal power due to the potential of forming an explosive hydrogen-oxygen mixture in the Mechanical Vacuum Pump Discharge Piping.

The examinee must recognize that being <10% power will enable the MSL High Radiation Trip of both the MVPs and GSEs, if running. The examinee must also recall that the MVPs will not be running at 8% power and therefore will not trip. Therefore, the examinee must determine that 4D100, Motor Tripped, will alarm due to ONLY the running GSE tripping.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This distractor was true prior to the most recent refueling outage and plant change that resulted from Engineering Design Package (EDP) 37673. EDP-37673 removed the MSL High Radiation trip from RPS and Group 1 Isolation Logic as part of a scram frequency reduction effort. If the examinee failed to recall this plant change, he/she could determine that 3D86 would alarm. This distractor is incorrect because EDP-37673 removed the MSIV isolation and replaced it with the GSE/MVP trips described above.
C. This distractor is plausible if power was just above the Point of Adding Heat (POAH) and conditions were such that a MVP was started prior to starting a Gland Sealing Exhauster. This is incorrect because conditions in the stem of the question indicate that the startup is further along, so a GSE will be running and no MVP will be running due to being >5% power.
D. This distractor is true if power in the stem of the question was <5% since a MVP could be running, when <5% power, to maintain Main Condenser Vacuum so 4D100 would alarm due to a trip of BOTH a GSE and a MVP. However, 23.125, Condenser Vacuum System, Precaution and Limitation 3.4, prevents the MVPs from being operated when the Reactor is operating at greater than 5% thermal power due to the potential of forming an explosive hydrogen-oxygen mixture in the Mechanical Vacuum Pump Discharge Piping. Therefore, this distractor is incorrect since a MVP will not be running at 8% power.

Reference Information:

3D82, Mn Stm Line Ch A/B/C/D Radn Monitor Hi-Hi.
23.125, Condenser Vacuum System
23.601, Instrument Trip Sheets.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
272000 Radiation Monitoring System
272000 A3. Ability to monitor automatic operations of the RADIATION MONITORING SYSTEM including:
272000 A3.10 3.3/3.2 Lights and alarms

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
RO

Associated objective(s):
Process Radiation Monitoring System (D1100)
Cognitive Enabler
Discuss the Process Radiation Monitoring System interrelationships with other systems.

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64	K/A Importance: 2.7/2.7			Points: 1.00
R64	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	81486

With the plant operating at 100% power a Loss of Offsite Power (LOP) occurred. Only EDGs 11 and 12 have started. All other plant equipment has responded as expected.
What is the status of Secondary Containment Ventilation?

A. Currently provided by Division 1 Standby Gas Treatment System (SGTS).

B. Currently provided by Division 2 Standby Gas Treatment System (SGTS).

C. None is currently running; however, a division of SGTS can be manually started.

D. None is currently running; however, Reactor Building Supply and Exhaust Fans can be started.

Answer: A

Answer Explanation:
When offsite power is lost, power to RPS A and B is also lost. This results in a trip of Secondary Containment Isolation Logic due to loss of power to the logic and not a valid Secondary Containment Isolation signal. This logic trip will cause an Auto Start of SGTS. However, with all Offsite Power lost and a failure of Division II EDGs 13 and 14 to start, Division 2 SGTS will not have power available to start either in auto or manually.

Therefore, the examinee must determine that only Division 1 SGTS has power available and Division 1 SGTS will have automatically started due to a loss of RPS A.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. The examinee could correctly recall that a loss of RPS will occur and that, because of that power loss, Secondary Containment Isolation Logic will send an auto start signal to both divisions of SGTS. The examinee could incorrectly recall the power supply relationship either between EDGs in a division (incorrectly thinking that EDGs 11 and 12 power Div 2 busses) or where Div 2 SGTS receives power, and therefore conclude that Div 2 SGTS will be running. This distractor is incorrect because Division 2 SGTS will not have power available.
C. The examinee could fail to recall that a loss of RPS A will occur and that, because of that power loss, Secondary Containment Isolation Logic will send an auto start signal to both divisions of SGTS and, because Div 1 SGTS has power available, it will automatically start. This is plausible because a valid secondary containment isolation signal has NOT resulted based on the current plant conditions. This distractor is incorrect because Div 1 SGTS will be running due to an auto start.
D. The examinee could fail to recall that a loss of RPS A will occur and that, because of that power loss, Secondary Containment Isolation Logic will send an auto start signal to both divisions of SGTS and, because Div 1 SGTS has power available, it will automatically start. This is plausible because a valid secondary containment isolation signal has NOT resulted based on the current plant conditions. This distractor is incorrect because, with power lost to Secondary Containment Isolation Logic, it will not be possible to reset the logic and start the RBHVAC fans.

Reference Information:

20.300.RPS A – Loss of RPS A AOP.
20.300.RPS A Bases.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
288000 Plant Ventilation Systems.
288000 K6.01 A.C. electrical

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (9) Shielding, isolation, and containment design features, including access limitations.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Reactor Building HVAC
Cognitive Enabler
List the automatic features of Reactor Building HVAC System operations.

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65	K/A Importance: 4.2/4.2			Points: 1.00
R65	Difficulty: 4.00	Level of Knowledge: High	Source: NEW	82613

With the plant operating at 100% power, a steam leak occurs in the North RWCU Pump Room. Conditions in the North RWCU Pump Room are as follows:

- Reactor Water Cleanup Pump Room A Temperature is 182°F
- Reactor Water Cleanup Pump Room A Differential Temperature is 53°F

Of the alarms listed below, which one(s) is/are consistent with current plant conditions?

- 1D66 Steam Leak Detection Ambient Temp High
- 1D70 Steam Leak Detection Diff Temp High
- 3D34 Sec Contm Temp High-High EOP Entry

A. 1D66 ONLY.

B. 1D66 and 3D34.

C. 1D66 and 1D70.

D. 1D70 and 3D34.

Answer: C

Answer Explanation:
Per ARP 1D66, Reactor Water Cleanup Pump Room A Temperature causes the alarm to come in at 175°F. Per ARP 1D70, Reactor Water Cleanup Pump Room A Differential Temperature causes the alarm to come in at 50°F.

Per ARP 3D34, Sec Contm Temp High-High EOP Entry, the list of initiating devices/setpoints does not list the inputs that cause 1D66 and 1D70, therefore 3D34 will not be in alarm.

Therefore, the examinee must assess plant conditions and determine that only 1D66 and 1D70 in alarm is consistent with the plant conditions given in the stem of the question.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The examinee could fail to recognize the pump room D/T as being above the alarm setpoint. This is plausible because it is a common error to recall this setpoint as being 55°F because the RWCU system isolates on high differential flow at 55 gpm. If the setpoint was 55°F, this distractor would be correct. This distractor is incorrect because 1D70 would be in alarm too because its setpoint is 50°F.
B. The examinee could fail to recognize the pump room D/T as being above the alarm setpoint. This is plausible because it is a common error to recall this setpoint as being 55°F because the RWCU system isolates on high differential FLOW at 55 gpm. The examinee could also assume that 3D34 will be in due to 1D66 being in alarm. This distractor is incorrect because 1D70 would be in alarm and 3D34 would not.
D. This distractor would be correct if the setpoint for high RWCU room temperature was higher than 182°F, which is plausible because several secondary containment related setpoints, such as the Maximum Safe Operating Temperatures of 210°F and the Main Steam Isolation Valves automatic closure of 200°F, occur above 182°F. This could cause the examinee to only recognize that 1D66 would be in alarm. 3D34 being in alarm would be correct if the RWCU D/T instruments input into 3D34, which is plausible because RWCU Pump Room D/T exceeding 50°F is an EOP entry condition. This distractor is incorrect because 1D66 would be in alarm and 3D34 would not be in alarm because RWCU Pump Room D/T is not an input for this alarm.

Reference Information:

1D66 Steam Leak Detection Ambient Temp High
1D70 Steam Leak Detection Diff Temp High
3D34 Sec Contm Temp High-High EOP Entry.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
290001 Secondary Containment
G2.4.46 Ability to verify that the alarms are consistent with the plant conditions

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
RO

Associated objective(s):
Containment Systems (T2200 & T2300)
Cognitive Enabler
Identify alarm response procedures associated with the Containment Systems.

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66	K/A Importance: 3.8/4.2			Points: 1.00
R66	Difficulty: 2.00	Level of Knowledge: Low	Source: MODIFIED	81367

In accordance with MOP09, Locked Valve Guidelines, what color padlock, if any, should be used on a locked CLOSED valve?

A. Red.

B. Black.

C. Red with black dot.

D. No color identification.

Answer: D

Answer Explanation:
Per MOP 09 Section 3.8.2 No color identification is used for a locked CLOSED valve.

Distractor Explanation:
Distractor colors are incorrect and either used for other configuration controls or could be plausibly assumed to be used by the examinee.

A. Per MOP09 Section 3.8.1, Red padlocks are used to identify locked OPEN valves.
B. Per MOP09 Section 3.8, since red is used to identify locked OPEN valves and red with black dot is used to identify THROTTLED valves, it is plausible for the examinee to conclude that locked CLOSED valves are color coded black since a closed valve is simply one that has been throttled fully shut.
C. Per MOP09 Section 3.8.3, Red with black dot padlocks are used to identify locked THROTTLED valves.

This question was modified from the version previously used on the ILO 2017 exam by changing the stem of the question such that the correct answser is now incorrect.

Reference Information:
MOP09 (pg 4)

Plant Procedures
MOP09 - Locked Valve Guidelines

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
G2.1.1 Knowledge of conduct of operations requirements

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
MODIFIED
RO

Associated objective(s):
Administrative Conduct Manuals - Licensed Operators/STA
Performance Terminal
Describe methods used to lock valves or switches at Fermi 2.

67	K/A Importance: 4.1/4.1			Points: 1.00
R67	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	83087

Consider the typical Moore / Siemens Model 353 Controllers that are installed for several systems in the Fermi 2 Main Control Room (MCR).

If input from the controlled parameter to the controller failed, which of the following actions would you perform to take MANUAL control of the parameter from the controller in the MCR?

- Depress the A/M pushbutton and verify that __(1)__ is indicated on the Alphanumeric Display.
- Rotate the pulser knob to adjust controller __(2)__ as necessary to adjust the parameter to the desired value.

A. (1) P
(2) Output

B. (1) S
(2) Setpoint

C. (1) V
(2) Output.

D. (1) P
(2) Setpoint

Answer: C

Answer Explanation:

Per UM353-1B, process automation controller User's Manual, Section 8.0 Local Faceplate Operation (pp 191-192).

A/M Pushbutton - controls the operation of an A/M (Auto/Manual) function block. When the A/M is switched to Auto the numeric display will show the Setpoint value, as indicated by .S in the alphanumeric display, and when switched to Manual, the Valve value and .V will be shown.

D Pushbutton - changes the variable currently displayed. Pressing this pushbutton steps the display one position in the sequence P, S, V, X and Y from any starting point within the display select group.

S Bargraph - this vertical bargraph displays the scaled range of the controller **setpoint** in the Active Loop. The setpoint in engineering units can be viewed by pressing the D button to display the dot S parameter.

P Bargraph - this vertical bargraph displays the scaled range of the controller **process** in the Active Loop. The process in engineering units can be viewed by pressing the D button to display the dot P parameter.

V Bargraph - this horizontal bargraph displays the scaled range of the controller **output** in the Active Loop. The value in engineering units can be viewed by pressing the D button to display the dot V parameter.

Pulser Knob - rotate the Pulser to change the value in the numeric display (e.g. Setpoint).

From the information provided in the stem of the question, the examinee must determine that a typical controller of this type will not be able to automatically control the controlled system parameter if the input (feedback) from the controlled parameter is lost. The examinee must then determine:

- The controller must be taken to the Manual Mode by depressing the A/M pushbutton.
- When taken to Manual, the examinee must recall that the controller will automatically select V on the Alphanumeric Display.
- When in Manual and V is selected, the examinee must recall that rotating the pulser knob will directly adjust controller output, which is how the process variable is controlled in the Manual Mode. **Note**: When in Manual, P could also be selected on the display and rotation of the pulser knob would still adjust controller output to change the controlled parameter.

NOTE: Enclosure D of 23.202 provides a better illustration of this type of controller used in a flow-control application for HPCI and RCIC. This may be easier to understand than the user's manual. Realize the controller can also be configured to control other parameters, such as temperature, in the same way.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This distractor would be correct if, when the A/M pushbutton was depressed, the controller switched to Manual and automatically displayed P. As stated in the note above, when in Manual, P (Process) could also be selected on the display and rotation of the pulser knob would still adjust controller output to change the controlled parameter. This distractor is incorrect, however, because when the A/M pushbutton is depressed to place the controller in Manual, V is automatically displayed and since input from the controller parameter to the controller has failed, as stated in the stem of the question.
B. This distractor would be correct if the operator was attempting to manually adjust the controlled parameter by changing the setpoint on the controller since operators routinely attempt to control system parameters by adjusting Setpoint for conditions like high/low temperature, flow, et by selecting A (Auto) and adjusting S (Setpoint) manually. Doing so keeps the controller in the control loop and is the preferred means of manual parameter control. The examinee could conclude that this action is necessary for these conditions, however, this is incorrect in this instance because adjusting Setpoint relies on feedback from the controlled parameter, which has failed as stated in the stem of the question.

D. This distractor would be correct if, when the A/M pushbutton was depressed, the controller switched to Manual and automatically displayed P and if P (process) was displayed when adjusting the controller setpoint since operators routinely attempt to control system parameters by adjusting Setpoint for conditions like high/low temperature, flow, etc. However, this is incorrect because when the A/M pushbutton is depressed to place the controller in Manual, V is automatically displayed and because adjusting Setpoint relies on feedback from the controlled parameter, which has failed as stated in the stem of the question.

Reference Information:

UM353-1B, process automation controller User's Manual.
23.202, HPCI System SOP, Enclosure D – HPCI and RCIC Controllers.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
G2.1.28Knowledge of the purpose and function of major system components and controls

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (7) Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
NRC Early Review
RO

Associated objective(s):
Simulator Familiarization
Performance Terminal
Describe the operation of each type of control device installed on the Control Room Panels.

68	K/A Importance: 2.8 / 3.7			Points: 1.00
R68	Difficulty: 2.00	Level of Knowledge: Low	Source: NEW	81927

Per MOP13, Conduct of Refueling and Core Alterations, the Refuel Floor Coordinator is in charge of what on the refuel floor?

A. ALL activities.

B. Core Alterations ONLY.

C. ANY movement of fuel ONLY.

D. Everything EXCEPT Core Alterations.

Answer: D

Answer Explanation:
Per MOP 13, Section 3.2.6, the Refuel Floor Coordinator is in charge of the Refuel Floor, with the exception of core alterations, and should be on the Refuel Floor when major evolutions are in progress.

Therefore, the examinee must recall that the Refuel Floor Coordinator is in charge of ALL refuel floor activities, with the exception of Core Alterations.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The examinee could determine that all personnel on the refuel floor report to the Refuel Floor Coordinator, including the Refuel Floor Supervisor who is in charge of overseeing Core Alterations. Therefore, the examinee could conclude that the Refuel Floor Coordinator is in charge of ALL refuel floor activities. This in incorrect because MOP 13 Section 3.2.2 states that the Refuel Floor Supervisor shall hold a Senior Reactor Operator (SRO) or a modified (limited to fuel handling) SRO license and the Refuel Floor Supervisor shall have no other responsibilities or duties other than the supervision of core alterations and 3.2.3 states that the Refuel Floor Supervisor shall report to the Shift Manager, ergo the Refuel Floor Coordinator is not in charge of Core Alterations.
B. The examinee could confuse the role of the Refuel Floor Coordinator with that of the Refuel Floor Supervisor and conclude that the Refuel Floor Coordinator is only in charge of Core Alterations. This is incorrect because MOP 13 Section 3.2.2 states that the Refuel Floor Supervisor shall hold a Senior Reactor Operator (SRO) or a modified (limited to fuel handling) SRO license and the Refuel Floor Supervisor shall have no other responsibilities or duties other than the supervision of core alterations.
C. The examinee could determine that any fuel movements are the responsibility of the Refuel Floor Coordinator including fuel movements in the spent fuel pool and in the reactor. However, this is incorrect because movement of fuel in the reactor is considered a Core Alteration and thus the responsibility of the Refuel Floor Supervisor as per MOP 13 Section 3.2.2.

Reference Information:

MOP13 – Conduct of Refueling and Core Alterations.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
G2.1.41 Knowledge of the refueling process

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
RO

Associated objective(s):
Administrative Conduct Manuals - Licensed Operators/STA

Performance Terminal

Describe methods used to control Operation's activities during refueling outages, including:

a. Refuel Floor Supervisor's responsibilities during refueling outages.
b. Minimum Refuel Floor complement during core alterations.
c. Access control for the Refuel Floor when core alterations are in progress.
d. Methods for controlling refuel floor activities during non-refuel outage conditions.

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69	K/A Importance: 2.9/4.1			Points: 1.00
R69	Difficulty: 2.00	Level of Knowledge: Low	Source: NEW	81667

An Engineering Design Package (EDP) was installed on the HPCI system in MODE 1 to correct a system INOPERABILITY issue.

The Post Maintenance Test (PMT) is being reviewed for adequacy.

Who is responsible for reviewing the PMT to determine if requirements for performing the test are supported by present plant conditions?

A. Shift Manager.

B. Work Group Supervisor.

C. EDP Owner / Responsible Engineer.

D. Control Room Licensed Nuclear Operator.

Answer: A

Answer Explanation:
Per MOP05, Section 2.6 Post Maintenance Testing (PMT) and WO Completion, Step 2.6.1: The Shift Manger is responsible to review PMT to determine if requirements for testing meet present plant condition.

Therefore, the examinee must recall that the Shift Manager is responsible for reviewing the PMT to determine if requirements for performing the test meet present plant conditions.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. Work Group Supervisors review PMTs identified as being shop work or for work orders determined not to require Operations review. Also, Work Group Supervisors are contacted if plant conditions do NOT permit performance of the PMT for resolution per MOP05 Step 2.6.1.2. However, for a PMT to restore HPCI OPERABILITY would not be reviewed by the WGS and would instead be the responsibility of a Shift Manager.
C. EDP Owners / Responsible Engineers sign off steps in the work order to signify concurrence with PMT test results per MOP05 Step 2.6.4. However, EDP Owners / Responsible Engineers do not review the PMT to determine if requirements for performing the test meet present plant conditions, which is the responsibility of a Shift Manager.
D. Control Room Licensed Nuclear Operator (CRLNO) is contacted to clear and remove the information dot in the Main Control Room at the completion of the PMT and before the equipment is returned to service per MOP05 Step 2.6.5.5. However, the CRLNO does not review the PMT to determine if requirements for performing the test meet present plant conditions, which is the responsibility of a Shift Manager.

Reference Information:

MOP05, Control of Equipment, Section 2.6, Post Maintenance Testing (PMT) and WO Completion.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
G2.2.21Knowledge of pre- and post-maintenance operability requirements

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
RO

Associated objective(s):
Administrative Conduct Manuals - Licensed Operators/STA

Performance Terminal
Describe the general requirements for controlling maintenance and modification activities, including:

a. Whose signature is required in order to begin maintenance.
b. What to do if special requirements are involved such as heavy loads, scaffolds, welding, grinding, fire permits, challenges to containment, or barriers.

70	K/A Importance: 3.6/4.5			Points: 1.00
R70	Difficulty: 3.00	Level of Knowledge: Low	Source: BANK	83627

The following conditions exist:

- ALL RPV Head Closure Bolts are FULLY TENSIONED.
- Reactor Coolant System Temperature is 185°F.
- The Reactor Mode Switch is in REFUEL.
- LCO 3.10.4, Single Control Rod Withdrawn - Cold Shutdown, does NOT apply.

Based on these conditions, which ONE of the following is the correct MODE of operation per Technical Specifications?

A. MODE 2, Startup.

B. MODE 3, Hot Shutdown.

C. MODE 4, Cold Shutdown.

D. MODE 5, Refuel.

Answer: A

Answer Explanation:
Per Technical Specifications Table 1.1-1 MODES (see below):

Table 1.1-1 (page 1 of 1)
MODES

MODE	TITLE	REACTOR MODE SWITCH POSITION	AVERAGE REACTOR COOLANT TEMPERATURE (°F)
1	Power Operation	Run	NA
2	Startup	Refuel[a] or Startup/Hot Standby	NA
3	Hot Shutdown[a]	Shutdown	> 200
4	Cold Shutdown[a]	Shutdown	≤ 200
5	Refueling[b]	Shutdown or Refuel	NA

(a) All reactor vessel head closure bolts fully tensioned.

(b) One or more reactor vessel head closure bolts less than fully tensioned.

Therefore, the examinee must recall that, with the Mode Switch in REFUEL and all RPV Head Bolts fully tensioned, note (a) applies and the reactor is considered to be in MODE 2 STARTUP regardless of RCS Temperature.

Distractor Explanation:
Distractors are incorrect and plausible because:
B. This distractor would be true if RCS Temperature exceeded 200°F with the Reactor Mode Switch in SHUTDOWN.
C. This distractor would be true if the Reactor Mode Switch was in SHUTDOWN.
D. This distractor would be true with ONE RPV Head Closure Bolt Less Than Fully Tensioned.

Reference Information:

Technical Specifications Table 1.1-1 MODES.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
G2.2.35 Ability to determine Technical Specification Mode of Operation

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Technical Specifications for Licensed Operators
Performance Enabler
Given a set of plant conditions and a copy of Section 1.1 of the Technical Specifications, state the plant MODE.

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71	K/A Importance: 2.9/2.9			Points: 1.00
R71	Difficulty: 2.00	Level of Knowledge: Low	Source: BANK	81366

You have just left a contaminated area and are required to perform a frisk using a hand-held frisker.
When you walk up to the frisker, you notice the following:

- The alarm lamp is NOT lit.
- It is ON with power available.
- The Range Switch is in the X1 position.
- The meter needle is indicating 320 CPM.
- The Response Switch is in the SLOW position.

What is your next action?

A. Contact Radiation Protection.

B. Place the Range switch in the X10 position.

C. Place the Response switch in the Fast position.

D. Perform a whole-body frisk that will take approximately three minutes.

Answer: A

Answer Explanation:
Per MRP04 Enclosure B, Instructions for use of Contamination Monitors, the frisker should be on the X1 range, selected to slow response and with a background reading less than 200 cpm.

Therefore, the examinee must recognize that, with a reading above 200 cpm, the correct action is to contact Radiation Protection.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. The examinee could determine that, with the high background reading, the correct action is to place the Range switch in the x10 position to attenuate the background signal to perform the frisk. This is plausible since placing the instrument on the x10 scale would bring the reading to ~32 cpm, which is below the 200 cpm requirement to perform a frisk. This is incorrect, however, since MRP04 requires the switch to be placed in the x1 position.
C. The examinee could determine that the reason for the high background reading is because the meter's response is selected to slow, which is causing a higher meter deflection for the same background. This distractor is plausible since the examinee could conclude that the correct action is to place the Response switch in the Fast position to correct this condition and bring the reading to below 200 cpm to allow for performing the frisk. This is incorrect, however, since MRP04 requires the switch to be placed in the Slow position.
D. The examinee could recognize that all switches are in the correct positions and not recognize the significance of the background reading being > 200 cpm. The examinee could therefore assume that a normal frisk, which should take approximately three minutes to perform per the NOTE in Enclosure B of MRP04, can be performed. This is incorrect, however, since MRP04 requires the frisk to NOT be performed and for RP to be notified if background on the meter is 200 cpm or greater.

Reference Information:

MRP04, Radiation Protection Conduct Manual.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
G2.3.5 Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(12) Radiological safety principles and procedures.

NRC Exam Usage
ILO 2013 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):
Administrative Conduct Manuals - Licensed Operators/STA
Cognitive Terminal
Discuss the administrative requirements and responsibilities of the Licensed Operator role

72	K/A Importance: 3.4/3.8			Points: 1.00
R72	Difficulty: 2.00	Level of Knowledge: Low	Source: MODIFIED	81148

An accident has occurred which requires you to take action to mitigate the accident in order to protect valuable property.

Radiation levels in the area where the actions are to be performed are 15,000 mrem/hr.

Emergency exposure TEDE limit for mitigating an accident or protecting valuable property has been authorized by the Emergency Director.

The MAXIMUM stay time for you under these circumstances is _____.

A. 20 minutes

B. 40 minutes

C. 60 minutes

D. 100 minutes

Answer: B

Answer Explanation:
Note: ALL of EP-201-03 will be provided with the exam. The examinee will have to select the correct table, Table 2 for this question, to determine the allowable Emergency Dose Limit to facilitate performance of the calculation below.
Per EP-201-03 Table 2, the dose limit to mitigate an accident or protect valuable property is 10 REM TEDE Whole Body. 10000/15000 = 0.66 (60 mins) = 40 mins

Distractor Explanation:
A. 5000/15000 (60 mins) = 20 mins. This distractor is plausible if the examinee determined that the dose limit for the conditions described in the stem of the question was the same as the Federal Occupational Dose Limit (Annual) given in EP-201-03 Table 1.
C. 15000/15000 (60 mins) = 60 mins. This distractor is plausible if the exainee determined that the dose limit for the conditions described in the stem of the question was 15 REM TEDE, which is plausible because 15 REM TEDE is the Federal Occupational Dose Limit (Annual) for the Lens of the Eye given in EP-201-03, Table 1.
D. 25000/15000 (60 mins) = 100 mins. This distractor is plausible if the examinee determined that the dose limit for the conditions described in the stem of the question was 25 Rem TEDE, which is incorrect because that is the limit for saving lives or protecting large populations given in EP-201-03 Table 3.

Reference Information:
EP-201-03, Variances from Routine Radiological Practice and Procedures During an Emergency, Table 2 (pg 6)

Plant Procedures
EP-201-03

Question Use
ILO
Open Reference provided on NRC Exam - ***EP-201-3, "Emergency Extensions Exceeding Federal Occupational Dose Limits"***
RO

NUREG 1123 KA Catalog Rev. 2
G2.3.13 Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2006 Exam
ILO 2017 Exam
ILO 2019 Exam
LOR 2013 Exam
LOR 2015 Exam

NRC Question Use (ILO 2019)
Low
MODIFIED
RO

Associated objective(s):
Administrative Conduct Manuals - Licensed Operators/STA

Performance Terminal

Describe the requirements that must be followed accessing High Radiation, Locked High Radiation, or Very High Radiation Areas at Fermi 2.

INITIAL QUALIFICATION

Performance Terminal

Describe the "Emergency Exposure Guidelines" for emergency workers including:

a. The limits imposed by these guidelines.
b. Who may authorize emergency workers to receive these exposures.
c. Criteria that must be met prior to authorizing these exposures.

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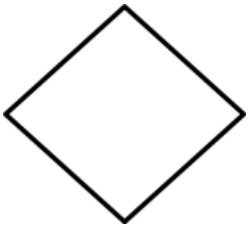
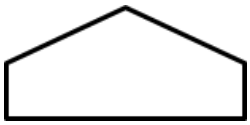
73	K/A Importance: 3.8/4.5			Points: 1.00
R73	Difficulty: 2.00	Level of Knowledge: Low	Source: BANK	84328

What do the following EOP flowchart symbols indicate?

1. 

2. 

A. 1) Instructional step
2) Hold step

B. 1) Instructional Step
2) Before step

C. 1) Decision step
2) Hold step

D. 1) Decision step
2) Before step

Answer: D

Answer Explanation:
Per Appendix F of the Fermi 2 Procedure Writers Guide, Section 6.0 Graphic Symbols:

6.3 – Action Step Symbol is a rectangle (Figure 21).
6.4 – Decision Step Symbol is a diamond (Figure 22).
6.6 – Hold Step Symbol is a hexagon (Figure 24).
6.8 – Before Step Symbol is a flat-bottom pentagon (Figure 26).
2.1.3 - Instructional steps are enclosed in rectangles (also known as Action Steps (6.3, Figure 21)

Distractor Explanation:
Distractors are incorrect and plausible because:

A. (1) The examinee could confuse the shape used for the Decision step with the shape used for the Instructional step. This is plausible because Decision Step and Instructional steps are closely related and work together in the EOP flowcharts to direct a course of action(s). Since the decision steps contain questions regarding the state of a parameter, the examinee could confuse the question with an instruction. This is incorrect because the shape shown is for a Decision Step which, although its answer will direct the course that leads to an action, the action itself will be in an Instructional Step so no actual actions (instructions) are taken in the Decision step itself. (2) The examinee could confuse the shape used for the Hold/Wait step with that used for the Before step. This is plausible since Hold/Wait and Before are very similar actions. However, this is incorrect as per the graphic symbols key provided by Appendix F of the Fermi 2 Procedure Writers Guide.
B. (1) The examinee could confuse the shape used for the Decision step with the shape used for the Instructional step. This is plausible because Decision Step and Instructional steps are closely related and work together in the EOP flowcharts to direct a course of action. Since the decision steps contain questions regarding the state of a parameter, the examinee could confuse the question with an instruction. This is incorrect because the shape shown is for a Decision Step which, although its answer will direct the course that leads to an action, the action itself will be in an Instructional Step so no actual actions (instructions) are taken in the Decision step itself. (2) This part is correct.
C. (1) This part is correct. (2) The examinee could confuse the shape used for the Hold/Wait step with that used for the Before step. This is plausible since Hold/Wait and Before are very similar actions. However, this is incorrect as per the graphic symbols key provided by Appendix F of the Fermi 2 Procedure Writers Guide.

Reference Information:

Fermi Writers Guide, Appendix F: Emergency Operating Procedure Flowcharts.

Plant Procedures
Fermi Writers Guide App F: EOP Flowcharts

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
G2.4.14Knowledge of general guidelines for EOP usage

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2013 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
RO

Associated objective(s):

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74	K/A Importance: 3.6/4.0			Points: 1.00
R74	Difficulty: 4.00	Level of Knowledge: High	Source: MODIFIED	79987

The plant is currently operating at 100% power in a black board condition when the CRLNO notices that the VAS display shows 3D19 as red, along with VAS Hardware System Trouble and MUX B and C FAILED.

Per Alarm Response Procedure 3D19, Annunciator System Trouble, which of the responses below correctly completes the following statement regarding the impact of these conditions on the VAS system?

This information indicates that the VAS system will incur ____(1)____of functionality and will result in _____(2)_____.

A. (1) loss
(2) loss of redundancy for each side of VAS I/O

B. (1) no loss
(2) loss of P601 through P805 window failures

C. (1) loss
(2) loss of P601 through P805 window failures

D. (1) no loss
(2) loss of redundancy for each side of VAS I/O

Answer: D

Answer Explanation:
ARP 3D19 includes a flowchart on Page 6 that the candidate should refer to based on the information provided in the stem of the question.
Due to the VAS System Hardware Failed and the blackboard condition, the operator should answer N to the question "have a number of false alarm windows turned on?" This should lead the candidate to review the table to determine Data Acquisition Status. Given the failure of MUX B and C, the operator should review Action B, which is located on the next page (page 7). Action B on page 7 describes the impact of a loss of two MUX units that make up one MUX per redundant pair (A&C are redundant to one another and B&D are the other redundant pair).
Per Action B, a failure of this pair (or any other non-redundant pair such as A&D, B&C, C&D or A&B) will result in no loss of VAS functionality, however a loss of redundancy for each side of the VAS I/O will occur.

Note: Question was modified by changing conditions in stem that cause a previously incorrect distractor (D) to be the correct answer. Also, the previously correct answer (C) is now an incorrect distractor.

Distractor Explanation:
Distractors are incorrect and plausible because:
A. The candidate could could correctly read the flowchart in the ARP, which would lead the candidate to Action B. However, the candidate could incorrectly interpret Action B which could lead the candidate to determine that the loss MUX B/C means that a loss of functionality has occurred, which is incorrect because loss of a non-redundant pair does not result in a loss of functionality.
B. The candidate could correctly read the flowchart in the ARP and determine that no loss of functionality occurred. However, the candidate could incorrectly interpret Action B which could lead the candidate to determine that the loss of MUX B/C will result in a loss of annunciators on the P601 through P805 panels, which is incorrect as stated on Action B.
C. The candidate could incorrectly read the flowchart in the ARP, which could lead the candidate to determine that Action C is required and therefore a loss of functionality has occurred, which is incorrect as stated in Action B. Note: This was the correct answer for the previous (bank) version of this question.

Reference Information:
ARP 3D19, Annunciator System Trouble (provided as reference)

Question Use
ILO
Open Reference provided on NRC Exam - ***ARP 3D19, "Annunciator System Trouble"***
RO

NUREG 1123 KA Catalog Rev. 2
G2.4.32Knowledge of operator response to loss of all annunciators

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
MODIFIED
RO

Associated objective(s):
Reactor Operator Qualification Card
Performance Terminal
Respond to 3D19 annunciator system trouble alarm

75	K/A Importance: 2.6/3.8			Points: 1.00
R75	Difficulty: 2.00	Level of Knowledge: Low	Source: NEW	83626

An Alert has been declared and all required Emergency Response Facilities have been activated.
The CRLNO believes there is a leak from an injection system in the Reactor Building.
A Damage Control & Rescue Team (DCRT) comprised of two NOs, two Mechanical Maintenance technicians and an RP tech are being briefed to investigate the leak.
Which Emergency Response Facility is responsible for dispatching the DCRT?

A. Main Control Room (MCR).

B. Technical Support Center (TSC).

C. Operational Support Center (OSC).

D. Emergency Operations Facility (EOF).

Answer: C

Answer Explanation:
Per EP-110, Organization and Responsibilities, Section 4.3, Operational Support Center (OSC) Assignment and Responsibilities:

The OSC is a designated assembly point within the TSC envelope. The OSC provides an area for coordination of shift personnel to support emergency response operations without causing congestion in the Control Room. Personnel reporting to the OSC may include Fire Brigade, Damage Control and Rescue Teams, Onsite RETs, instrument control technicians and general maintenance personnel. The OSC is activated for an Alert, Site Area Emergency, or General Emergency. The OSC Coordinator integrates OSC activities and dispatches emergency personnel on assignments as directed by the Emergency Director.

Therefore, the examinee must use his/her knowledge of the Emergency Response Facilities and their roles and responsibilities to recall that the OSC is activated at an Alert and that it is the responsibility of the OSC to dispatch the emergency personnel once activated.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The MCR is the normal assembly point for dispatching people to investigate plant issue during non-emergency events and also for emergency events at the Unusual Event level when the OSC is not activated. This distractor is incorrect because the OSC takes over this responsibility once active at an Alert or higher.
B. The TSC is activated when emergency conditions escalate to an Alert, Site Area Emergency or General Emergency. The TSC provides plant management and technical support to Control Room personnel and relieves the reactor operators of peripheral duties not directly related to reactor system manipulations during an emergency so it is plausible to assume that the TSC would take over dispatching emergency response teams to relieve the reactor operators of this duty. However, the TSC is only responsible for coordinating the deployment of emergency response teams and not for dispatching the teams.
D. The EOF is activated for an Alert, Site Area Emergency, or General Emergency. The EOF is a command post for the overall management of the offsite emergency response including the coordination of radiological and environmental assessments, the determination of protective actions for the public, and the management of recovery operations. One of the responsibilities of the EOF is to direct and coordinate offsite environmental assessment activities, which includes directing Radiological Emergency Team Coordinator, Dose Assessors, and EOF Laboratory Technicians and offsite Radiological Emergency-response teams (RETs), so it is plausible to assume that the EOF would take over dispatching emergency response teams to relieve the reactor operators of this duty. However, distractor is incorrect because the EOF is not directly responsible for this action.

Reference Information:

EP-110, Organization and Responsibilities.

Question Use
Closed Reference
ILO
RO

NUREG 1123 KA Catalog Rev. 2
G2.4.42Knowledge of emergency response facilities

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
RO

Associated objective(s):
INITIAL QUALIFICATION
Cycle 12-2 Objectives
Performance Terminal
List three types of communication systems used during emergency response operations at Fermi 2.

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76	K/A Importance: 4.0/4.2			Points: 1.00
S76	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	81466

You are the Control Room Supervisor (CRS).

The plant was operating at 100% power when, due to degrading main condenser vacuum, operators inserted a manual scram.

Post scram conditions are as follows:
- Mode Switch is in SHUTDOWN
- Two rods remain FULL OUT
- MSIVs are CLOSED
- SRVs A and G are controlling RPV Pressure
- HPCI ISOLATED
- RCIC had to be MANUALLY started
- RPV level is 100”, rising slowly.
- Suppression Pool temperature is 98°F, rising slowly.
- All "APRM DOWNSCALE" lights are lit.

Which of the following identifies:

(1) The action that you will direct to insert the two Control Rods?

(2) The WIDEST allowable RPV Water level band?

A. (1) From EOP Step FSQ-11, perform 29.ESP.03, Alternate Control Rod Insertion Methods.

(2) -25” to 114”

B. (1) From EOP Step FSQ-11, perform 29.ESP.03, Alternate Control Rod Insertion Methods.

(2) -25” to 214”

C. (1) From 20.000.21, Reactor Scram AOP, perform Condition B for Control Rod(s) failed to fully insert.

(2) -25” to 114”

D. (1) From 20.000.21, Reactor Scram AOP, perform Condition B, for Control Rod(s) failed to fully insert.

(2) -25” to 214”

Answer: D

Answer Explanation:

Per 20.000.21, Reactor Scram AOP, the SRO examinee must direct the performance of Condition B for Control Rods that failed to insert. Condition B provides guidance to fully insert control rods using either the normal method (23.623) OR, with Shift Manager concurrence, using alternate methods listed in 29.ESP.03, Alternate Control Rod Insertion Methods.

Since all Control Rods are not inserted past the Minimum Subcritical Banked Withdrawal Position (Position 02 at Fermi 2) and the Rx will not remain shutdown under ALL conditions without boron (more than 1 rod full out), the SRO examinee must recognize that 29.100.01, Sheet 1A – RPV Control ATWS, must be entered. The SRO examinee must recall that, on the Failure to Scram Level (FSL) leg, if power is <3% upon initial entry, that drastic level reduction actions are not required. With the reactor effectively shutdown, the SRO examinee must recall that FSL-17 allows for a wide level band of -25" to 214" under these conditions.

This question requires the SRO examinee to differeniate between the statement in step RC-3, "will the Rx remain S/D under ALL conditions w/o boron" and the second statement in FSQ-OR1, "Rx is S/D with no boron injection". The first statement in RC-3, at Fermi 2 simply means are 184 Control Rods fully inserted (or is only 1 rod out). If only 1 rod is out, then the Fermi 2 Shutdown Margin requirements are met and the SRO would direct actions from Sheet 1 - RPV Control. The second statement, in FSQ-OR1, is basically defining conditions under which the Rx is S/D, on control rods alone (i.e., without boron injection) and at Fermi 2 is defined as all APRMs are below their downscale trip setpoints of 5%.

In the stem of this question, since two rods are out, the SRO should recall that Sheet 1 must be exited and Sheet 1A, RPV Control - ATWS, entered because SDM requirements are not met. Then, in the Power (FSQ) leg of Sheet 1A, the SRO should recall that FSQ-OR1, second statement is met so the actions of the FSQ leg (including step FSQ-11 to use 29.ESP.03 to insert Control Rods) will NOT be performed. Instead, the 20.000.21, Scram AOP, will be performed and Action B directed to insert the 2 Control Rods. Although 20.000.21, Condition B, does allow use of 29.ESP.03 to insert control rods, this procedure is not explicitly directed by the SRO as it also requires SM concurrence.

<u>Distractor Explanation:</u>
Distractors are incorrect and plausible because:

A. Direction to perform 29.ESP.03 is plausible for two reasons. First, this method is allowed in Condition B of the Scram AOP with Shift Manager concurrence. Also, the Failure to Scram Power (FSQ) leg of 29.100.01, Sheet 1A provides direction for performance of 29.ESP.03; However with power out of the heating range after the scram (APRMs below the downscale trip setpoint of 5% at Fermi 2), the FSQ leg will be exited and the Scram AOP performed per the second override statement in FSQ-OR1. Therefore, this answer is incorrect since the CRS will direct performance of Scram AOP Condition B and not 29.ESP.03 directly.
   A -25 to 114" level band is plausible since the FSL leg directs that RPV water level be kept <114" for any ATWS condition with power >3% to reduce the likelihood of developing thermal hydraulic instabilities. The SRO examinee could incorrectly recall that the highest RPV level allowed for any ATWS is 114", which is not correct for low power (<3%) failure-to-scram conditions.
B. Direction to perform 29.ESP.03 is plausible for two reasons. First, this method is allowed in Condition B of the Scram AOP with Shift Manager concurrence. Also, the Failure to Scram Power (FSQ) leg of 29.100.01, Sheet 1A provides direction for performance of 29.ESP.03; However with power out of the heating range after the scram (APRMs below the downscale trip setpoint of 5% at Fermi 2), the FSQ leg will be exited and the Scram AOP performed per the second override statement in FSQ-OR1. Therefore, this answer is incorrect since the CRS will direct performance of Scram AOP Condition B and not 29.ESP.03 directly.
   The level band given is correct.
C. The rod insertion actions given are correct.
   A -25 to 114" level band is plausible since the FSL leg directs that RPV water level be kept <114" for any ATWS condition with power >3% to reduce the likelihood of developing thermal hydraulic instabilities. The SRO examinee could incorrectly recall that the highest RPV level allowed for any ATWS is 114", which is not correct for low power (<3%) failure-to-scram conditions.

<u>10 CFR 55.43(b)(5) SRO Justification:</u>
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires assessment of plant conditions and then selection of a procedure to mitigate or recover, or with which to proceed.

The question cannot be answered solely by knowing "systems knowledge", or solely by knowing immediate operator actions, or solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs, or solely by knowing the purpose, overall sequence of events, or mitigative strategy of a procedure. The SRO examinee must assess plant conditions and select the correct EOP/AOP section as well as EOP level leg to direct mitigating actions.

Reference Information:

20.000.21, Reactor Scram
29.100.01, Sheet 1A – RPV Control ATWS

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
295006 SCRAM
295006 AA2. Ability to determine and/or interpret the following as they apply to SCRAM :
295006 AA2.03 Reactor water level

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
SRO

Associated objective(s):
RPV Control

Performance Terminal
Describe the plant condition that would require use of the alternative actions contained in 29.100.01 Sh 1, 1A, 3, and 3A, including:

a. Alternate Level Control
b. Emergency RPV Depressurization
c. RPV Flooding
d. deleted
e. Steam Cooling
f. RPV Control - ATWS

77	K/A Importance: 3.6/4.6			Points: 1.00
S77 - V2	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	81128

The plant is in MODE 3 with RPV Pressure at 80 psig. The following conditions exist:

- All plant equipment is available.
- RHR Pump C was recently started.
- Division 1 RHR is in the Shutdown Cooling Mode.

RHR Pump C subsequently tripped on overcurrent due to a shorted motor winding.

(1) How many RHR Shutdown Cooling subsystems are currently OPERABLE?

(2) What Action should the CRS direct to restore at least one RHR Shutdown Cooling subsystem to operation.

A. (1) Three.
(2) Start RHR Pump A.

B. (1) One.
(2) Start RHR Pump A.

C. (1) Two.
(2) Place Division 2 RHR in SDC.

D. (1) One.
(2) Place Division 2 RHR in SDC.

Answer: A

Answer Explanation:
Per Tech Spec BASES B 3.4.8, Each RHR shutdown cooling loop consists of two subsystems. An OPERABLE RHR shutdown cooling subsystem consists of one
OPERABLE RHR pump, one heat exchanger, and the associated piping and valves. The two subsystems have a common suction source and are allowed to have a common heat exchanger and common discharge piping.

Therefore, the SRO examinee must recall this definition from Tech Spec Bases and determine that three (3) RHR Shutdown Cooling sub-systems are OPERABLE.
Given that one sub-system in the Division 1 RHR SDC Loop is OPERABLE, the correct course of action is to direct Action E.1 to start RHR Pump A and restore Division 1 RHR SDC to operation to meet LCO 3.4.8.

Note: When considering the plausibility of the distractors below, consider the TS BASES definition of a LPCI subsystem from B 3.5.1, which states "There are two LPCI sub-systems, each consisting of two motor driven pumps and piping and valves to transfer water from the suppression pool to the RPV." It is a common misconception among SRO candidates to assume that a sub-system in LCO 3.4.8 requires 2 RHR pumps by confusing the BASES for LCO 3.5.1 with that of LCO 3.4.8.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. The SRO examinee could incorrectly recall that, to meet the LCO, both pumps in each of the two loops must be OPERABLE and, therefore, determine that, with the A pump tripped, Division 1 is INOP thus only ONE sub-system (Division 2) is OPERABLE. This is not correct, since the two Division 2 pumps (and piping, HX, etc.) satisfy the LCO requirement for 2 sub-systems, not one. This, plus the C pump in Division 1 make 3 sub-systems OPERABLE. The examinee could then conclude that, altough the Division 1 sub-system is INOPERABLE, it is still available and should be used to restore SDC to service in the most expeditious manner.

C. The SRO examinee could incorrectly recall that an OPERABLE RHR SDC sub-system requires just one of its divisional RHR pumps and its associated HX, piping, etc. to be OPERABLE. This is plausible because of the confusion between LCOs 3.4.8 and 3.5.1 described above. This could lead the examinee to conclude that the Division 1 sub-system is OPERABLE due to the availability of Pump A and the Division 2 sub-system is OPERABLE due to the availability of Pumps B or D. This is incorrect since three RHR SDC sub-systems are OPERABLE as described above. The examinee could then conclude that Division 2 RHR should be placed in service to restore SDC due to the availability of a redundant RHR pump in that division.

D. The SRO examinee could incorrectly recall that, to meet the LCO, both pumps in each of the two loops must be OPERABLE and, therefore, determine that, with the A pump tripped, Division 1 is INOP thus only ONE sub-system (Division 2) is OPERABLE. This is not correct, since the two Division 2 pumps (and piping, HX, etc.) satisfy the LCO requirement for 2 sub-systems, not one. This, plus the C pump in Division 1 make 3 sub-systems OPERABLE. This incorrect line of thinking could also lead the examinee to determine that RHR must be restored by plaxing Division 2 RHR in service.

10 CFR 55.43(b)(2) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires knowledge of TS bases that are required to analyze TS-required actions and terminology.

The question cannot be answered solely by knowing </= 1-hour TS/TRM Actions, or solely by knowing LCO/TRM information listed "above the line," or solely by knowing the TS safety limits.

Reference Information:

Tech Spec BASES B 3.4.8, RHR Shutdown Cooling System-Hot Shutdown.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
295021 Loss of Shutdown Cooling
G2.2.37 Ability to determine operability and/or availability of safety related equipment

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (2) Facility operating limitations in the technical specifications and their bases.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
SRO

Associated objective(s):
Residual Heat Removal (E1100)
Cognitive Enabler
Describe the RHR System technical specification limiting conditions for operation, their bases, the associated surveillance requirement(s), and their relationship to operability.

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78	K/A Importance: 3.2/4.6			Points: 1.00
S78	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	81127

The plant is in MODE 5 nearing completion of a refueling outage. The fuel pool gates have been installed and Reactor Cavity Level lowered below the elevation of the Spent Fuel Pool weirs. Movement of spent fuel is in progress on the Refuel Floor when the following timeline of events occurs:

- 0800 – 2D1, Fuel Pool Water Level Low is received.
- 0810 – 3D35, Div I/II Fuel Pool Vent Exhaust Radiation Monitor Upscale Trip is received.
- 0840 – A rise is noted on the RB5 Spent Fuel Pool ARM (Ch.15).
- 0900 – Spent Fuel Pool Level lowers to 33 ft.

Which of the above times was the EARLIEST that required entry into the Emergency Plan?

A. 0800

B. 0810

C. 0840

D. 0900

Answer: C

Answer Explanation:
Note: EP-101, Classification of Emergencies, Enclosure A will be provided to the examinee to answer this question.

Per EP-101, Classification of Emergencies, Enclosure A Section R, Part 2 – Irradiated Fuel Event:

At time 0800 2D1 alarming satisfies half of the required EALs for RU2.1. At time 0840 ARM Channel 15 for the RB5 Spent Fuel Pool indicated a rise in its reading. This meets the second part of the Emergency Action Levels (EALs) of RU2.1 which, along with the first part of alarm 2D1 (at 0800), signifies that conditions for an Unusual Event (RU2) first occurred at time 0840.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. At time 0800, indications of SFP lowering is evident by receipt of 2D1. This makes this distractor plausible since unplanned water level drop in the refueling pathway is one half of the emergency action threshold criteria for an Unusual Event (RU2.1). This distractor is incorrect because the second half of the EAL is not met due to no indication of an unplanned rise in area radiation levels.
B. At time 0810 – 3D35, Div I/II Fuel Pool Vent Exhaust Radiation Monitor Upscale Trip is received. This alarm will cause a Secondary Containment isolation and it occurs at 3 mR/hr. A common misconception is that this alarm occurs at 5 mR/hr, which is the EOP entry condition for Secondary Containment on high FP Vent Exh radiation. This distractor is plausible because Fuel Pool Vent Exhaust Radiation Monitor >/= 5 mR/hr is in the EAL for RA2.2. This distractor is incorrect because the FP Vent Exhaust Trip occurs at 3 mR/hr, and because the stem does not provide indication of damage to irradiated fuel. Lastly, although the FP Vent Exhaust Rad Monitor reading has increased, it is not listed under RU2.1 and no indication of a rise in rad levels on the ARMs listed under RU2.1 has yet occurred.
D. The SRO examinee may fail to recognize the conditions explained above that satisfy the EALs for an Unusual Event under RU2.1 but recognize that lowering of spent fuel pool level to Level 2, as indicated by level </= 33 ft, meets the threshold for EAL RA2.3, which is plausible because it alone would satisfy the EAL and would require entry into the E-Plan for an Alert at time 0900 under RA2.3 However, this distractor is incorrect because an Unusual Event should have been recognized and declared at time 0840 as described above.

10 CFR 55.43(b)(5) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires assessing plant conditions and then determining when entry of an emergency procedure (the Emergency Plan) is required. Although EOP entry conditions are RO level of knowledge, the ROs at Fermi 2 do not have to know entry conditions into the E-Plan. This is specifically SRO knowledge.

The question cannot be answered solely by knowing "systems knowledge", or solely by knowing immediate operator actions, or solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs, or solely by knowing the purpose, overall sequence of events, or mitigative strategy of a procedure.

Reference Information:

EP-101, Classification of Emergencies
2D1 - Fuel Pool Water Level Low
3D35 - FP Vent Exh Radn Mon Upscale Trip

Question Use
ILO
Open Reference provided on NRC Exam - ***EP-101*, *"Classification of Emergencies," Enclosure A, Pages 1 through 3***
SRO

NUREG 1123 KA Catalog Rev. 2
295023 Refueling Accidents
295023 AA2 Ability to determine and/or interpret the following as they apply to REFUELING ACCIDENTS:
295023 AA2.05 Entry conditions of emergency plan

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
SRO

Associated objective(s):
EMERGENCY CLASSIFICATION & PROTECTIVE ACTION RECOMMENDATIONS
Performance Terminal
Properly classify conditions into one of the four classifications

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79	K/A Importance: 3.3/4.0			Points: 1.00
S79	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	81046

You are the Control Room Supervisor (CRS). The reactor was scrammed due to a loss of condenser vacuum. The following plant conditions exist.

- Reactor Power is 32%.
- Reactor Water Level is -12".
- RPV injection is from HPCI, SBFW and RCIC.
- The STA just informed you that the HCL curve has been exceeded.

What direction will you give next and why?

A. Open SRVs as necessary, ignore cooldown rate, to reduce RPV pressure below the HCL.

B. Open 5 SRVs, ADS preferred, to avoid failure of the containment and equipment necessary for the safe shutdown of the plant

C. Order out 29.ESP.11, Defeat of RPV Level 1 & High Rad MSIV & Main Steam Line Drain Valve Isolation Signals, to allow MSIVs to be re-opened.

D. Terminate and Prevent all injection into the RPV except Boron Systems, CRD and RCIC, to minimize the potential for rapid injection of large amounts of cold, unborated water.

Answer: D

Answer Explanation:
The examinee must recall that, per the TWT Leg, exceeding the HCL curve requires the RPV be Emergency Depressurized per step TWT-5 when Torus water temp and RPV pressure cannot be kept <HCL. The examinee must then recall that normal ED (Contingency #3) methods cannot be used due to the ATWS conditions present and therefore Terminate and Prevent must be directed per BWROG EPGs/SAGs, Appendix B page B14-24. This is done because, if emergency depressurization of the RPV is required, these systems must be operated to minimize the potential for rapid injection of large amounts of cold, unborated water into the core region as RPV pressure decreases below pump shutoff head.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This distractor is plausible because it is directed from FSP-OR2 if Torus Water Temperature cannot be kept <HCL and it would be correct if the HCL curve had not yet been exceeded, or if the WHEN step for the HCL stated that it was permissible to restore and keep Torus Water Temperature <HCL. However, since the HCL has been exceeded, and the WHEN step does not state “restore and kept”, then once the HCL is exceeded, the correct action is to ED. Additionally, opening SRVs to restore RPV pressure <HCL is not a viable strategy since, once the SRVs are closed, RPV pressure will rise again and the additional heat input due to SRV opening will make the HCL even more restrictive. Each additional SRV opening increases the likelihood of uncontrolled RPV injection, which is why T&P should be performed for these plant conditions.
B. This distractor is plausible because it is required by step TWT-5 when Torus Water Temperature and RPV pressure cannot be kept <HCL, conditions that are represented by the stem of the question, and would be true if the plant were not in an ATWS condition. The reason for performing the ED under these conditions are from BWROG EPGs/SAGs, Appendix B page B-7-18 and are true when the HCL is exceeded. However, since the HCL was exceeded in this case due to heat input to the Torus, because the plant is still at power, before the ED is directed, the CRS shall order T&P per step FSL-19 for the reasons outlined above.
C. This distractor is plausible because it is directed from FSP-OR2 and it would be correct, and a viable strategy, to restore the condenser as a heat sink to prevent Torus Water Temperature from rising to the HCL. However, since the HCL has been exceeded, and since step TWT-5 is not a “restored and kept” step, this distractor is incorrect because the ED must be performed after a T&P is complete.

10 CFR 55.43(b)(5) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires the SRO to assess plant conditions, in an emergency, and then select the procedure with which to proceed.

The question cannot be answered solely by knowing "systems knowledge", or solely by knowing immediate operator actions, or solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs, or solely by knowing the purpose, overall sequence of events, or mitigative strategy of a procedure.

Reference Information:

29.100.01 Sheet 2, Primary Containment Control.
29.100.01, Sheet 1A, RPV Control-ATWS
BWROG EPGs/SAGs, Appendix B.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
295026 Suppression Pool High Water Temperature
G2.4.18 Knowledge of the specific bases for EOPs

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
SRO

Associated objective(s):
Primary Containment Control
Cognitive Terminal
Given a set of plant parameters that meet the entry conditions, execute Fermi 2 Emergency Operating Procedures in accordance with management expectations.

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80	K/A Importance: 3.8/4.5			Points: 1.00
S80	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	81446

You are the Control Room Supervisor (CRS).

A Loss of Offsite Power (LOP) and high-powered ATWS have occurred. RPV level is being controlled below Top of Active Fuel (TAF) for Level/Power Control.

Drywell Temperature is 202°F and rising and Drywell Pressure is 1.50 psig and rising.

What is (1) the status of cooling water flow to the Drywell and (2) the action you will direct to mitigate the rising Drywell Temperature?

A. (1) Isolated.

(2) Operate ALL available Drywell Cooling per 29.ESP.08, Drywell Cooling Water Restoration.

B. (1) Isolated.

(2) Start any available Drywell Cooling Fan per 8D41 (17D41), Div I (II) Drywell Temperature High.

C. (1) Not isolated.

(2) Operate ALL available Drywell Cooling per 29.ESP.08, Drywell Cooling Water Restoration.

D. (1) Not isolated.

(2) Start any available Drywell Cooling Fan per 8D41 (17D41), Div I (II) Drywell Temperature High.

Answer: D

Answer Explanation:
A complete loss of offsite power will result in a loss of all RBCCW pumps and subsequent start of EECW when the EDGs restore power to the essential busses. When the EDGs restore power, EECW will divorce from RBCCW however the drywell cooling isolation valves will remain open.

Lowering RPV level below Level 1 (32” above TAF) will result in all single speed Drywell Cooling Fans tripping off. However, Drywell Cooling Fan power is restored when the EDGs restore power to the essential busses and the fans can be started by manual operator action to restore cooling to the Drywell.

Therefore, the SRO examinee must determine that cooling flow to the Drywell is NOT isolated and the correct course of action is to direct that all available Drywell Cooling Fans be started to mitigate the rising Drywell Temperature.

Note: This direction is important because cooling flow to the Drywell WILL isolate if Drywell Pressure reaches 1.68 psig. Starting the Drywell Cooling Fans can prevent this from occurring.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. A common misconception is that EECW isolates to/from the Drywell upon any system initiation, which is incorrect. It is also plausible for an examinee to determine that EECW isolated to/from the Drywell at either Level 2 (110.8”) or Level 1 (32”) when RPV water level was lowered for Level/Power Control, which is also incorrect. Direction to perform 29.ESP.08 is given in step DWT-3, which is directly after the WHEN step that is passed through when DWT exceeds 145°F (EOP entry condition). It is plausible for the examinee to recall this step and determine that 29.ESP.08 is the correct course of action. However, 29.ESP.08 will not mitigate the rising Drywell Temperature because no Drywell Cooling Fans are running due to RPV level being <Level 1.
B. A common misconception is that EECW isolates to/from the Drywell upon any system initiation, which is incorrect. It is also plausible for an examinee to determine that EECW isolated to/from the Drywell at either Level 2 (110.8”) or Level 1 (32”) when RPV water level was lowered for Level/Power Control, which is also incorrect.
C. Direction to perform 29.ESP.08 is given in step DTW-3, which is directly after the WHEN step that is passed through when DWT exceeds 145°F (EOP entry condition). It is plausible for the examinee to recall this step and determine that 29.ESP.08 is the correct course of action. However, 29.ESP.08 will not mitigate the rising Drywell Temperature because no Drywell Cooling Fans are running due to RPV level being <Level 1.

10 CFR 55.43(b)(5) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires the SRO examinee to assess plant conditions and then select the procedure to mitigate the degrading conditions.

The question cannot be answered solely by knowing "systems knowledge", or solely by knowing immediate operator actions, or solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs, or solely by knowing the purpose, overall sequence of events, or mitigative strategy of a procedure.

Reference Information:

29.ESP.08, Drywell Cooling Water Restoration
8D41, DIV I DRYWELL TEMPERATURE HIGH
17D41, DIV II DRYWELL TEMPERATURE HIGH

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
295028 High Drywell Temperature
G2.4.8 Knowledge of how abnormal operating procedures are used with EOPs

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
NRC Early Review
SRO

Associated objective(s):
Primary Containment Control
Cognitive Terminal
Given a set of plant parameters that meet the entry conditions, execute Fermi 2 Emergency Operating Procedures in accordance with management expectations.

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81	K/A Importance: 3.5/4.3			Points: 1.00
S81	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	81506

While operating the reactor in MODE 1, a fission product release into the reactor coolant occurs. Current plant conditions are:

- Reactor is shutdown following the SCRAM.
- Reactor Pressure is 940 psig.
- RPV level in +100 inches.
- Main Steam Line C Inboard & Outboard MSIVs failed to close.
- The Main Turbine is tripped.
- Dose assessment indicates site boundary doses are 980 mrem (TEDE) and 500 mrem (Adult Thyroid) and rising.

(1) What action does the Emergency Operating Procedures require?
(2) What is the event classification?

A. (1) Emergency Depressurize the RPV.
(2) Alert.

B. (1) Emergency Depressurize the RPV.
(2) Site Area Emergency.

C. (1) Use the SRV's to commence a reactor cool down at less than 90°F/hr rate.
(2) Site Area Emergency.

D. (1) Use the SRV's to commence a reactor cool down at less than 90°F/hr rate.
(2) General Emergency.

Answer: B

Answer Explanation:
Answer Explanation:
Note: The examinees will be provided EP-101, Enclosure A, as a reference for this question.
Per 29.100.01, Sheet 5, the EOPs require Emergency Depressurization BEFORE offsite radiation release rates reach the General Emergency (GE) release rate.
EP-101, Enclosure A, Table R defines the Site Area Emergency (SAE) offiste radiation release rate, as determined by dose assessment as stated in the stem of the question, as doses >100 mrem TEDE or 500 mrem thyroid CDE at or beyond the site boundary.
EP-101, Enclosure A, Table R defines the GE offiste radiation release rate, as determined by dose assessment as stated in the stem of the question, as doses >1,000 mrem TEDE or 5,000 mrem thyroid CDE at or beyond the site boundary.

Therefore, the SRO examinee must interpret the offsite radiation release rate information given in the stem of the question as being above the Site Area Emergency action threshold and approaching the GE threshold. The SRO examinee must also recall that, with offisite radiation release rates approaching the GE release rate, Emergency RPV Depressurization is required by the Radioactive Release leg of the EOPs.

Distractor Explanation:
Distractors are incorrect and plausible because:
A. EOP Sheet 5 requires an ED prior to GE release rate. Also, the examinee could incorrectly convert between Rem (in the stem of the question) and mrem (in EP-101) and conclude that dose rates at the site boundary are not yet at the Site Area Emergency level. Also, since dose throid dose is at 0.5 R (500 mrem) the examinee could misread and assume that BOTH the TEDE AND thyroid dose levels must be exceeded for an SAE. This distractor is incorrect, however, because the SAE radioactivity release level for TEDE dose has been exceeded.
C. Sending steam from the RPV to the Torus is an available method of cooling down the RPV with the MSIV closed and 90°F/hr is the normal cooldown rate. The examinee could incorrectly recall the conditions that require an ED and assume a normal cooldown is required. However, offsite radiation release rates dictate that an ED be performed irrespective of cooldown rate limits. The second part of the distractor is correct since the radiation level is still at the SAE level.
D. Sending steam from the RPV to the Torus is an available method of cooling down the RPV with the MSIV closed and 90°F/hr is the normal cooldown rate. The examinee could incorrectly recall the conditions that require an ED and assume a normal cooldown is required. However, offsite radiation release rates dictate that an ED be performed irrespective of cooldown rate limits. The second half of this distractor is incorrect because the GE radioactivity release rate has not yet been exceeded.

10 CFR 55.43(b)(5) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires the examinee to assess plant conditions and then determine the current site Emergency Classification per the Emergency Plan, which is not RO level of knowledge. The question also requires the examinee to use knowledge of the Emergency Classification to determine that an ED is required.

The question cannot be answered solely by knowing "systems knowledge", or solely by knowing immediate operator actions, or solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs, or solely by knowing the purpose, overall sequence of events, or mitigative strategy of a procedure

Reference Information:

29.100.01, Sheet 5 - Secondary Containment Control and Radiation Release.
EP-101, Classification of Emergencies.

Plant Procedures
29.100.01 SH 5
EP-101

Question Use
ILO
Open Reference provided on NRC Exam - ***EP-101*, *"Classification of Emergencies," Enclosure A, Pages 1 through 3***
SRO

NUREG 1123 KA Catalog Rev. 2
295038 High Off-Site Release Rate
295038 EA2. Ability to determine and/or interpret the following as they apply to HIGH OFF-SITE RELEASE RATE :
295038 EA2.03 Radiation levels

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

NRC Exam Usage
ILO 2010 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
SRO

Associated objective(s):
Secondary Containment Control and Radioactive Release
Cognitive Terminal
Given a set of plant parameters that meet the entry conditions, execute Fermi 2 Emergency Operating Procedures in accordance with management expectations.

EMERGENCY CLASSIFICATION & PROTECTIVE ACTION RECOMMENDATIONS
Performance Terminal
Properly classify conditions into one of the four classifications

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82	K/A Importance: 3.5			Points: 1.00
S82	Difficulty: 4.00	Level of Knowledge: Low	Source: NEW	83708

The plant is at 100% Power when a confirmed fire in Fire Detection Zone 1, Torus Room North of Column 12, occurs. The fire brigade leader reports that the fire is threatening cable trays in that zone.

Which of the following is the Safe Shutdown strategy that the Control Room Supervisor should currently employ from 20.000.22, Plant Fires?

A. HPCI is the preferred High Pressure Feed source and steps are to restore/protect HPCI. If necessary, depressurize the RPV using Div 2 SRVs to use low pressure ECCS systems.

B. RCIC is the preferred High Pressure Feed source and steps are to restore/protect RCIC. If necessary, depressurize the RPV using Div 1 SRVs to use low pressure ECCS systems.

C. Place the Mode Switch in Shutdown, enter the EOPs, and emergency depressurize the RPV using Div 2 SRVs to use low pressure ECCS systems.

D. Place the Mode Switch in Shutdown, enter the EOPs, and emergency depressurize the RPV using Div 1 SRVs to use low pressure ECCS systems.

Answer: A

Answer Explanation:
Per 20.000.22, Plant Fires AOP, a fire in Fire Detection Zone 1/ Fire Zone 01RBN: Torus Room N of Col 12 with Cable Trays threatened requires the SRO to perform actions of Condition D of that AOP. The generic Safe Shutdown strategy for the entire AOP is to use available High Pressure Feed or depressurize to use low pressure ECCS systems, per EOP flow charts, if no High-Pressure Feed is available.

The SRO examinee must recall that generic Safe Shutdown strategy and then modify that strategy for the specific fire zone given in the stem of the question.

This zone employs Safe Shutdown strategy 1, which is the generic strategy PLUS additional actions to protect the HPCI system since it is the preferred HP feed source for this strategy. Safe Shutdown strategy 1 also requires that the Div 2 SRVs be used if the RPV must be de-pressurized to allow use of low pressure ECCS.

Therefore, the examinee must determine that HPCI, RCIC, and SBFW may all be unavailable and that HPCI is the preferred HP feed source, that actions must be taken to restore/protect HPCI, and that depressurization should be directed using Div 2 SRVs.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. This is true for Safe Shutdown strategy 3 that is employed for a fire in Fire Detection Zone 1/ Fire Zone 01RBS: Torus Room S of Col 12 with Cable Trays. This is incorrect because the fire is in Fire Zone 01RBN, Torus Room N of Col 12.
C. This is true for a fire in Fire Detection Zone 1 Torus Room N of Col 12 that causes a loss of HP Feed sources such that low pressure sources are required to maintain RPV inventory. This is incorrect because nothing in the stem of the question should indicate that HP feed sources have been lost and therefore the strategy should be to protect HPCI.
D. This is true for a fire in Fire Detection Zone 1 Torus Room S of Col 12 that causes a loss of HP Feed sources such that low pressure sources are required to maintain RPV inventory since this strategy employs use of Div 1 SRVs to de-pressurize. This is incorrect because the fire is North of Column 12.

10 CFR 55.43(b)(5) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because the question cannot be answered solely by knowing "systems knowledge", or solely by knowing immediate operator actions, or solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs, or solely by knowing the purpose, overall sequence of events, or mitigative strategy of a procedure.

This question requires SRO-only knowledge to assess plant conditions and then select the appropriate procedures to control vital plant equipment to mitigate the event.

Reference Information:

20.000.22, Plant Fires AOP.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
600000 Plant Fire On Site
600000 AA2. Ability to determine and interpret the following as they apply to PLANT FIRE ON SITE:
600000 AA2.16 Vital equipment and control systems to be maintained and operated during a fire

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
SRO

Associated objective(s):

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83	K/A Importance: 4.4			Points: 1.00
S83	Difficulty: 4.00	Level of Knowledge: High	Source: NEW	83707

You are the Control Room Supervisor (CRS).

A GROSS fuel failure occurred and the Mode Switch has been taken to shutdown. The following plant conditions currently exist:

- All Immediate operator actions have been taken.
- Post Scram Feedwater Logic actuated on the Scram.
- Reactor Pressure has been lowered to 900 psig.
- 3D148, FW/MTG RPV H2O Level 8 Trip is in alarm.
- 20.000.23, High RPV Water Level has been entered.
- RPV water level is 225" and rising at 0.8"/min.

One minute later, B21-R605, RPV Floodup Level Indicator, becomes unavailable.

In accordance with AOP 20.000.23, High RPV Water Level, which of the following level control actions will you direct and why?

A. Close the Inboard MSIVs to prevent flooding the Main Steam Lines.

B. Establish RWCU Blowdown to restore RPV Water Level to a band directed by the SM.

C. Reset Reactor Scram IAW 23.610, RPS System SOP, to minimize input from the CRD system.

D. Close C1100-F034, CRD Charging Wtr Header Iso Vlv, to minimize input from the CRD system.

Answer: D

Answer Explanation:
The examinee must determine that, with RPV Level rising but <265", the correct actions to take are per 20.000.23, High RPV Water Level AOP Condition E. Per Condition E, the examinee must recall that slowing input from the CRD system will be attempted to try to arrest the RPV level increase and prevent level from rising to the elevation of the Main Steam Lines (279" per Caution 1 on Page 6 of the AOP). The preferred method of slowing input from the CRD system is to reset the scram if possible, IAW Action E.2, and per 23.610. However, 23.610 Section 6.2, Reset Following Reactor Scram, has a pre-requisite that the SRO should recall that prevents resetting the scram if fuel damage is suspected (part of the reason why Action E.2 states Reset scram "if possible".

Therefore, the SRO examinee must determine that he/she must direct closing the C11-F034, CRD Charging Wtr Header Iso Vlv to minimize input from the CRD system.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This distractor is correct if RPV level was >265" IAW Action F.1 of 20.000.23. Also, Caution 1 states that the bottom of the MSLs is 279" and, if RPV Flood Up Indication is not available, the determination to close the MSIVs is based on evaluation regarding RPV level trend and injection status. This distractor is incorrect because, with RPV level <265", it is preferable to maintain the MSIVs open to allow for more means of removing excess inventory from the RPV. The trend given in the stem would not support MSIV isolation per Caution 1.
B. This distractor is correct if fuel damage had not occurred because Condition I is performed if (1) RWCU is available, (2) No indication of fuel element failure exists and (3) SM directs RPV level lowered. However, since the stem of the question indicates that fuel damage has occurred, this distractor is incorrect.
C. This distractor is correct if fuel damage was not occurring IAW Action E.2 of 20.000.23. Additionall, 23.610, RPS SOP, Secction 6.2, Reset Following Reactor Scram, pre-requisite 6.2.1.4 prohibits resetting a scram if fuel damage is suspected. This distractor is incorrect because the stem of the question states that fuel failure has occurred.

10 CFR 55.43(b)(5) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires the examinee to interpret control room indications, verify the status of systems, assess plant conditions due to that assessment, and then select the correct procedure (AOP) section to direct that will mitigate the impact and with which to proceed. The SRO also has to understand how the actions will affect the plant.

The question cannot be answered solely by knowing "systems knowledge", or solely by knowing immediate operator actions, or solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs, or solely by knowing the purpose, overall sequence of events, or mitigative strategy of a procedure.

Reference Information:

20.000.23, High RPV Water Level AOP.
23.610, Reactor Protection System (RPS) SOP.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
295008 High Reactor Water Level
G2.2.44 Ability to interpret control room indications to verify the status and operation of system, and understand how operator actions and directives affect plant and system conditions

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
SRO

Associated objective(s):
Senior Reactor Operator
Cycle 12-2 Objectives
Performance Enabler
Provide direction and monitor the shift team during performance of an emergency / abnormal operating procedures.

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84	K/A Importance: 4.2/4.6			Points: 1.00
S84-V2	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	81488

During a reactor startup with power at 23% a rod drop accident causes a power spike and has resulted in the following:

- Reactor Pressure …….....…….…….…….…… 960 psig
- Reactor Level …….....…….…… 197 inches
- Reactor power ……..…….…….…….……...……..…… 28%
- MCPR ……..…….…….…….……..……...…….…….…1.03
- MFLCPR ……..…….…….…….……..……..…….…….…1.38
- MAPRAT…..…….…….…….……..……..……..……..…… 0.68
- MFLPD...…..…….…….…….……...…..……..……..……..…… 1.00

Which of the following action(s) is(are) required to be performed, within 2 hours, to satisfy Technical Specifications?

A. Restore all Thermal Limits to within limits.

B. Restore compliance with all Safety Limits ONLY.

C. Restore compliance with all Safety Limits AND Insert all insertable control rods.

D. Restore compliance with all Safety Limits AND Reduce THERMAL POWER to <25%.

Answer: C

Answer Explanation:
Per Technical Specifications section 2.1, Safety Limits, 2.1.1.2 requires the MCPR Safety Limit to be ≥1.08 for two recirculation loop operation or ≥ 1.09 for single recirculation loop operation. Therefore, the examinee must recognize that this SL is NOT met.

Per Technical Specifications section 2.2, Safety Limit Violations, the examinee must recall that, with any SL violation, the following actions must be completed within 2 hours:

2.2.1 Restore compliance with all SLs: and
2.2.2 Insert all insertable control rods

Therefore, the SRO examinee must determine that the required action is to restore compliance with all SLs and insert all insertable control rods within 2 hours since these actions are the only ones (particularly the control rod insertion) listed that would restore compliance with BOTH the Safety Limits AND the Thermal Limit LCOs 3.2.1, 3.2.2 and 3.2.3.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This distractor would be correct if only a TS Thermal Limit was violated and not a TS Safety Limit, which is plausible because the conditions in the stem of the question show both a Thermal Limit and an SL violation. This distractor is incorrect because, although the action to restore compliance with the Thermal Limit would also restore compliance with the SL, the action listed in the distractor does not include inserting all control rods within the 2 hour time frame so TS would NOT be satisfied.
B. This distractor would be correct if TS required that ONLY compliance with the SLs be restored within 2 hours, which is plausible because the action for violating a Thermal Limit is to restore compliance with the Thermal Limit within 2 hours per Section 3.2, LCOs 3.2.1, 3.2.2 and 3.2.3 Action A.1. This distractor is incorrect because, although TS does require compliance be restored for all SLs within 2 hours, it also requires all control rods be inserted so if only the action in this distractor was taken, TS would NOT be satisfied.
D. This distractor would be correct if the TS required actions for a Safety Limit violation did not require all control rods be inserted, once compliance with the SL was restored, but instead required power to be reduced <25%. This is plausible because the SL that was violated in the stem of the question (MCPR) is closely related to Thermal Limits and the TS APPLICABILITY for Thermal Limits is THERMAL POWER >/= 25%. Additionally, Action B.1 of LCOs 3.2.1, 3.2.2 and 3.2.3 require power be reduced <25% RTP, if compliance with the Thermal Limit cannot be restored, to take the plant to a power level where the LCOs are not applicable. This distractor is incorrect because it does not include inserting all control rods within the 2 hour time frame so TS would NOT be satisfied.

10 CFR 55.43(b)(2) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires application of required TS actions with completion times that are greater than 1-hour.

The question cannot be answered solely by knowing </= 1-hour TS/TRM action, or solely by knowing LCO/TRM information listed "above the line", or solely by knowing TS safety limits. Although the question does require knowledge of the TS safety limits to recognize one is being violated, it also requires knowledge of the actions required for a TS safety limit violation, which is NOT RO level of knowledge, since the completion time is greater than one hour.

Reference Information:

Technical Specification Section 2.0 Safety Limits, Section 3.2 Power Distribution Limits and LCO 3.1.3 Control Rod Operability.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
295014 Inadvertent Reactivity Addition
295014 AA2. Ability to determine and/or interpret the following as they apply to INADVERTENT REACTIVITY ADDITION:
295014 AA2.05 Violation of safety limits

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (2) Facility operating limitations in the technical specifications and their bases.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
NRC Early Review
SRO

Associated objective(s):
Senior Reactor Operator
Performance Enabler
Analyze conditions and apply the appropriate technical specifications.

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85	K/A Importance: 3.5/3.6			Points: 1.00
S85	Difficulty: 4.00	Level of Knowledge: High	Source: NEW	81027

You are the Control Room Supervisor.

The plant is operating when a small break LOCA and ATWS occurs. ATWS conditions continue for 2 hours before the crew can shutdown the reactor (all rods are full in). The following plant conditions are now present:

- RPV water level is 10" above TAF and steady.
- SBFW is the only injection source.
- Reactor Pressure is 900 psig and rising slowly.
- MSIVs are closed.
- Drywell pressure is 12 psig and steady.
- Drywell Temperature is 280°F and steady.
- Suppression pool temperature is 152°F and rising.
- Torus pressure is 21 psig and rising slowly.
- Torus water level is 14.5” and slowly rising, and all efforts to lower level are unsuccessful.

Which of the following actions will you direct?

A. Vent the Torus.

B. Emergency Depressurize.

C. Reduce reactor pressure, <90°F/hr.

D. Reduce reactor pressure, ignore cooldown rate.

Answer: D

Answer Explanation:
Per EPG (B-17-80) the SRVTPLL (STPLL in EPG) bases is:

The SRV Tail Pipe Level Limit (SRVTPLL) is the lesser of:
• The Maximum Pressure Suppression Primary Containment Water Level.
• The highest suppression pool water level at which opening an SRV will not result in exceeding the code allowable stresses in the SRV tail pipe, tail pipe supports, quencher, or quencher supports.

The SRVTPLL is a function of RPV pressure. SRV operation with suppression pool water level above the SRVTPLL could damage the SRV discharge lines. This, in turn, could lead to containment failure from direct pressurization and damage to equipment inside the containment (ECCS piping, RPV water level instrument runs, wetwell-to-dry well vacuum breakers, etc.) from pipe-whip and jet-impingement loads.

The SRO examinee must interpret the rising RPV Pressure and Suppression Pool level as approaching the SRVTPLL. Given that efforts to lower Torus Level have so far been unsuccessful and RPV Pressure and Torus Water Level are approaching the SRVTPLL, the SRO must determine that actions of P-OR2 of 29.100.01 Sheet 1, RPV Control are appropriate to reduce RPV Pressure to stay <SRVTPLL, ignoring the cooldown rate limit.

Distractor Explanation:
Distractors are incorrect and plausible because:
A. Venting the torus is required if Torus Pressure cannot be kept < PCPL and it is plausible that the examinee could interpret the given values of Torus Water Level and Torus Pressure as meeting this condition. This distractor is also correct if the EOPs allowed venting the Torus as a means of preventing the PSP from being exceeded, since values given in the stem indicate that the PSP is being approached. This distractor is incorrect because the PCPL is not being challenged and because the EOPs do not allow venting the torus to stay < PSP.
B. Emergency Depressurization is required per 29.100.01 Sheet 2, Primary Containment Control, Step TWL-11 when Torus water level and RPV Pressure cannot be restored and kept <SRVTPLL. ED is also required if Torus Pressure and Torus Water Level exceed the PSP curve, which is plausible since the PSP is being approached. This answer is incorrect because the SRVTPLL has not yet been exceeded and efforts to reduce RPV pressure have not yet been attempted and also because the PSP has not been exceeded.
C. Reducing RPV pressure is required per 29.100.01 Sheet 1, RPV Control. It is plausible that the examinee could fail to recognize that the SRVTPLL is being approached and/or fail to recognize that the EOPs allow exceeding the cooldown rate to stay below the SRVTPLL. This answer is incorrect because the EOPs allow for ignoring the cooldown rate to avoid exceeding the SRVTPLL.

10 CFR 55.43(b)(5) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires specific knowledge of actions required by the EOPs, it is not related to immediate actions and the entry conditions are not relevant or leading to answer.
The SRO must interpret the rising RPV pressure and Torus Water level as challenging the SRVTPLL and then select the step of the EOP to mitigate the rising trend.

Reference Information:

BWROG EPG/SAGs Appendix B Bases B-17-80
29.100.01 Sheet 1, RPV Control
29.100.01 Sheet 2, Primary Containment Control
29.100.01 Sheet 6, Curves, Cautions and Tables.

Question Use
ILO
Open Reference provided on NRC Exam - ***29.100.01, Sheet 6, "Curves, Cautions, and Tables" (without the Cautions)***
SRO

NUREG 1123 KA Catalog Rev. 2
295029 High Suppression Pool Water Level
295029 EA2. Ability to determine and/or interpret the following as they apply to HIGH SUPPRESSION POOL WATER LEVEL :
295029 EA2.02 Reactor pressure

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
SRO

Associated objective(s):
Primary Containment Control
Performance Terminal
Using the graphs from the EOP Flowcharts, and parameter values for specific plant conditions, determine appropriate operator actions per the EOP Flowcharts.

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86	K/A Importance: 3.9/4.2			Points: 1.00
S86	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	81026

HPCI has just been placed in the Test Mode for a surveillance at rated flow and pressure. The following conditions exist:

- Suppression Pool Temperature is 85°F, and is rising at 0.33°F per minute.
- The plant is in MODE 2.
- Reactor Power is 8%.

Which of the following responses accurately completes the statements below?

In __(1)__ minutes, Technical Specification LCO 3.6.2.1, Suppression Pool Average Temperature, will NOT be MET.

After the TS required Immediate Action is taken, the crew will then have 24 hours to restore Suppression Pool Average Temperature to ≤__(2)__.

A. (1) 30
(2) 95°F

B. (1) 75
(2) 105°F

C. (1) 60
(2) 95°F

D. (1) 60
(2) 105°F

Answer: C

Answer Explanation:

Per TS LCO 3.6.2.1, Suppression Pool Average Temperature shall be ≤105°F with THERMAL POWER >1% and testing that adds heat to the suppression pool is being performed.

Therefore, the SRO examinee must first calculate the difference between current temperature (85°F) and the TS LCO Limit (105°F) as 20°F. Then, the examinee must determine that, with the suppression pool heating up 1°F every 3 minutes, that it would take (3 minutes x 20°F) = 60 minutes to reach TS LCO limit at which time the LCO will not be MET.

When LCO 3.6.2.1 is not MET, CONDITION C is applicable, which requires the crew to Immediately suspend all testing that adds heat to the suppression pool, as is stated in the stem of the question (given because this is RO knowledge). TS Bases for Action C.1 states "With the testing suspended, Condition A is entered and the Required Actions and associated Completion Times are applicable".

Therefore, the SRO examinee must recall that, after Action C.1 is complete, Condition A must be entered and 24 hours is allowed to restore temperature to ≤95°F according to Required Action A.2. Per TS Bases, "the time period that the temperature is > 95°F is short enough not to cause a significant increase in unit risk."

Distractor Explanation:
Distractors are incorrect and plausible because:

A. 30 minutes is the amount of time to heat up the suppression pool from 85°F to 95°F at 1°F every 3 minutes. This is plausible because the examinee could fail to recall the LCO extends the allowable temperature to 105°F with THERMAL POWER >1% and testing that adds heat to the suppression pool is being performed. The second part of the distractor is correct.
B. 75 minutes is the amount of time to heat up the suppression pool from 85°F to 110°F at 1°F every 3 minutes. This is plausible because the examinee could fail to recall the LCO extends the allowable temperature to 105°F with THERMAL POWER >1% and testing that adds heat to the suppression pool is being performed and instead recall that the limit is 110°F with testing in progress, which is plausible because 110°F is the TS limit for Torus Water Temperature when <1% RTP. 24 hours to restore suppression pool temperature to ≤105°F is plausible if the examinee incorrectly associated the 24-hour time limit with CONDITION C instead of CONDITION A. This distractor is incorrect because, as stated in TS BASES, once the Immediate Action is taken to suspend testing that adds heat to the suppression pool, CONDITION A is then applicable as is Required Action A.2 to restore temperature to ≤95°F.
D. The first part of this distractor is correct. 24 hours to restore suppression pool temperature to ≤105°F is plausible if the examinee incorrectly associated the 24-hour time limit with CONDITION C instead of CONDITION A. This distractor is incorrect because, as stated in TS BASES, once the Immediate Action is taken to suspend testing that adds heat to the suppression pool, CONDITION A is then applicable as is Required Action A.2 to restore temperature to ≤95°F

10 CFR 55.43(b)(2) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires knowledge of TS bases and application of required actions (TS Section 3).

The question cannot be answered solely by knowing </= 1-hour TS/TRM action, or solely by knowing LCO/TRM information listed "above the line", or solely by knowing TS safety limits. The question can only be answered by the SRO candidate having knowledge of the TS bases for LCO 3.6.2.1 as well as the application of TS required actions that are "below the line". Since the LCO allows Torus Temperature up to 105°F with testing that adds heat to the suppression pool, RO level of knowledge could be used to conclude that Suppression Pool Temperature must be lowered <105°F to restore compliance with the LCO. However, "below the line" information from Condition A must be known to determine that the TS required action actually requires Suppression Pool Temperature be lowered <95°F. Since this information is located in Required Action A.2, it is "below the line" and SRO-Only knowledge.

Reference Information:

Technical Specification and Bases for LCO 3.6.2.1 – Suppression Pool Average Temperature.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
206000 HPCI System.
206000 A2. Ability to (a) predict the impacts of the following on the HIGH PRESSURE COOLANT INJECTION SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations:
206000 A2.08 High suppression pool temperature: BWR-2,3,4

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (2) Facility operating limitations in the technical specifications and their bases.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
SRO

Associated objective(s):
Senior Reactor Operator
Performance Enabler
Analyze conditions and apply the appropriate technical specifications.

87	K/A Importance: 3.3/3.6			Points: 1.00
S87	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	80967

The plant was operating at 100% power when a seismic event occurred that resulted in receipt of alarms 1D10, CORE PLATE TO SP HDR A DIFF PRESS HIGH and 2D20, CORE PLATE TO SP HDR B DIFF PRESS HIGH. Investigation into the alarms has resulted in the following being reported to the Main Control Room:

- E21-N004A, Div 1 Core Spray Break Detection Diff Press Ind Switch, at H21-P016 (RBB-F15), is reading +2.5 psid.
- E21-N004B, Div 2 Core Spray Break Detection Diff Press Ind Switch, at H21-P036 (RBB-B10), is reading +3.2 psid.

Which of the following Actions, if any, are the MOST LIMITING required by Technical Specifications?

A. Be in MODE 3 within 13 hours.

B. Be in MODE 3 within 12 hours and reduce reactor steam dome pressure to ≤150 psig within 36 hours.

C. Restore one Core Spray subsystem to OPERABLE status in 7 days. If that ACTION is not complete, be in MODE 3 12 hours after that.

D. Restore one Core Spray subsystem to OPERABLE status in 72 hours. If that ACTION is not complete, be in MODE 3 12 hours after that.

Answer: A

Answer Explanation:
The examinee must first recognize that the alarms, and indications reported from the field, are indicative of breaks in the Division 1 and Division 2 Core Spray injection lines inside the Reactor Pressure Vessel. The examinee must then recognize that this renders both Core Spray Divisions INOPERABLE which will require Actions in accordance with TS LCO 3.5.1 - ECCS Operating. The examinee must also recognize that the CONDITION places the plant in LCO 3.0.3 and determine that MODE 3 within 13 hours is required.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. This distractor is correct if LCO 3.5.1 was not met due to two or more ADS valves being inoperable as required by CONDITION J of LCO 3.5.1, which is plausible because the examinee could determine that the plant must be brought below 150 psig so that Core Spray is not required to be OPERABLE. This distractor is incorrect because the additional action to lower pressure is only required for ADS valve inoperability.
C. This distractor is correct for only one division of Core Spray being INOPERABLE as per CONDITION A of LCO 3.5.1, which requires restoration of system operability in 7 days. The examinee could then correctly recall that if the Action of Condition A is not complete, then Condition D requires the plant to be in MODE 3 12 hours after that. This distractor is plausible because the examinee could fail to recognize that the conditions provided in the stem of the question also place the plant in LCO 3.0.3. The fact that LCO 3.0.3 entry is required makes this distractor incorrect.
D. This distractor is correct for two Low Pressure ECCS sub-systems being INOPERABLE, but only if they are NOT both Core Spray or LPCI as per CONDITION C of LCO 3.5.1, which requires restoration of one Low Pressure Injection/Spray subsystem operability in 72 hours. The examinee could then correctly recall that if the Action of Condition C is not complete, then Condition D requires the plant to be in MODE 3 12 hours after that. This distractor is plausible because Condition C is written for 2 Low Pressure Injection/Spray subsystems, but NOT for 2 Core Spray subsystems. The fact that Condition C is written for one CSS and one LPCI subsystem and because LCO 3.0.3 entry is required makes this distractor incorrect.

10 CFR 55.43(b)(2) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires application of required actions (TS section 3) in accordance with rules of application requirements. Also, this question requires application of generic limiting for condition for operation (LCO) requirements from section LCO 3.0.3, which is SRO-only knowledge.

The question cannot be answered solely by knowing </= 1-hour TS/TRM action, or solely by knowing LCO/TRM information listed "above the line", or solely by knowing TS safety limits. The question can only be answered by the SRO candidate applying the required actions of TS LCO 3.5.1 as well as generic LCO 3.0.3.

Reference Information:

ARPs 1D10 and 2D20, Core Plate to SP Hdr A (B) DP High.
TS LCO 3.5.1 - ECCS Operating and LCO 3.0.3.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
209001 Low Pressure Core Spray System.
209001 A2. Ability to (a) predict the impacts of the following on the LOW PRESSURE CORE SPRAY SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations:
209001 A2.05 3.3/3.6 Core spray line break

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (2) Facility operating limitations in the technical specifications and their bases.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
SRO

Associated objective(s):
Core Spray System
Cognitive Enabler
Describe the Core Spray System technical specification limiting conditions for operation, their bases, the associated surveillance requirement(s), and their relationship to operability.

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88	K/A Importance: 3.0/3.2			Points: 1.00
S88	Difficulty: 4.00	Level of Knowledge: High	Source: NEW	80966

The plant is operating at 100%.

An Engineering Analysis and Operability Determination has resulted in all 16 of the Main Steam Line Flow High instruments being declared INOPERABLE.

Which of the following sets of instruments will you direct I&C to start working on FIRST to restore isolation capability and what is the Technical Specification basis for restoring this Trip Function?

A. All four MSL Flow instruments for MSL ‘A’ and all four for MSL ‘B’.

Restore backup to the pressure regulator maximum steam flow limiter to ensure the RPV cooldown limit is not exceeded by closing the MSIVs for a pressure regulator failure event.

B. All four MSL Flow instruments for MSL ‘A’ and all four for MSL ‘C’.

Restore protection for a main steam line break (MSLB) event to ensure that fuel damage and offsite radiation release do not occur by closing the MSIVs for a MSLB.

C. One MSL Flow instrument, from each of the four MSLs, for the A Trip Channel and one MSL Flow instrument, from each of the four MSLs, for the B Trip Channel.

Restore protection for a main steam line break (MSLB) event to ensure that fuel damage and offsite radiation release do not occur by closing the MSIVs for a MSLB.

D. One MSL Flow instrument, from each of the four MSLs, for the A Trip Channel and one MSL Flow instrument, from each of the four MSLs, for the C Trip Channel.

Restore backup to the pressure regulator maximum steam flow limiter to ensure the RPV cooldown limit is not exceeded by closing the MSIVs for a pressure regulator failure event.

Answer: C

Answer Explanation:

Per B 3.3.6.1.

The Main Steam Line (MSL) Isolation Functions are considered to be maintaining isolation capability when sufficient channels are OPERABLE or in trip, such that both trip systems will generate a trip signal from the given Function on a valid signal.

The other (non-MSL) isolation functions are considered to be maintaining isolation capability when sufficient channels are OPERABLE or in trip, such that one trip system will generate a trip signal from the given Function on a valid signal.

Most MSL Isolation Functions receive inputs from four channels. The outputs from these channels are combined in a one-out-of-two taken twice logic to initiate isolation of all main steam isolation valves (MSIVs). The outputs from the same channels are arranged into two two-out-of-two logic trip systems to isolate the two MSL drain valves at the containment boundary.

The exceptions to this arrangement are the Main Steam Line Flow-High Function and Area Temperature Functions. The Main Steam Line Flow-High Function uses 16 flow channels, four for each steam line. One channel from each steam line inputs to one of the four trip strings logic. Two trip strings logics make up each trip system and both trip systems must trip to cause an MSL isolation. Each trip string logic has four inputs (one per MSL), any one of which will trip the trip string logic. Either trip string logic can trip the trip system. This is effectively a one-out-of-eight taken twice logic arrangement to initiate isolation of the MSIVs

Therefore, for the first part of the answer, the SRO examinee must determine that 4 instruments in Trip System A and 4 instruments in Trip System B must be restored in order to restore trip function capability. The examinee must correctly recall the trip system logic for this Function (1 out of 2 taken twice for EACH MSL) and then recognize that restoring the four A instruments (effectively restoring the A Trip Channel) and the four B instruments (restoring the B Trip Channel) will accomplish the objective of restoring trip function capability.

The examinee must then correctly recall that the Main Steam Line Flow-High Function is directly assumed in the analysis of the main steam line break (MSLB). The isolation action, along with the scram function of the Reactor Protection System (RPS), ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46 and offsite doses do not exceed the 10 CFR 100 limits.

<u>Distractor Explanation:</u>
Distractors are incorrect and plausible because:

A. The examinee could incorrectly conclude that restoring the MSL High Flow trip function for the A and B MSLs will restore trip function capability. This is plausible if the examinee incorrectly applies the trip system logic (1 out of 2 twice) to the Main Steam Lines and not the instruments. The second part is plausible because the bases given is for the Main Steam Line Pressure-Low function and the examinee could incorrectly attribute this with the Main Steam Line Flow-High function.
B. The examinee could incorrectly conclude that restoring the MSL High Flow trip function for the A and C MSLs will restore trip function capability. This is plausible if the examinee incorrectly recalls the trip system logic (1 out of 2 twice) and also incorrectly applies this logic to the Main Steam Lines and not the instruments. The second part of this distractor is correct.
D. The examinee could incorrectly recall the trip system definition for this function and determine that restoring all of the A and all of the C instruments will restore trip function capability, which is incorrect. The second part is plausible because the bases given is for the Main Steam Line Pressure-Low function and the examinee could incorrectly attribute this with the Main Steam Line Flow-High function.

<u>10 CFR 55.43(b)(2) SRO Justification:</u>
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires knowledge of TS bases that are required to analyze TS required actions and terminology.

The question cannot be answered solely by knowing </= 1-hour TS/TRM action, or solely by knowing LCO/TRM information listed "above the line", or solely by knowing TS safety limits. The question can only be answered by the SRO candidate having knowledge of the TS bases for LCO 3.3.6.1 as well as the term Function as it applies to TS required instrumentation.

Reference Information:

Technical Specification and Bases for LCO 3.3.6.1.
23.601, Instrument Trip Sheet for the Main Steam Line Flow - High Trip Function.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
223002 PCIS/NSSS
223002 A2. Ability to (a) predict the impacts of the following on the PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations:
223002 A2.06 3.0/3.2 Containment instrumentation failures

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (2) Facility operating limitations in the technical specifications and their bases.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
SRO

Associated objective(s):
Primary Containment Isolation System
Cognitive Enabler
Describe Primary Containment Isolation System technical specification limiting conditions for operation, their bases, the associated surveillance requirement(s), and their relationship to operability.

89	K/A Importance: 2.7/4.1			Points: 1.00
S89	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	80926

Which of the following SRV related events would require the completion of an Immediate (One, Four or Eight Hour) Notification to the NRC per 10CFR50.72?

A. One Low-Low Set SRV Failed to open in response to signals from Low-Low Set Logic during a transient..

B. Automatic SRV opening and closing in response to signals from Low-Low Set Logic during a transient.

C. A GOP plant shutdown was commenced, because SRV L opened for an undetermined reason, and was subsequently closed by pulling fuses.

D. The Mode Switch is taken to shutdown, when Suppression Pool Average Temperature reached 110°F, because an SRV opened and could not be subsequently closed.

Answer: D

Answer Explanation:
Per the Fermi 2 GRRR (General Regulatory Requirements Reporting) List, a Four-Hour report is required per paragraph 10CFR50.72(b)(2)(i) for the initiation of any nuclear plant shutdown required by the plant's Technical Specifications. This report is also required by NUREG 1022, Paragraph 3.2.3.

Therefore, the SRO examinee must evaluate the conditions given and determine that a stuck open SRV requiring the Mode Switch be placed in shutdown is not only an action of AOP 20.000.25 (Condition B) but also a requirement of Technical Specification LCO 3.6.2.1, Suppression Pool Average Temperature when it exceeds 110°F (Action D.1 of Condition D). The examinee must then recognize the relationship between this Tech Spec required action and the Immediate Notification requirements of 10CFR50.72.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. Failure of an SRV to open is plausible because Routine, Annual Report A-8, Safety Relief Valve Challenge Report, is an annual report required each year by April 30th. This report is for challenges to and failures of SRVs. The candidate could recall that this report is required per MES29 to satisfy Technical Specification 5.6.6 and therefore conclude that this report is required by 10CFR50.72 and/or 10CFR50.73, which is incorrect because this report is required by 10CFR50.4. This distractor is incorrect because this event is not reportable under 10CFR50.72.
B. An automatic initiation of certain BWR systems is reportable, however the SRVs are not one of the systems listed. This distractor is plausible because the candidate could incorrectly determine that SRVs are part of the BWR systems which apply. This distractor is also plausible because Routine, Annual Report A-8, Safety Relief Valve Challenge Report, is an annual report required each year by April 30th. This report defines an SRV challenge as a manual or automatic actuation of an SRV. The candidate could recall that this report is required per MES29 to satisfy Technical Specification 5.6.6 and therefore conclude that this report is required by 10CFR50.72 and/or 10CFR50.73, which is incorrect because this report is required by 10CFR50.4.
C. Even if the valve closes, NRC Bulletin 80-25 requires that if a SRV fails to function as designed and the cause of the malfunction is not clearly determined, understood, and corrected, then the valve must be removed from service, disassembled, and inspected. Removal from service would require plant shutdown and cooldown. If the cause of the valve failure is positively known and corrected, plant operation may continue. No time limit for shutdown is specified in the NRC Bulletin so an orderly GOP shutdown is acceptable. Therefore, the candidate could confuse this plant shutdown with a Tech Spec required plant shutdown and wrongfully conclude that it is reportable under 10CFR50.72.

10 CFR 55.43(b)(1) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires specific knowledge of reporting requirements that are a condition of the facility license, which is not knowledge required of Reactor Operators.

Reference Information:

GRRR List.
20.000.25, Stuck Open SRV and BASES.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
239002 SRVs
G2.4.30 Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (1) Conditions and limitations in the facility license.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
SRO

Associated objective(s):

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90	K/A Importance: 3.4/4.7			Points: 1.00
S90	Difficulty: 2.00	Level of Knowledge: High	Source: BANK	80886

The plant is operating at 100% reactor power.

A fire in the Division 1 Battery Room results in one 130 VDC Division 1 Battery being severely damaged and its associated Battery Charger tripping.

Which of the following outlines the MINIMUM Action(s) required by LCO 3.8.4 to be in compliance with Technical Specifications?

A. Complete a plant shutdown within 14 hours.

B. Restore the battery charger to operable status within 4 hours.

C. Within 2 hours restore DIV 1 DC to operable with only the DIV 1 Battery Charger in service.

D. Place the Reactor Mode Switch in Startup/Hot Standby within 7 hours, and place the Reactor Mode Switch in Shutdown within 13 hours, and be less than 200°F Average Reactor Coolant Temperature in 37 hours.

Answer: A

Answer Explanation:

From TS Bases for LCO 3.8.4: DC electrical power subsystems-with each DC subsystem consisting of two 130 VDC batteries in series, two battery chargers, and the corresponding control equipment and interconnecting cabling supplying power to the associated bus, are required to be OPERABLE to ensure the availability of the required power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA

To answer this question the examinee must first identify that the LCO is not met due to one battery charger and one DC subsystem INOPERABLE.

To determine TS action required (G 2.2.40):
3.8.4 LCO The Division I and Division II DC electrical power subsystems shall be OPERABLE.

The Basis states that two 130 batteries are required for the subsystem to be OPERABLE.

CONDITION B. One DC electrical power subsystem inoperable for reasons other than Condition A.
REQUIRED ACTION Restore DC electrical subsystem to OPERABLE status within 2 hours.

CONDITION C. Required Action and Associated Completion Time not met.
REQUIRED ACTION: Be in MODE 3 in 12 hours.

Distracter Explanation:

B. This distractor is plausible because one battery charger tripped and the examinee could (1) fail to recognzie that the damaged battery has impacted operability of the Div 1 DC subsystem and therefore (2) determine that restoration of the tripped battery charger (REQUIRED ACTION for CONDITION A) is the minimum required TS actions. This is incorrect because, in addition to the Battery Charger being tripped, the damaged battery requires that restoration of the DC power subsytem be performed within 2 hours.

C. This distractor is plausible because the examinee could conclude that restoration of the DC power subsystem could be completed by (1) restoring the battery charger from a tripped condition and then (2) aligning the charger's output to system loads by either bypassing or isolating (pulling battery fuses and negative links) the damaged battery. Since the battery chargers are housed in a different room than the battery, the examinee could conclude that restoring the battery charnger to operation within 2 hours would restore the Div I DC Power Subsystem to OPERABLE status per CONDITION B. However, although this could restore power and functionality to impacted DC loads, per TS Bases for LCO 3.8.4, a DC subsystem consists of two 130 VDC batteries in series, two battery chanrgers and control equipment, interconnecting cabling, etc., therefore it is incorrect to assume that Operability can be restored on only the Battery Chargers.

D. This distractor is based on actions that would need to be taken if entry into LCO 3.0.3 was required, which is plausible if the conditions in the stem of the question represented conditions that were not bounded by the ACTIONS of LCO 3.8.4. This is incorrect because LCO 3.0.3 does not apply since T.S. 3.8.4 can be complied with.

10 CFR 55.43(b)(2) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires application of required actions (TS section 3) in accordance with rules of application requirements. Also, this question requires knowledge of TS bases that is required to analyze TS-required actions and terminology, which is SRO-only knowledge.

The question cannot be answered solely by knowing </= 1-hour TS/TRM action, or solely by knowing LCO/TRM information listed "above the line", or solely by knowing TS safety limits. The question can only be answered by the SRO candidate applying the required actions of TS LCO 3.8.4 and/or information contained in the Bases for that LCO.

Reference Information:

TS & TS BASIS 3.8.4 LCO, COND B&C

Question Use
ILO
Open Reference provided on NRC Exam - ***TS LCOs 3.8.4, "DC Sources-Operating," and 3.8.5,"DC Sources-Shutdown"***
SRO

NUREG 1123 KA Catalog Rev. 2
263000 DC Electrical Distribution
G2.2.40 Ability to apply technical specifications for a system

Technical Specifications
3.8.4 DC Sources Operating

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (1) Conditions and limitations in the facility license.
10 CFR 55.43(b) (2) Facility operating limitations in the technical specifications and their bases.

NRC Exam Usage
ILO 2015 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
High
SRO

Associated objective(s):
Technical Specifications for Licensed Operators
EAL/TS/Reporting
Performance Enabler
Given plant conditions that constitute non-compliance with any LCO, apply Technical Specifications and Bases to determine the applicable Condition(s), Required Action(s), and associated Completion Time(s).

91	K/A Importance: 2.6/2.7			Points: 1.00
S91	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	80906

The plant operating at 100% power with the B Reactor Water Cleanup (RWCU) Filter Demineralizer (F/D) out of service for septa replacement. The A RWCU F/D and both RWCU pumps are in service.

The CRLNO is coordinating with the RB Rounds Operator to manually adjust flow for RWCU F/D A due to Flow Control Valve issues.

- At 1000 2D97, RWCU Filter Demin Trouble is received along with F/D A Flow Low on G33-P001, RWCU Filter Demins Control Panel.
- At 1002 RWCU System Flow lowers below 70 gpm.

At 1005 the RB NO reports the following for RWCU F/D A:

- BACKWASH REQUIRED light is on

(1) What is the impact of the above conditions on the RWCU System?

(2) In addition to a Backwash and Precoat of RWCU F/D A, which of the following actions, if any, should the CRS direct?

A. (1) RWCU F/D A shifts to HOLD ONLY.
(2) No other actions need be directed.

B. (1) RWCU F/D A shifts to HOLD ONLY.
(2) Direct STA/SNE to insert substitute IPCS point values for Reactor Water Cleanup Inlet/Outlet Temperatures ONLY.

C. (1) RWCU F/D A shifts to HOLD, then the RWCU Pumps trip.
(2) Direct STA/SNE to insert a substitute IPCS point value for RWCU Inlet Flow ONLY.

D. (1) RWCU F/D A shifts to HOLD, then the RWCU Pumps trip.
(2) Direct STA/SNE to insert substitute IPCS point values for Reactor Water Cleanup Inlet/Outlet Temperatures AND for RWCU Inlet Flow.

Answer: C

Answer Explanation:
The candidate must first recognize that that 2D114, RWCU Low Flow, will result in a trip of both RWCU pumps and loss of the RWCU system.

The SRO examinee must then recall that the correct actions to direct from the RWCU system AOP are Condition E to insert a substitute value of 0 for IPCS Point G33CF6004 (RWCU Inlet Flow). Note that Condition E is important in order to restore the heat balance in IPCS so that CTP calculation is restored for accurate power monitoring.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. (1) The examinee could recognize system flow as being <90 gpm as the point where the RWCU F/Ds automatically shift to the HOLD mode, which is consistent with receipt of 2D97, RWCU F/D Trouble. The examinee could conclude that this is the only impact on the system, which is incorrect because, when system flow continues to drop <70 gpm at 1002, the RWCU Pumps will trip. (2) The examinee could recognize that RWCU flow dropping rapidly below 90 gpm, without the 15 second delay time required by the logic, will cause a Resin Intrusion lockout of RWCU F/D A, which is consistent with the BACKWASH REQUIRED light being lit. It is plausible that, if the examinee determined that only RWCU F/D A went into HOLD, then the only action required is the Backwash F/D A. This is incorrect because the system will also have tripped off when system flow dropped <70 gpm, so additional actions are required.
B. (1) The examinee could recognize system flow as being <90 gpm as the point where the RWCU F/Ds automatically shift to the HOLD mode, which is consistent with receipt of 2D97, RWCU F/D Trouble. The examinee could conclude that this is the only impact on the system, which is incorrect because, when system flow continues to drop <70 gpm at 1002, the RWCU Pumps will trip. (2) The examinee could recognize the need to backwash RWCU F/D A but also determine that substitute IPCS point values for Reactor Water Cleanup Inlet/Outlet Temperatures. This is plausible because, if the RWCU pumps were still running, then a substitute value for flow is NOT needed and the examinee could determine that the reduction in system flow would cause system temperatures to change and, therefore, necessitate changing IPCS values for inlet/outlet temperatures. This is incorrect because a NOTE exists in the AOP to warn the operator to NOT remove from scan or insert a substitute value for IPCS Point G33DT2502 (Reactor Water Cleanup Inlet Temperature) or 33DT2503 (Reactor Water Cleanup Outlet Temperature).
D. (1) The first part of this distractor is correct. (2) The examinee could recognize the need to backwash RWCU F/D A but also determine that substitute IPCS point values for Reactor Water Cleanup Inlet/Outlet Temperatures and RWCU Flow. This is plausible because the examinee could determine that the reduction in system flow would cause system temperatures to change and, therefore, necessitate substituting IPCS values for inlet/outlet temperatures. This is incorrect because a NOTE exists in the AOP to warn the operator to NOT remove from scan or insert a substitute value for IPCS Point G33DT2502 (Reactor Water Cleanup Inlet Temperature) or 33DT2503 (Reactor Water Cleanup Outlet Temperature).

10 CFR 55.43(b)(5) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires the examinee to determine the impact of the low flow alarm on the RWCU system, assess plant conditions due to that impact, and then select the correct procedure (AOP) section to direct that will mitigate the impact and with which to proceed.

The question cannot be answered solely by knowing "systems knowledge", or solely by knowing immediate operator actions, or solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs, or solely by knowing the purpose, overall sequence of events, or mitigative strategy of a procedure.

Reference Information:
2D97, RWCU Filter Demin Trouble.
2D114, RWCU Flow Low.
20.707.01, Loss of RWCU AOP.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
204000 RWCU System
204000 A2. Ability to (a) predict the impacts of the following on the REACTOR WATER CLEANUP SYSTEM; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations:
204000 A2.11 Inadequate system flow: Plant-Specific

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
NRC Early Review
SRO

Associated objective(s):
Emergency and Abnormal Operating Procedures Performance Training
Cycle 12-3 Objectives
Performance Terminal
Given the plant operating conditions/parameters, evaluate those conditions/parameters for the appropriate operator response in accordance with approved plant procedures, and perform the actions determined to be necessary.

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92	K/A Importance: 3.1 / 3.3			Points: 1.00
S92-V3	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	83086

The plant is in MODE 1 with the following conditions:
- Movement of irradiated fuel is in progress in the Spent Fuel Pool (SFP).
- An irradiated fuel bundle is currently suspended from the Refueling Bridge.
- Fuel Pool Cooling and Cleanup (FPCCU) system is in service on the East FPCCU Pump and the A Filter Demineralizer.
- The B (West) Pump and B Filter Demineralizer are both in standby.

A leak develops in the FPCCU system causing the following:
- Alarm 2D1, Fuel Pool Water Level Low, is received.
- Refuel Floor Coordinator reports that SFP level is 21’ 6” and lowering.

(1) How will the FPCCU system be impacted?

(2) What action shall the CRS direct?

A. (1) West FPCCU Pump automatically starts.
(2) Immediately suspend ALL fuel movement.

B. (1) West FPCCU Pump automatically starts.
(2) Return the fuel bundle to its storage location and THEN suspend fuel movement.

C. (1) East FPCCU Pump will trip.
(2) Immediately suspend ALL fuel movement.

D. (1) East FPCCU Pump will trip.
(2) Return the fuel bundle to its storage location and THEN suspend fuel movement.

Answer: D

Answer Explanation:
Per ARP 2D1, normal pool level is 37.58' and alarm 2D1 comes in at an elevation 4" below normal, or 37.25'. As stated in the ARP, this level is 4" below the elevation of the top of the weir plate that returns water to the FPCCU Skimmer Surge Tanks. Therefore, the examinee must determine that, with no water returning to the SSTs, SST level will lower to the point that the running FPCCU pump will trip.

ARP 2D1, subsequent actions, require that operators comply with Technical Specification LCO 3.7.7, Spent Fuel Storage Pool Water Level. The examinee must determine that the indicated water level means that LCO 3.7.7 is not met. The examinee must recall the required action for LCO 3.7.7 not being met, with movement of irradiated fuel assemblies in the spent fuel storage pool, is to suspend movement of the irradiated fuel assemblies Immediately. Additionally, the examinee must recall the BASES for the Required Action states that "Suspension of this activity shall not preclude completion of movement of an irradiated fuel assembly to a safe position" and therefore the fuel bundle should be returned to its storage location BEFORE the TS required action to suspend all fuel movement is taken.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The examinee could incorrectly recall that the standby FPCCU pump automatically starts on a low SFP level condition, which is plausible since the FPCCU pumps take suction from the SSTs and discharge back to the SFP the examinee could assume that this occurs to increase flow back to the SFP on a low-level condition. This is incorrect since the FPCCU pumps do not automatically start on low SFP level. The second part is plausible since the action to Immediately suspend movement of irradiated fuel assemblies in the spent fuel storage pool is directly spelled out in TS LCO 3.7.7 Action A.1 and the examinee could determine that, since the initial conditions for the fuel handling accident are not met (BASES for LCO 3.7.7) then the correct action is to stop fuel handling such that a fuel handling accident could not occur. This is incorrect because TS BASES allows for completion of movement of an irradiated fuel assembly to a safe position.
B. The examinee could incorrectly recall that the standby FPCCU pump automatically starts on a low SFP level condition, which is plausible since the FPCCU pumps take suction from the SSTs and discharge back to the SFP the examinee could assume that this occurs to increase flow back to the SFP on a low-level condition. The second part is correct.
C. The examinee could recognize that the conditions in the stem of the question will lead to a trip of the running FPCCU pump, which is correct. The second part is plausible since The second part is plausible since the action to Immediately suspend movement of irradiated fuel assemblies in the spent fuel storage pool is directly spelled out in TS LCO 3.7.7 Action A.1 and the examinee could determine that, since the initial conditions for the fuel handling accident are not met (BASES for LCO 3.7.7) then the correct action is to stop fuel handling such that a fuel handling accident could not occur. This is incorrect because TS BASES allows for completion of movement of an irradiated fuel assembly to a safe position.

10 CFR 55.43(b)(2) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because the question cannot be answered solely by knowing ≤1-hour TS/TRM Actions, or solely by knowing LCO/TRM information listed "above the line", or solely by knowing the TS safety limits.

To answer the question, the SRO examinee must use knowledge of TS bases that is required to analyze the TS-required actions.

Reference Information:

2D1, Fuel Pool Water Level Low ARP.
Technical Specification LCO 3.7.7 – Spent Fuel Storage Pool Water Level.
TS 3.7.7 BASES.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
233000 Fuel Pool Cooling and Cleanup
233000 A2. Ability to (a) predict the impacts of the following on the FUEL POOL COOLING AND CLEAN-UP ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations.
233000 A2.02 Low pool level

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (2) Facility operating limitations in the technical specifications and their bases.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
NRC Early Review
SRO

Associated objective(s):
Fuel Pool Cooling & Cleanup
Cognitive Enabler
Identify Fuel Pool Cooling and Cleanup System related technical specifications, with emphasis on action statements requiring prompt actions (for example, one hour or less).

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93	K/A Importance: 4.1			Points: 1.00
S93-V2	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	83706

During performance of 23.623, “Reactor Manual Control / Reactor Mode Switch / Refueling Platform – Refueling Interlocks” the following conditions are established:

- The Mode Switch is locked in REFUEL.
- A single control rod is withdrawn one notch.
- The Refueling Platform is over the spent fuel pool.
- The dummy fuel assembly is loaded onto the main fuel hoist.
- Track Switch #1 is lifted and held to simulate the Refueling Platform over the core.

The operator then performs the following:

- He takes the main fuel hoist controls to raise and the hoist begins to raise the dummy assembly.
- He takes the main fuel hoist controls to lower and the hoist remains in its current position.
- He takes the refueling platform controls to reverse (towards the core) and the platform remains in its current position.

With the conditions observed, the refueling interlocks are ___(1)___ based on ___(2)___.

A. (1) OPERABLE
(2) meeting all acceptance criteria

B. (1) INOPERABLE
(2) the dummy assembly raising when commanded

C. (1) INOPERABLE
(2) the dummy assembly failing to lower when commanded

D. (1) INOPERABLE
(2) the platform failing to move when commanded

Answer: B

Answer Explanation:
Per 24.623 Reactor Manual Control/Reactor Mode Switch/Refueling Platform - Refueling Interlocks,

Initial conditions of the stem are established by steps 5.2.3.1 (Locked in REFUEL), 5.2.3.8.a (one rod withdrawn one notch), 5.2.3.12 (returned to SF Pool), 5.2.3.15 (load main fuel hoist) and 5.2.3.16 (lift and hold Track Switch #1.) After initial verifications in step 5.2.3.17, step 5.2.3.18 provides the following direction:

18. Verify the following: (SR 3.9.1.1.b and c)
a. Refuel Platform will not drive over reactor core. □
b. Main Fuel Hoist will not raise. □
c. Main Fuel Hoist will not lower. □
ACCEPTANCE CRITERIA_____
INITIALS

Distractor Explanation:
A. The candidate may determine that all of the listed conditions meet the function of the interlocks and acceptance criteria is met for this surveillance. This is incorrect because acceptance criteria includes that the hoist does not raise in this condition. (Step 5.2.3.18.b)
C. With the Mode Switch in the REFUEL position, it is allowed to withdraw one control rod. A candidate could therefore incorrectly substitute this with the actual interlock which is based on the ALL RODS IN signal from RMCS. This is incorrect because downward main fuel hoist motion is prevented due to absence of the ALL RODS IN signal after the given conditions are established. (Step 5.2.3.18.c)
D. The candidate may incorrectly recall that only the main hoist is blocked by interlock, and that movement of the refueling platform is always allowed with the mode switch in the REFUEL position and only 1 rod out. This is incorrect because Refueling platform motion is prevented due to absence of the ALL RODS IN signal after the given conditions are established. (Step 5.2.3.18.a)

10 CFR 55.43(b)(2) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires the candidate to assess fuel-handling equipment SR acceptance criteria.

Reference Information:

24.623 Reactor Manual Control/Reactor Mode Switch/Refueling Platform - Refueling Interlocks.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
234000 Fuel Handling
G2.2.12 Knowledge of surveillance procedures

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (7) Fuel handling facilities and procedures.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
High
NEW
SRO

Associated objective(s):
Refueling
(F1500)

Cognitive Enabler
Describe the Refueling System technical specification limiting conditions for operation, their bases, the associated surveillance requirement(s), and their relationship to operability.

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94	K/A Importance: 2.9/3.9			Points: 1.00
S94	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	80726

The plant is operating at 100% power on night shift with the following shift assignments:

Date: Today

	Nights	**Days**
SM	P. Skarbek	D. Etue
CRS	YOU	C. McAllister
CRLNO	J. Clements	A. Palomar
COP H11-P603	T. Kicinski	B. Teifer
Shift Foreman	** F. Scadin	** D. Roberts
Other	N/A	D. Pearce
Turbine Bldg	* E. Walters	* D. Cooper
Reactor Bldg	* C. Byrd	* W. Walland
Outside/Fermi 1	* B. Eisenmann	* B. Hughes
Radwaste Op-Assigned	# M. Foster	# S. Bruley
Dedicated Shutdown NO	A. Shakil	R. Bitzer
Other	@ C. Fowler (FB Only)	* C. Jewell

* Fire Brigade Member ** Fire Brigade Leader # CR Communicator
@ Fire Brigade Qualified Fire Protection Inspector

At 0300 B. Eisenmann has a medical emergency and leaves site.

As the Control Room Supervisor, which of the following actions, if any, are required by MOP10, Fire Brigade?

A. Fire Brigade is at minimum manning, no action is required.

B. Fire Brigade manning is below minimum, inform A. Shakil that he is now on the Fire Brigade.

C. Fire Brigade manning is below minimum, however, it is acceptable to wait until turnover at 0700.

D. Fire Brigade manning is below minimum, start calling for a Fire Brigade member to arrive by 0500.

Answer: D

Answer Explanation:
Per MOP10, Section 3.1:

3.1.1 A Fire Brigade of at least 5 members shall be maintained onsite at all times. The Fire Brigade shall not include the SM, Security, or members of the minimum shift crew necessary for safe shutdown of the unit or any personnel required for other essential functions during a fire emergency. A typical Fire Brigade should consist of:

1. One Fire Brigade Leader.
2. Four Operators (or three Operators and a Fire Brigade Qualified Fire Protection Inspector).
3. One other qualified member of plant staff as communicator.

3.1.2 The Fire Brigade composition may be less than the minimum requirements for a period not to exceed two hours to accommodate unexpected absences of Fire Brigade members if immediate action is taken to restore the Fire Brigade to its minimum requirements.

Therefore, the SRO examinee must conclude that that action must be taken immediately to restore the Fire Brigade to its minimum requirements and up to 2 hours can be taken to accommodate the unexpected absence.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The examinee could fail to recognize that minimum manning requirements are not met. This is incorrect as described above.
B. The examinee could recognize that Abu Shakil is a qualified NO and would meet the Four Operator requirement of MOP10. However, this answer is incorrect because MOP10 prohibits the use of NOs that are part of the minimum shift crew necessary for safe shutdown of the unit, of which Abu is a part, as stated in the stem of the question.
C. The examinee could recognize that MOP10 does allow for the Fire Brigade composition to be less than the minimum requirements to accommodate unexpected absences, however, the examinee could fail to remember that there is a time limit associated with this exception or the examinee could incorrectly recall the allowed amount of time and determine that it would be met even if the crew waited until turnover. This is incorrect since turnover usually takes place between 0630 and 0700, which is outside of the allowable 2 hour exception.

10 CFR 55.43(b)(5) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question involves assessing plant conditions (normal vs. abnormal shift manning) and selecting a procedure (MOP10) section (3.1, Fire Brigade Composition) to mitigate or recover shift staffing back to meet the minimum requirements. This question requires specific knowledge of the content of MOP10, Section 3.1 and not the procedure's overall purpose.

The question cannot be answered solely by knowing "systems knowledge", or solely by knowing immediate operator actions, or solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs, or solely by knowing the purpose, overall sequence of events, or mitigative strategy of a procedure.

Reference Information:

MOP10, Fire Brigade

Question Use
Closed Reference
ILO

NUREG 1123 KA Catalog Rev. 2
G2.1.5 Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
SRO

Associated objective(s):
Administrative Conduct Manuals - Licensed Operators/STA
Performance Terminal
Describe the typical Fire Brigade composition and any exceptions to the minimum requirements.

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95	K/A Importance: 4.3/4.6			Points: 1.00
S95	Difficulty: 2.00	Level of Knowledge: Low	Source: NEW	83628

~~The plant is operating at 100%.~~ **

You are on shift as the Control Room Supervisor (CRS).

With control room manning in compliance with MOP19, Reactivity Management, which of the following evolutions would require you to position yourself in close proximity to the P603 Operator to maintain proper Reactivity Management oversight?

A. Reactor startup per the GOP until criticality is achieved.

B. Planned downpower to perform a rod pattern adjustment.

C. Reactor shutdown per the GOP until the plant reaches 25% power.

D. Reactor Recirculation flow adjustments required to maintain thermal power.

Answer: D

**Removed with concurrence of Chief Examiner (6/28/2019).

Answer Explanation:
Per MOP19 Section 4.3, Large reactivity changes requiring a Reactivity Management Senior Reactor Operator (RMSRO) are planned changes to Control Rod position or Recirculation pump speed. MOP-19 then states that the RMSRO role is normally fulfilled by the on shift STA/IA with an active SRO license and then goes on to list exceptions to the use of the STA/IA as the RMSRO. For these instances, another SRO is called in to fulfill that function.

MOP19-100 Section 5.3 lists responsibilities for On-Shift Reactivity Oversight.

5.3.1 requires that the SM ensure a RMSRO is staffed when required (MOP19 lists when one is required as described above).

5.3.2 states that the CRS shall maintain oversight of all reactivity manipulations in accordance with MOP19, "Reactivity Management":

- For the small Reactor Recirculation flow adjustments required to maintain thermal power, the CRS shall be positioned in close proximity to the P603 Operator and Peer Checker so as to maintain this oversight role.
- For larger power maneuvers, a Reactivity Management SRO will be assigned to provide direct oversight of the manipulation of reactivity controls.

The examinee should recognize that Recirculation flow adjustments required to maintain thermal power will not have a RMSRO assigned and therefore will require the examinee, as the CRS as stated in the stem of the question, to position him/herself in close proximity to the P603 operator.

Distractor Explanation:
Distractors A, B and C are all incorrect because they are examples of large reactivity changes that require the use of a RMSRO. They are all plausible because they are listed in MOP19 as requiring Reactivity Management oversight and the examinee could recall that he/she must position him/herself in close proximity to the P603 Operator. However, MOP19 Section 5.3.4 states that the CRS and RMSRO should divide responsibilities and 5.3.6 states that the RMSRO should act as the point of contact for the on-shift Reactor Engineer and communicate directions to the P603 operator and keep the CRS informed. Therefore, the CRS will maintain command-and-control over the rest of the control room and will not position him/herself in close proximity to the P603 Operator for the evolutions in distractors A, B and C.

10 CFR 55.43(b)(5) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires specific knowledge of SRO roles and responsibilities for Reactivity Management as well as reactivity changes requiring a Reactivity Management Senior Reactor Operator (RMSRO), and knowledge of reactivity manipulations that will NOT require the use of a RMSRO and therefore the CRS will have to fulfill that role. The question is not related to immediate actions or entry conditions. The answer to this questions is based on assessing a planned reactivity change and implementation a station administrative procedure correctly. It cannot be answered by solely knowing systems knowledge, immediate operator actions, entry conditions or knowing the purpose, overall sequence of events or mitigative strategy of a procedure.

Reference Information:
MOP19, Section 4.3
MOP19-100, Section 5.3

Plant Procedures
MOP19

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
G2.1.37 Knowledge of procedures, guidelines, or limitations associated with reactivity management

NRC Question Use (ILO 2019)
Low
NEW
SRO

Associated objective(s):
Conservative Reactivity Management
Cognitive Enabler
Define the Roles and Responsibilities established at Fermi 2 regarding Reactivity Management.

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96	K/A Importance: 2.2/3.2			Points: 1.00
S96	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	80646

In accordance with MES12, Performing Temporary Modifications, when removing a Temporary Modification, which of the following is the responsibility of the Shift Manager, Control Room Supervisor, Field Support Supervisor or Shift Engineer?

A. Verify the adequacy of the modification testing as specified in the work package.

B. Verify the plant or DCS system is in a condition that the Temporary Modification can be removed.

C. Verify all changes required by applicable Temporary Modification Status Change Notices (MES12015) have been implemented.

D. Verify the work package against Temporary Modification documentation, ensuring removal instructions, prerequisites, assumptions, defined parameters, and stated values are adequately addressed to support removal.

Answer: B

Answer Explanation:
Per MES12 Section 7.1, Removal Instructions, Step 7.1.4 is the responsibility of the Shift Manager / Control Room Supervisor / Field Support Supervisor / Shift Engineer:
Verify the plant or DCS system is in a condition that the Temporary Modification can be removed.
Establish necessary plant or system conditions to allow removal of Temporary Modification.
Upon satisfactory review, authorize work package to remove Temporary Modification.
The Correct answer is one of the responsibilities of the licensed SROs listed in the stem of the question.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This distractor is plausible because it is part of the process for removal of Temporary Modifications as per MES 12, Section 7.1, Step 7.1.2.5. However, this distractor is incorrect because this responsibility lies with either a System Engineer, Plant Support Engineer or First Team Engineer and not a licensed SRO.
C. This distractor is plausible because it is part of the process for removal of Temporary Modifications as per MES 12, Section 7.1, Step 7.1.10.1. However, this distractor is incorrect because this responsibility lies with the Temporary Modification Owner and not a licensed SRO.
D. This distractor is plausible because it is part of the process for removal of Temporary Modifications as per MES 12, Section 7.1, Step 7.1.2.3. However, this distractor is incorrect because this responsibility lies with either a System Engineer, Plant Support Engineer or First Team Engineer and not a licensed SRO.

10 CFR 55.43(b)(3) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires specific knowledge of administrative processes for temporary modifications as outlined in MES12, Performing Temporary Modifications. To answer the question, the examinee must know actions in the Temporary Modification process that are specific to Senior Reactor Operators (SROs) only.

Reference Information:

MES12, Section 7.1, Removal Instructions.

Plant Procedures
MES12 - Performing Temporary Modifications

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
G2.2.5 2.2/3.2 Knowledge of the process for making design or operating changes to the facility

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (3) Facility licensee procedures required to obtain authority for design and operating changes in the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
SRO

Associated objective(s):
Administrative Conduct Manuals - Licensed Operators/STA
Performance Terminal
Describe who can verify installation of a Temporary Modification.

Administrative Conduct Manuals - Licensed Operators/STA
Performance Terminal
Describe when an existing Work Request may or may not be used for the removal of a Temporary Modification.

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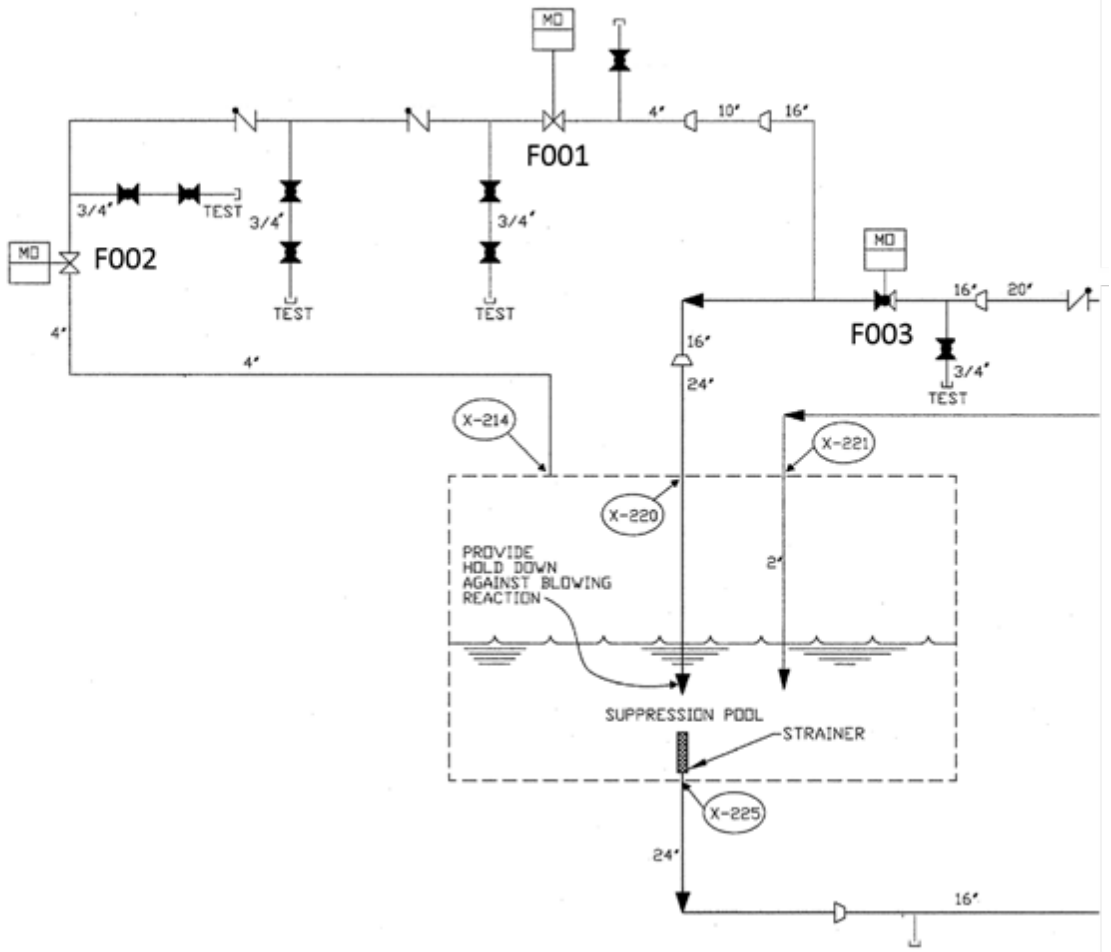
97	K/A Importance: 3.9/4.3			Points: 1.00
S97-V3	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	83106

The Valve labeled F001 in the generic drawing below has been declared INOPERABLE.

Your review of LCO 3.6.1.3, Primary Containment Isolation Valves (PCIVs), has determined that Condition A, One or more penetration flow paths with one PCIV inoperable, except due to leakage not within limits, should be entered and the containment penetration isolated within 4 hours.

Which of the following is(are) the MINIMUM REQUIRED action(s) to ensure the system is placed in a configuration that is in compliance with the LCO?



A. Close the F002 ONLY.

B. Close AND de-energize the F002.

C. Close the F002 and the F003 ONLY.

D. Close AND de-energize the F002 and the F003.

Answer: B

Answer Explanation:
The SRO examinee must recall that one valve in the penetration must not only be closed but also de-energized (deactivated) as spelled out in the BASES for LCO 3.6.1.3, which states that the method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure, which is why the automatic MOV must be closed AND de-energized.

This method is also spelled out in Operations Department Expectation 12 (ODE-12), page 6 which states the following for penetration flow paths with two isolation valves: “The penetration flow path must be isolated with a manual valve, blank flange, or active valve de-energized in the closed position."

Therefore, the SRO examinee must recall the information above and interpret the drawing to determine that the F002 valve must be closed, and de-energized, to put the plant in the correct configuration required by Tech Specs.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This distractor would be correct if TS only required the penetration to be isolated by closing one of the isolation valve in a penetration containing two isolation valves. This is plausible since either isolation valve is fully capable (both are leak tested, both have independent logic, power supplies, control logic, etc.) of providing containment isolation therefore closing the valve would isolate the penetration. This distractor is incorrect because TS requires the valve to not only be closed but to be de-activated as described in TS Bases above.
C. This distractor would be correct if TS required two valve isolation for a penetration containing two PCIVs, which is plausible since the penetration does normally contain two isolation valves. However, this distractor is incorrect because two valve isolation is NOT required and because TS requires the use of a de-activated automatic valve if that valve is used to isolate the penetration.
D. This distractor would be correct if TS required two valve isolation for a penetration containing two PCIVs, which is plausible since the penetration does normally contain two isolation valves. However, even though closing these valves would isolate the penetration, closing both valves is not required by TS and doing so is not the MINIMUM REQUIRED actions necessary to satisfy TS.

10 CFR 55.43(b)(2) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires application of required actions (TS section 3) in accordance with rules of application requirements. Also, this question requires knowledge of TS bases that is required to analyze TS-required actions and terminology, which is SRO-only knowledge.

The question cannot be answered solely by knowing </= 1-hour TS/TRM action, or solely by knowing LCO/TRM information listed "above the line", or solely by knowing TS safety limits. The question can only be answered by the SRO candidate applying the required actions of TS LCO 3.6.1.3 and/or information contained in the Bases for that LCO.

Reference Information:
Technical Specifications LCO 3.6.1.3, Primary Containment Isolation Valves (PCIVs) BASES.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
G2.2.15 3.9/4.3 Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, line-ups, tag-outs, etc.

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (2) Facility operating limitations in the technical specifications and their bases.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
SRO

Associated objective(s):
Technical Specifications for Licensed Operators
EAL/TS/Reporting
Performance Enabler
Given plant conditions that constitute non-compliance with any LCO, apply Technical Specifications and Bases to determine the applicable Condition(s), Required Action(s), and associated Completion Time(s).

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98	K/A Importance: 3.8/4.3			Points: 1.00
S98-AFTER SUBMITTAL	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	85266

ANY time Primary Containment Water Level is __(1)__, the CRS should direct Primary Containment be vented from the __(2)__ to most effectively reduce radioactivity released.

A. (1) <570'
(2) Torus

B. (1) <570'
(2) Drywell

C. (1) <589'
(2) Torus

D. (1) <589'
(2) Drywell

Answer: A

Answer Explanation:

Per BWROG Appendix B, venting through the Torus vent is preferred over using the drywell vent to take advantage of the scrubbing action of water in the suppression pool. The EPGs state “If primary containment water level is rising, early or extended venting may be appropriate while the suppression chamber vent path is still available to take advantage of suppression pool scrubbing”. This concept is generic in nature in that it applies to controlling radiation release regardless of the need (plant conditions causing) to vent containment. Therefore, the SRO examinee must recall that, when Containment Water Leve is <570’, it is preferable to Vent from the Torus, which is the elevation of the Torus Vent. Above 570', containment venting shifts to the Drywell due to the Torus Vent becoming submerged.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. With this response, the statement reads “ANY time Primary Containment Water Level is <570’, the CRS should direct Primary Containment be vented from the Drywell to most effectively reduce radioactivity released.” This statement is plausible because the Torus is vented, when <570’, to most effectively scrub the fission product gasses prior to venting and the examinee could recall that some fission product scrubbing does occur, when venting from the Drywell, whenever Drywell Sprays are in operation. However, this degree of scrubbing is less than what is achieved when vented water must pass from the Drywell, through the Suppression Chamber Vent header and downcommers, and through the water in the Torus prior to being vented out of the Torus. Therefore, this statement is incorrect because, when <570', more scrubbing occurs when venting from the Torus.

C. With this response, the statement reads “ANY time Primary Containment Water Level is <589’, the CRS should direct Primary Containment be vented from the Torus to most effectively reduce radioactivity released.” This statement is plausible because 589’ is an inflection point on the PCPL curve that is provided to the examinees with this exam, so if the examinee doesn’t directly recall the use of 570’ as the decision point, he/she could see that inflection point and incorrectly apply it to the point used to decide between venting from the Torus or the Drywell and because venting from the Torus, when possible, does provide the most effective reduction of radioactivity released through scrubbing of fission product gasses. However, this statement is not correct because it is NOT possible to vent from the Torus ANY time Containment Water Level is <589’, since the Torus vent is covered with water when >570’.

D. With this response, the statement reads “ANY time Primary Containment Water Level is <589’, the CRS should direct Primary Containment be vented from the Drywell to most effectively reduce radioactivity released.” This statement is plausible because 589’ is an inflection point on the PCPL curve that is provided to the examinees with this exam, so if the examinee doesn’t directly recall the use of 570’ as the decision point, he/she could see that inflection point and incorrectly apply it to the point used to decide between venting from the Torus or the Drywell and because some fission product scrubbing does occur, when venting from the Drywell, but only when Drywell Sprays are in operation. This statement is incorrect for two reasons: First, because venting from the Drywell only preferentially occurs once Containment Water Level exceeds 570’, when the Torus Vent becomes covered, so venting the Drywell is ONLY a better option above 570’ and not ANY time Containment Water Level is <589’. When water level is <570’, venting from the suppression chamber is generally preferred, to obtain the benefits of suppression pool scrubbing (see discussion of Radioactivity Release from BWROG EPG, Appendix B, Page B-7-41). Second, although the BWROG EPGs/SAGs, Appendix B discusses the scrubbing obtained from venting the Drywell, with Drywell Sprays in operation, this degree of fission product scrubbing is not as effective as what Appendix B refers to as suppression pool scrubbing. Lastly, scrubbing in the Drywell only occurs with Drywell Sprays in operation. At Fermi 2, Drywell Sprays are not permitted when water level rises to the bottom of the Torus to Drywell Vacuum breakers, which occurs at an indicated Torus Water Level of +45”, corresponding to a Containment Water Level of approximately 561’, well below 570’. In other words, although containment venting will shift to the Drywell when Containment Water Level exceeds 570’, the benefits of fission product scrubbing will not be available due to the inability to spray the Drywell, making the statement in this distractor incorrect.

10 CFR 55.43(b)(5) SRO Justification:

The question cannot be answered solely by knowing "systems knowledge", or solely by knowing immediate operator actions, or solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs, or solely by knowing the purpose, overall sequence of events, or mitigative strategy of a procedure.

Reference Information:

29.100.01 SH 2, Primary Containment Control
BWROG EPGs/SAGs, Appendix B, Page B-7-41.

Plant Procedures
29.100.01 SH 2

Question Use
Closed Reference
ILO

NUREG 1123 KA Catalog Rev. 2
G2.3.11Ability to control radiation releases

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

NRC Exam Usage
ILO 2012 Exam
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
SRO

Associated objective(s):

99	K/A Importance: 3.8/4.3			Points: 1.00
S99	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	80686

You are the Control Room Supervisor and are executing the EOPs because of an event. The normal complement of shift personnel is all available in the Main Control Room.
While executing the EOP flowcharts, you encounter the symbol below:

After you circle it, what are you required to do with the information contained in the symbol?

A. Immediately communicate the information to the Shift Manager.

B. Immediately make a Hi-Com announcement directing the Shift Communicator to report to the Main Control Room.

C. Direct the STA to Evaluate the information against EP-101 Enclosure A, Initiating Condition Matrix, within the next 5 minutes.

D. Immediately announce Assembly/Accountability per EP-530, Assembly and Accountability and Onsite Protective Actions.

Answer: A

Answer Explanation:
Per Operations Department Expectation ODE-10, Emergency Operating Procedure Expectations, Section on Flowchart Marking, when the CRS reaches an EP-101 flag, he/she is to circle the flag and communicate this information to the Shift Manager.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. This distractor is plausible because the information contained in the flag shown indicates that an Emergency Action Level (EAL) threshold has been reached, meaning the site is in an Emergency, and a 15 minute notification is required. Since the Shift Communicator will make this communication, it is plausible that the SRO in the CRS role will make this announcement. However, with a full crew in the Main Control Room, this communication is the responsibility of the Shift Manager.
C. This distractor is correct if the Shift Manager was not available in the Main Control Room because the CRS and STA are both qualified per station procedures to make Emergency Classifications and because NRC regulations require the licensee to establish and maintain the capability to assess, classify, and declare an emergency condition within 15 minutes after the availability of indications to plant operators that an emergency action level has been exceeded and to promptly declare the emergency condition as soon as possible following identification of the appropriate EAL. This distractor is incorrect because the Shift Manager is normally responsible for recognizing when EALs are met and classifying events so the Shift Manager will perform this action when in the Main Control Room, therefore communication of the information contained in the flag is given to the SM to make the delcaration..
D. This distractor is correct for conditions such as a Tornado or for certain Security Events because, for these type of events, the CRS makes plant announcements, per EP-530, for safe shelter. This is incorrect because, in this case, the Shift Manager will make the EP-530 required announcement after he/she reviews EP-101 against current plant conditions and classifies the event accordingly.

10 CFR 55.43(b)(5) SRO Justification:
The question cannot be answered solely by knowing "systems knowledge", or solely by knowing immediate operator actions, or solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs, or solely by knowing the purpose, overall sequence of events, or mitigative strategy of a procedure.

Reference Information:

ODE-10, Emergency Operating Procedure Expectations.
ODE-5, Roles and Responsibilities.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
G2.4.20 Knowledge of operational implications of EOP warnings, cautions, and notes.

10CFR55 RO/SRO Written Exam Content
10 CFR 55.43(b) (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Low
NEW
SRO

Associated objective(s):
Primary Containment Control

Performance Terminal

Using the graphs from the EOP Flowcharts, and parameter values for specific plant conditions, determine appropriate operator actions per the EOP Flowcharts.

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100	K/A Importance: 3.0/4.1			Points: 1.00
S100	Difficulty: 2.00	Level of Knowledge: Low	Source: BANK	83546

The Fermi 2 site has entered a General Emergency and consideration is being given to evacuating several sectors of the 10 mile Emergency Planning Zone (EPZ).

Who makes the final decision on whether or not to IMPLEMENT the offsite Protective Action Recommendations (PARs)?

A. Emergency Officer.

B. Emergency Director.

C. State decision-makers.

D. Radiation Protection Coordinator.

Answer: C

Answer Explanation:
Per EP-545, Section 4.6 Responsibility for PARs:

State decision-makers make the final decision on what protective actions(s) to implement.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This distractor is correct if the question asked who made protective action recommendations when the Emergency Operations Facility (EOF) is functional. This distractor is incorrect because the Emergency Officer is only responsible for making a final protective action recommendation local and/or state authorities and not for making the final decision on what protective actions to implement.
B. This distractor is correct if the question asked who made protective action recommendations when the Technical Support Center (TSC) and Emergency Operations Facility (EOF) are not functional OR if the TSC is functional and the EOF is not functional. This distractor is incorrect because the Emergency Director is only responsible for making the final protective action recommendations and not for making the final decision on what protective actions to implement.
D. This distractor is correct if the question asked who advises the Emergency Officer in matters related to protective actions if the EOF is functional. This distractor is incorrect because the Radiation Protection Coordinator is only responsible for evaluating information and advising the Emergency Officer not for making the final decision on what protective actions to implement.

10 CFR 55.43(b)(5) SRO Justification:
This question meets ES-401 Attachment 2 requirements to be SRO-Only because answering this question requires knowledge of site administrative procedures that specify coordination of plant emergency procedures. At Fermi 2, the responsibility for making PARs rests with SRO-licensed individuals such as the Shift Manager, Control Room Supervisor and/or STA, making this an SRO-only task.

The question cannot be answered solely by knowing "systems knowledge", or solely by knowing immediate operator actions, or solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs, or solely by knowing the purpose, overall sequence of events, or mitigative strategy of a procedure.

Reference Information:

EP-545, Protective Action Recommendations.

Question Use
Closed Reference
ILO
SRO

NUREG 1123 KA Catalog Rev. 2
G2.4.37 Knowledge of the lines of authority during implementation of the emergency plan

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(10) Administrative, normal, abnormal, and emergency operating procedures for the facility.

NRC Exam Usage
ILO 2019 Exam

NRC Question Use (ILO 2019)
Bank
Low
SRO

Associated objective(s):
EMERGENCY CLASSIFICATION & PROTECTIVE ACTION RECOMMENDATIONS

Performance Terminal

State who makes the Protective Action Recommendations and which agencies must receive the recommendations.

INITIAL QUALIFICATION
EMERGENCY CLASSIFICATION & PROTECTIVE ACTION RECOMMENDATIONS

Performance Terminal

State who makes the Protective Action Recommendations and which agencies must receive the recommendations.