1	K/A Importance: 3.8			Points: 1.00
R01-V3	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	115027

The plant was operating at 100% power when the reactor scrammed due to a spurious MSIV isolation.

Plant conditions are as follows:

- RPV level is 155" and rising slowly.
- The lowest level indicated was 135".
- RPV pressure is 1010 psig and lowering slowly.

Based on the highest pressure sensed during the transient of 1145 psig, answer the following questions:

(1) What is the status of the Reactor Recirculation Pumps?

(2) What action should be taken promptly?

A. (1) Tripped
(2) Reset the reactor scram.

B. (1) Running
(2) Raise RR pump speeds to 30%.

C. (1) Running
(2) Lower RR pump speeds to 30%.

D. (1) Tripped
(2) Maximize RWCU bottom head drain flow.

Answer: D

Answer Explanation:

The examinee should evaluate Reactor Pressure and interpret that, when pressure peaked at 1145 psig, then the Scram Pressure of 1093 psig and the ARI Pressure of 1133 psig have been exceeded. The examinee should recall that, at Fermi 2, when ARI actuates (1) BOTH RR MG Sets Trip to satisfy ATWS / RPT requirements.

The examinee should then determine that, with both RR Pumps tripped, per AOP 20.138.01, Recirculation Pump Trip, Condition C, if both RR pumps are tripped, (2) RWCU Bottom Head Drain Flow should be maximized to minimize temperature stratification in the lower RPV Bottom Head area. Note that this is operationally significant because this will help to ensure temperature requirements are met for subsequent RR pump restart.

A. (1) is correct. For part (2) since a Scram occurred, as stated in the stem, and the MSIVs closed, the examinee could determine that resetting the scram is correct because it minimizes CRD flow to the RPV, which helps with temperature stratification, at low RR flows, in the RPV bottom head region. This is incorrect since the scram cannot be reset with level at 155".

B. Part (1) is incorrect because ARI will trip both the RRMG sets. Part (2) is plausible because 28% speed is the minimum speed of the RRMG sets but 30% speed is the procedural minimum that they are set at upon start of the RRMG sets. The examinee could determine the RRMG sets would run back to minimum, therefore requiring that they should be raised to 30%. 28% is also plausible because that is the speed setting that RR DCS will set the controllers to when a RRMG set trips, therefore setting the controller up for the next RR Pump start.

C. Part (1) is incorrect because ARI will trip the RRMG sets. Part (2) is plausible because 40% is the speed the RRMG sets run back to on a loss of forward pumping of heater drains and on trip of a RFP, both of which will occur during the plant scram and MSIV closure indicated in the stem of the question. If the RRMG sets ran back to 40%, then lowering them to 30% is the correct action since that's the procedurally driven minimum RRMG set speed.

References:
20.138.01, Recirculation Pump Trip and BASES.

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295001 Partial or Complete Loss of Forced Core Flow Circulation
295001.AA2 Ability to determine and/or interpret the following as they apply to Partial or Complete Loss of Forced Core Flow Circulation: (CFR: 41.10 / 43.5 / 45.13)
295001.AA2.09 Reactor pressure

Associated objective(s):

Emergency and Abnormal Operating Procedures Performing Training

Cognitive Terminal

Given abnormal plant operating conditions and parameters, perform the required actions for the appropriate operator response in accordance with approved Fermi 2 Alarm Response Procedures, Abnormal Operating Procedures, and Emergency Operating Procedures: Perform other EOP / AOP actions per site procedures as directed. (RO)

2	K/A Importance: 3.7			**Points: 1.00**
R02	Difficulty: 3.00	Level of Knowledge: High	Source: MODIFIED	102607

The plant is operating at 100% power when the following events occur:

- Bus 65F deenergizes due to a fault in the 65F-F6 breaker.
- EDG 14 starts and loads.
- 20.300.65F, Loss of Bus 65F, has been entered.

(1) When power is restored to MCC 72F-4B, which MPU will automatically transfer back to its normal power supply?

(2) Why is this prevented by opening 72F-4B Circuit 4, prior to restoring MCC 72F-4B?

A. (1) MPU 2
(2) To prevent overloading EDG 14.

B. (1) MPU 3
(2) To prevent overloading EDG 14.

C. (1) MPU 2
(2) To prevent transferring between out of phase sources.

D. (1) MPU 3
(2) To prevent transferring between out of phase sources.

Answer: D

Answer Explanation:

MCC 72F-4B is the normal power source for MPU3 and it is lost when Bus 65F loses power. When EDG 14 sequences back onto the bus, power to MCC 72F-4B can be restored.
MPU 3 is normal seeking when its normal source of power is returned to 92% of rated by EDG 14 restoring power to the bus.
AOP 20.300.65F Condition F has the operator open its normal power feed, 72F-4B Ckt 4, to prevent transfer back to its normal source automatically, therefore allowing it to be transferred back MANUALLY by the operators later in the AOP when the bus is restored to normal offsite power.

When power is restored to MCC 72F-4B, (1) MPU 3 will transfer back to its normal source 30 minutes after the normal source is restored.
20.300.65F Action F prevents this from occurring by opening 72F-4B Circuit 4 to (2) Prevent an out of phase transfer from occurring (as per Note 5 of the AOP).

Distractor Explanation:

Distractors are incorrect and plausible because:

A. Like MPU 3, the normal source of power to MPU 2 is from 65F. When power is lost to MPU 2, it will transfer to its alternate source (72E) just like MPU 3 will. However, unlike MPU 3, when the normal power source is restored via EDG 14, MPU 2 will not transfer back because it is a power-seeking MPU. If this was not understood, or the operator incorrectly recalled actions are taken to prevent a transfer of MPU 3, then this could be mistaken as the correct answer. Part (2) is a plausible reason for preventing automatic transfer back to EDG 14 since, before loads are restored on EDG 14, operators will monitor EDG load to ensure overloading does not occur. However, this is not the reason given for why this action is taken and the AOP spells out the reason being to prevent an out of phase transfer from occurring.
B. Part (1) is correct. Part (2) is a plausible reason for preventing automatic transfer back to EDG 14 since, before loads are restored on EDG 14, operators will monitor EDG load to ensure overloading does not occur. However, this is not the reason given for why this action is taken and the AOP spells out the reason being to prevent an out of phase transfer from occurring.
C. Like MPU 3, the normal source of power to MPU 2 is from 65F. When power is lost to MPU 2, it will transfer to its alternate source (72E) just like MPU 3 will. However, unlike MPU 3, when the normal power source is restored via EDG 14, MPU 2 will not transfer back because it is a power-seeking MPU. If this was not understood, or the operator incorrectly recalled actions are taken to prevent a transfer of MPU 3, then this could be mistaken as the correct answer. Part (2) is correct, albeit for a different MPU.

Reference Information:

20.300.65F AOP.

Plant Procedures
20.300.65F

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Closed Reference
High Cognitive Level
Modified
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
295003 Partial or Complete Loss of AC Power
295003.AK3 Knowledge of the reasons for the following responses or actions as they apply to Partial or Complete Loss of AC Power: (CFR: 41.5 / 45.6)
295003.AK3.01 Manual and automatic bus transfer

Associated objective(s):
4160/480V Electrical Distribution
Cognitive Terminal
In accordance with approved plant procedures, given the condition of the system: Identify the reason(s) for the following actions or occurrences related to the 4160/480V Electrical Distribution System: 4160V buses automatically swapping to their alternate supply, 480V buses automatically swapping to their alternate supply.

3	K/A Importance: 3.9			**Points: 1.00**
R03	Difficulty: 2.00	Level of Knowledge: High	Source: NEW	103689

A complete loss of Offsite Power has occurred.

All Emergency Diesel Generators (EDGs) started and loaded as expected.

20.300.Offsite, Loss of Offsite Power AOP, has been entered.

CTG 11-1 failed to start when attempted per the AOP.

Battery chargers with power available have been restored per the AOP.

If power is not restored within 1 hour, which DC buss(es) will require load reduction and why?

A. BOP ONLY to ensure power remains available to the BOP DC motor loads.

B. BOP ONLY to ensure power remains available to the BOP DC control loads.

C. BOP and ESF to ensure power remains available to the BOP and ESF DC motor loads.

D. BOP and ESF to ensure power remains available to the BOP and ESF DC control loads.

Answer: B

Answer Explanation:

Per 20.300.Offsite:
Condition BB is entered, and Attachment 9, BOP DC Load Reduction is performed, if BOP Battery Chargers cannot be restored within 1 hour of the onset of the event.
Per 20.300.Offsite BASES for Action BB.1, this is because failure of the Blackstart Unit to start requires shutdown of BOP DC powered equipment when plant conditions permit.
The examinee should recall that CTG11-1 is the Blackstart Unit, and failure of CTG11-1 to start will jeopardize loads supplied by the BOP Battery. The examinee must then recall that Attachment 9 removes power to large DC motors, such as the RRMG Set, RFP Turbine and Main Turbine Emergency Oil Pumps when those respective pieces of equipment stop rotating (i.e., when conditions permit as stated in the Bases).

The examinee must recall that it is the motor loads that are shed to ensure the BOP battery remains available to supply power to control loads.
Note: This is also explained on page 5 of the DC Electrical Student Text, ST-OP-315-0064-001, in the bases for actions taken in the event of a Loss of Offsite Power (as specified in the stem of the question) to maintain Critical Safety Functions.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. BOP DC loads are shed, but motor loads are shed to maintain power to the control loads, not the other way around.
C. Only DC BOP loads are shed. ESF DC loads are maintained by the operator performing AOP Actions AR through AY. If a complete loss of Offsite AND Onsite AC electrical power had occurred, then AOP 20.300.SBO would have been entered and these actions performed as stated in the stem of the question. In that case, BOTH BOP and ESF DC loads would have been stripped. BOP DC loads are shed, but motor loads are shed to maintain power to the control loads, not the other way around.
D. Only DC BOP loads are shed. ESF DC loads are maintained by the operator performing AOP Actions AR through AY. If a complete loss of Offsite AND Onsite AC electrical power had occurred, then AOP 20.300.SBO would have been entered and these actions performed as stated in the stem of the question. In that case, BOTH BOP and ESF DC loads would have been stripped. Motor loads are stripped, but only for the BOP DC busses.

Reference Information:

20.300.Offsite
20.300.Offsite BASES
ST-OP-315-0064-001, DC Electrical Student Text

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295004 Partial or Complete Loss of DC Power
295004.AK3 Knowledge of the reasons for the following responses or actions as they apply to Partial or Complete Loss of DC Power: (CFR: 41.5 / 45.6)
295004.AK3.01 Load shedding

Associated objective(s):

DC Electrical Distribution

Cognitive Terminal

In accordance with approved plant procedures, given various controls and indications for system operations: Describe the impact on plant operations of a loss of the following DC buses, and describe the actions necessary to correct, control or mitigate the loss of DC power: 260/130VDC ESF bus, 260/130VDC BOP bus, 48/24VDC Bus

4	K/A Importance: 4.4			**Points: 1.00**
R04	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	102613

The plant is conducting a startup with the following plant conditions:

- Reactor Power is 23%.
- The Main Turbine is running at synchronous speed.
- The Main Turbine Bypass Valves are 10% open.
- Main Turbine 1st Stage Pressure is 125 psig.

A leak has developed, outside the Drywell, affecting only the REFERENCE leg of the Narrow Range RPV Level instruments.

Which procedures will be entered as a DIRECT result of the change in INDICATED level due to this failure?

A. 20.000.21, Reactor Scram
29.100.01, RPV Control EOP

B. 20.107.01, Loss of Feedwater or Feedwater Control.
20.109.01, Turbine / Generator Trip.

C. 20.107.01, Loss of Feedwater or Feedwater Control.
20.109.01, Turbine / Generator Trip.
20.000.21, Reactor Scram

D. 1D65, SBFW Isolation RPV Water Level 8.
2D89, HPCI Turbine Trip Solenoid Energized.
1D79, RCIC Turbine Shutdown RPV Water Level 8.

Answer: B

Answer Explanation:

A leak on the reference leg of a D/P level transmitter will cause indicated RPV level to rise. The examinee must recall that, if level rises on the Narrow Range level instruments only, per 20.000.23, High RPV Water Level AOP Condition A, when Narrow Range level indicates >214" direct Main Turbine Trip and trip of the North and South RFPTs will result. Therefore, the examinee must determine that the AOPs for Main Turbine Trip (20.109.01) and RFPT trip (20.107.01) must be entered.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. The examinee could determine that the failure in the stem of the question will cause indicated level on the Narrow Range Level instruments to lower, causing RPS to scram the reactor on RPV Level 3, therefore requiring entry into the Scram AOP and the RPV Control EOP. This would be true if the leak was on the Variable leg. However, with the leak on the Reference leg, indicated level will rise causing a trip of the Main and RFP Turbines per Condition A of 20.000.23.

C. The examinee could determine that, due to the Main Turbine tripping on indicated High RPV Water Level, the reactor will also scram requiring entry into the Scram AOP. This would be correct at higher powers (above ~30%) and higher Main Turbine First Stage Pressure (>161.9 psig) as per Condition B of 20.000.23. However, at the power level and first stage pressures indicated in the stem, the reactor will not immediately trip.

D. The examinee could incorrectly recall that the Narrow range level instruments, when indicating high, will trip HPCI, RCIC and SBFW. This is plausible as per Condition C of 20.000.23. However, HPCI, RCIC and SBFW are affected by the Wide Range level instruments indicating >214" and not Narrow Range as specified in the stem of the question.

Reference Information:

20.000.23, High RPV Water Level AOP
20.107.01, Loss of Feedwater or Feedwater Control
20.109.01, Turbine / Generator Trip

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295005 Main Turbine Generator Trip
295005.AA2 Ability to determine and/or interpret the following as they apply to Main Turbine Generator Trip: (CFR: 41.10 / 43.5 / 45.13)
295005.AA2.07 Reactor water level

Associated objective(s):

Emergency and Abnormal Operating Procedures Performing Training

Cognitive Terminal

Given abnormal plant operating conditions and parameters, perform the required actions for the appropriate operator response in accordance with approved Fermi 2 Alarm Response Procedures, Abnormal Operating Procedures, and Emergency Operating Procedures: Identify symptoms for entry into emergency and abnormal operating procedures. (RO)

5	K/A Importance: 4.2			**Points: 1.00**
R05	Difficulty: 2.00	Level of Knowledge: High	Source: BANK	102610

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

- C32-R616A North Reactor Feedwater Pump (RFP) Controller in AUTO.
- C32-R616B South Reactor Feedwater Pump (RFP) Controller in AUTO.
- RPV Startup LCV Mode Switch in RUN.
- Level Control Mode Switch in 3-Element.

A reactor scram subsequently occurs.

Two minutes after the scram, (1) what is the status of the RFP Controllers and (2) what are the approximate RFP Turbine speeds?

A. (1) Auto
(2) 1600 rpm

B. (1) Auto
(2) 2650 rpm

C. (1) Manual
(2) 1600 rpm

D. (1) Manual
(2) 2650 rpm

Answer: D

Answer Explanation:

Per 20.000.21, Reactor Scram AOP, Note 3, The examinee should recall that Post Scram Feedwater Logic (PSFWL) takes the following automatic actions, and the operator should be able to recall these actions so they can monitor the response of the Reactor Water Level Control System as it applies to a Scram:

T-6 seconds after Reactor scram, DCS logic causes C32-R618, Master Feedwater Level Controller, setpoint (SP) setdown to 150 inches (below minimum scale of 160 inches of SP display). This action occurs regardless of RPV Startup LCV Mode Switch position.
T-30 seconds after Reactor scram, DCS logic causes the following actions if RPV Startup LCV Mode Switch is in RUN:

- For 2 seconds, C32-R620, N21-F403 Startup LCV Controller, is pulsed to AUTO with a setpoint (SP) of 197 inches.
- N2100-F607, N RFP Disch Line Iso Valve, and N2100-F608, S RFP Disch Line Iso Valve, receive close signals (approximately 90 seconds to close).
- N2100-F045A, N RFP Disch HYD Stop Valve, and N2100-F045B, S RFP Disch HYD Stop Valve, receive close signals (approximately 8-10 seconds to close).

T-60 seconds after Reactor scram, DCS logic causes the following actions if RPV Startup LCV Mode Switch was in RUN at 30 seconds after Reactor scram:

- For 2 seconds, C32-K616A, North Reactor Feed Pump Controller, and C32-K616B, South Reactor Feed Pump Controller, are pulsed to MANUAL with outputs at approximately 29.23% corresponding to approximately 2650 rpm on the North and South Reactor Feed Pump Turbine. This action occurs in AUTO or MANUAL.
- N2100-F607, N RFP Disch Line Iso Valve, and N2100-F608, S RFP Disch Line Iso Valve, close signals are clear.
- N2100-F045A, N RFP Disch HYD Stop Valve, and N2100-F045B, S RFP Disch HYD Stop Valve, close signals are clear.

The examinee must first evaluate the conditions in the stem and determine that, with the RPV startup LCV Mode Switch in RUN, PSFWL will actuate. The examinee must then determine that 2 minutes after the scram PSFWL will have set the RFPT speed controllers to (1) Manual and the RFPT speeds to approximately (2) 2650 rpm.

<u>Distractor Explanation:</u>
Distractors are incorrect and plausible because:

A. (1) Auto is the normal mode for the RFPT controllers and also the mode they would be in if the RPV Startup LCV Mode Switch was in the START position. However, with the RPV Startup LCV Mode Switch was in the RUN position, the RFP speed controllers will be in MANUAL 2 minutes after the scram. (2) is the speed that the RFPTs would be turning at if the RPV Startup LCV Mode Switch was in the START position. This is true because, 6 seconds after Reactor scram, DCS logic causes C32-R618, Master Feedwater Level Controller, setpoint (SP) setdown to 150 inches (below minimum scale of 160 inches of SP display), regardless of RPV Startup LCV Mode Switch position. This causes the RFPTs to lower to the lower demand setpoint of the controllers (approximately 1600 rpm) and, if the RPV Startup LCV Mode Switch was in START after 60 seconds, the RFPTs would not get a signal to increase speed so they would remain at 1600 rpm. However, with the RPV Startup LCV Mode Switch in the RUN position, the RFPT speeds will get set to approximately 2650 rpm by PSFWL.
B. (1) Auto is the normal mode for the RFPT controllers, and the candidate could fail to recall that PSFWL sets the RFP controllers to MANUAL 60 seconds after a scram. However, with the RPV Startup LCV Mode Switch was in the RUN position, the RFP speed controllers will be in MANUAL 2 minutes after the scram. (2) is correct and is plausible with part (1) if the candidate incorrectly determines that the final condition is 2650 rpm with the controllers in AUTO.

C. (1) Manual is correct and is the final mode of the RFP controllers after PSFWL has finished its sequence. (2) is plausible because it represents the minimum speed setpoint of the RFPs, which is the lowest speed attainable with the RFP controllers and the point when speed control shifts to the MOP (Motor Operated Potentiometer). The candidate could recall seeing the RFPTs at 1600 rpm following a scram and incorrectly determine that this is their final speed. This is incorrect because the RFP controllers will be set to an output corresponding to approximately 2650 rpm 60 seconds after the scram.

Reference Information:
20.000.21, Reactor Scram AOP

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.

Fermi 2 NRC Exam Usage
ILO 2019 Retake Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)
Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
295006 SCRAM
295006.AA1 Ability to operate and/or monitor the following as they apply to SCRAM: (CFR: 41.7 / 45.6)
295006.AA1.02 Reactor water level control system

Associated objective(s):
Reactor Feedwater
Cognitive Terminal
In accordance with approved plant procedures, given various controls and indications for system operations: Describe Reactor Feedwater system automatic features.

6	K/A Importance: 3.8			Points: 1.00
R06	Difficulty: 3.00	Level of Knowledge: Fund	Source: NEW	103187

The plant is operating at 100% power, with all plant equipment in a normal configuration, when a confirmed fire is reported in Zone 14, DC MCC area, which is a 3L Zone.

The CRS enters 20.000.18, Control of the Plant from the Dedicated Shutdown Panel. The following actions are performed:

- Control Room Actions for a Confirmed Fire in a 3L Zone.
- The CRS directs one licensed operator and one other operator to H21-P623, Dedicated Shutdown Panel, with a set of Security Keys.

When will the Blackstart Combustion Turbine Generator (CTG) receive a signal to start?

A. When separating from the 120kV grid if a loss of 120kV Mat occurs.

B. By the designated operator when contacted to start the Blackstart Unit.

C. When the licensed operator places the EF2 SUPV CONTROL in LOCAL at the Dedicated Shutdown Panel.

D. When the Dedicated Shutdown System transfer arming collar in the Main Control Room is placed in 'Emerg Start' and the pushbutton depressed.

Answer: D

Answer Explanation:

Per 20.000.18, Control of the Plant from the Dedicated Shutdown Panel:

Actions of Condition A will have an operator in the Main Control Room place the Dedicated Shutdown System transfer arming collar is placed in 'Emerg Start' and the pushbutton depressed, which will send a start signal to CTG11-1. The examinee must recall that this action is taken, early in an event and BEFORE offsite power is lost, to ensure Standby Feedwater injection to the RPV can occur, if needed, within 24.4 minutes of a scram.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. If a loss of 120kV Offsite power were to occur under these conditions, the AOP directs entering Condition H, which separates site electrical from offsite power and allows CTG 11-1 to automatically tie in (output breaker closes in on the dead bus). This is incorrect though because the CTG is tied in here. It is actually started much earlier in the AOP as described above.
B. The examinee could incorrectly recall that an operator is always designated to start the Blackstart Unit, or the examinee could determine that CTG 11-1 is NOT the Blackstart Unit and therefore the designated CTG must be started in its place per Action A.1 of the AOP. The examinee could also assume that the "other operator" directed to the Dedicated Shutdown Panel is the designated operator who will then start the Blackstart Unit. These are all incorrect assumptions because nothing in the stem of the question indicates that CTG 11-1 is not available and, if CTG 11-1 is available, a designated operator is not assigned since remote starting is preferrable.
C. The examinee could confuse that Actions taken per step A.5 at the Dedicated Shutdown Panel as what starts the CTG. However, as long as the CTG is started from the MCR in Action A.1, these steps are not necessary.

Reference Information:

20.000.18, Control of the Plant from the Dedicated Shutdown Panel

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295016 Control Room Abandonment
295016.AA1 Ability to operate and/or monitor the following as they apply to Control Room Abandonment: (CFR: 41.7 / 45.6)
295016.AA1.15 Emergency generators

Associated objective(s):

Emergency and Abnormal Operating Procedures Performing Training

Cognitive Terminal

Given abnormal plant operating conditions and parameters, perform the required actions for the appropriate operator response in accordance with approved Fermi 2 Alarm Response Procedures, Abnormal Operating Procedures, and Emergency Operating Procedures: Perform other EOP / AOP actions per site procedures as directed. (RO)

7	K/A Importance: 3.8			Points: 1.00
R07	Difficulty: 2.00	Level of Knowledge: High	Source: NEW	102667

The plant is operating at 100% power when the crew entered 20.127.01, Loss of Reactor Building Closed Cooling Water System AOP.

EECW/EESW Auto initiated and Attachment 1 of 20.127.01 has been performed.

Receipt of which of the following alarms would be an indication that a TOTAL loss of RBCCW has occurred?

A. 2D9, Fuel Pool System Temperature High.

B. 8D41, Division 1 Drywell Temperature High.

C. 7D51, Division 1 Control Air System Trouble.

D. 8D61, Div 1 Battery Charger Area Temperature High.

Answer: A

Answer Explanation:

Per 20.127.01 NOTE 1, a list of components cooled by RBCCW only are given, with corresponding indications/alarms that may be received as a result.
2D9, Fuel Pool System Temperature High is listed as one of those alarms since FPCCU is only cooled by RBCCW.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. Per 20.127.01 Attachment 1, last bullet of Steps 2 and 3, IF a high Drywell Pressure exists, then P4400-F606A(B), Div 1(2) EECW to Drywell Outboard Isolation Valves will close, causing loss of cooling water flow to the Drywell. If the examinee only remembers these valves as being on Attachment 1, without the benefit of having this attachment during the exam, then the examinee could incorrectly conclude that cooling flow to the Drywell is lost when RBCCW is lost, therefore 8D41 could be expected. This is incorrect since these conditions will not occur on a loss of RBCCW without a High DW pressure condition.
C. Per 20.127.01 Action J the CAC Room Coolers and the CACs themselves are cooled by RBCCW until EECW is initiated. It is plausible that the examinee could determine that 7D51 would be received because the CACs are loads that are normally cooled by RBCCW. However, the CAC coolers will be cooled by EECW/EESW on a loss of RBCCW and Action J is only performed if EECW fails to initiate.
D. Per 20.127.01 Action J the Battery Charger Room Coolers are loads that are normally cooled by RBCCW. The examinee could determine that, since this room cooler is in a general area in the vicinity of the Division 2 Switchgear room, that it is only cooled by RBCCW therefore 8D61 would result. However, the Battery Charger Room coolers will be cooled by EECW/EESW on a loss of RBCCW and Action J is only performed if EECW fails to initiate.

Reference Information:

20.127.01, “LOSS OF REACTOR BUILDING CLOSED COOLING WATER SYSTEM"

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b) (8) Components, capacity, and functions of emergency systems.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295018 Partial or Complete Loss of Component Cooling Water
295018.AK2 Knowledge of the relationship between Partial or Complete Loss of Component Cooling Water and the following systems or components: (CFR: 41.7 / 45.8)
295018.AK2.06 Fuel pool cooling and cleanup system

Associated objective(s):

Emergency and Abnormal Operating Procedures Performing Training

Cognitive Terminal

Given abnormal plant operating conditions and parameters, perform the required actions for the appropriate operator response in accordance with approved Fermi 2 Alarm Response Procedures, Abnormal Operating Procedures, and Emergency Operating Procedures: Apply notes and cautions as directed by the EOP / AOP. (RO)

8	K/A Importance: 3.6			Points: 1.00
R08-V2 AFTER SUBMITTAL	Difficulty: 2.00	Level of Knowledge: High	Source: NEW	102612

The plant is operating at 100% power when a leak in the Station Air Header results in the following:

- Station Air Header Pressure is 90 psig and lowering.
- The West Station Air Compressor (SAC) is in service and running loaded.
- The Center SAC is tagged out for maintenance.
- The East SAC is in standby and not running.
- P5000-F401, Station Air to TB Header Isolation Valve, is Open.

Which of the following should the CRLNO perform now and why?

A. Close P5000-F401 to prevent the Inboard MSIVs from going closed.

B. Close P5000-F401 to prevent the Outboard MSIVs from going closed.

C. Start the East Station Air Compressor to prevent the Inboard MSIVs from going closed.

D. Start the East Station Air Compressor to prevent the Outboard MSIVs from going closed.

Answer: D

Answer Explanation:

20.129.01, Loss of Station and Control Air AOP, Condition A contains the information necessary to answer this question.

The examinee must recall (1) the pressure at which the AOP requires starting the standby air compressors, which are the Station Air Compressors, and at 95 PSIG, 20.129.01 states "Start any available Station Air Compressor" and then recall that (2) The OUTBOARD MSIVs are supplied by IAS, which is a load on the Station Air Compressors.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. If Station Air Header Pressure was below 85 psig with the P5000-F401 still open, and if the examinee failed to recall which MSIVs received air from IAS, then the examinee could choose this response since the examinee could determine that closing the P5000-F401 would arrest the air pressure reduction and prevent closing the Inboard MSIVs. This is incorrect because the stem of the question indicates that the backup air system (the East SAC) has failed to auto start at 95 psig, therefore starting the standby SAC is required now, since pressure is below 95 psig and not yet below 85 psig.
B. If Station Air Header Pressure was below 85 psig with the P5000-F401 still open, this response would be correct because the leak could be in the station air header, downstream of the P5000-F401, which could be the reason why station air header pressure was lowering. If the examinee forgot the isolation setpoint for the P5000-F401, the examinee could choose this response since closing it could stop the pressure reduction and prevent the Outboard MSIVs from closing. This is incorrect because the stem of the question indicates that the backup air system (the East SAC) has failed to auto start at 95 psig. Starting the standby SAC is required now, since pressure is below 95 psig.
C. Starting the East Station air compressor is correct because the available Station Air Compressors should have been started at 95 PSIG per 20.129.01. The examinee could fail to recall what air sub-system supplies the Inboard MSIVs and determine that the East SAC should be started for that reason. However, the Div 1 and Div 2 Control Air Compressors auto start at 85 PSIG, and the associated NIAS isolation valves close at 85 psig. Closing the isolation valves and start of the CACs is what will maintain NIAS header pressure and prevent Inboard MSIV closure. Starting the SAC will help prevent Outboard MSIV closure.

Reference Information:

20.129.01, Loss of Station and/or Control Air
20.129.01 BASES, Loss of Station and/or Control Air Bases
7D53, Station Air Header Pressure Low

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.

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
295019 Partial or Complete Loss of Instrument Air
295019.AK3 Knowledge of the reasons for the following responses or actions as they apply to Partial or Complete Loss of Instrument Air: (CFR: 41.5 / 45.6)
295019.AK3.01 Alignment of backup air systems

Associated objective(s):
Compressed Air Systems
    Cognitive Terminal
    In accordance with approved plant procedures/references, given the operating conditions and parameters for the Compressed Air System: Identify abnormal and emergency operating procedures associated with the system, as applicable.

9	K/A Importance: 3.4			Points: 1.00
R09-V2	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	102608

The plant is in MODE 5 with the RPV Head REMOVED.

Fuel handling operations are in progress between the RPV and the Spent Fuel Pool.

Fuel Pool Cooling and Cleanup (FPCCU) is in operation.

Division 1 RHR is in the Shutdown Cooling mode.

ALL RBCCW/EECW cooling water to the Drywell is ISOLATED and DRAINED for maintenance.

RHR Pump A trips when an electrical fault causes closure of E1150-F008, RHR SDC Otbd Suction Iso Valve. The valve cannot be reopened electrically or manually.

Which of the following actions is required under these conditions?

A. Place Division 2 RHR in Shutdown Cooling.

B. Restore Div 1 RHR in Shutdown Cooling with RHR Pump C in service.

C. Start a Reactor Recirculation Pump to restore forced core flow circulation.

D. Shift FPCCU discharge to the Reactor Well and maximize flow to the Reactor Cavity.

Answer: D

Answer Explanation:

Per 20.205.01, Loss of SDC AOP:

BOTH Loops of RHR are rendered unavailable by the COMMON suction line isolation. With NO RHR available and fuel movement in progress, the examinee must determine that the Reactor Vessel Head and Fuel Pool Gates are removed.
The examinee must then recall that 20.205.01, Loss of Shutdown Cooling, Action J.1 directs shifting FPCCU discharge to the Reactor Well, maximizing flow to the Reactor Cavity.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. This method would be performed per Condition H if SDC could not be restored to the in service Division (Div 1), which is the case with the failure given in the stem. However, Since F008 is on the common RHR SDC suction line, with no bypass valve, DIV 2 RHR will not be available so this action will be ineffective.
B. This method would be performed per Condition E if SDC was lost due to a pump trip, which did occur and was stated in the stem. However, Since F008 is on the common RHR SDC suction line, with no bypass valve, the C RHR pump will not be available so this action will be ineffective.
C. Starting a RR pump is listed as an action in Conditions L and I, among others, and is performed to restore forced core flow circulation in instances where RHR is not able to be restored to SDC, which is the case in this question. However, cooling water is isolated and drained to the Drywell, therefore not available to support RR pump operation. This makes shifting FPCCU discharge to the Reactor Well the correct action to take.

Reference Information:
20.205.01, Loss of SDC AOP

Plant Procedures
20.205.01

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.

Fermi 2 NRC Exam Usage
ILO 2017 Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)
Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
295021 Loss of Shutdown Cooling
295021.AA1 Ability to operate and/or monitor the following as they apply to Loss of Shutdown Cooling: (CFR: 41.7 / 45.6)
295021.AA1.07 Fuel pool cooling and cleanup

Associated objective(s):

Emergency and Abnormal Operating Procedures Performing Training

Cognitive Terminal

Given abnormal plant operating conditions and parameters, perform the required actions for the appropriate operator response in accordance with approved Fermi 2 Alarm Response Procedures, Abnormal Operating Procedures, and Emergency Operating Procedures: Perform other EOP / AOP actions per site procedures as directed. (RO)

10	K/A Importance: 3.8			Points: 1.00
R10	Difficulty: 2.00	Level of Knowledge: Fund	Source: BANK	102611

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 the Standby Gas Treatment System and is related to this event?

A. 16D1, RB Refueling Area Fifth Floor High Radiation

B. 3D32, DIV I/II RB Vent Exh Radiation Monitor Upscale

C. 3D35, DIV I/II FP Vent Exh Radiation Monitor Upscale Trip

D. 3D41, Control Center Makeup Air Radiation Monitor Upscale

Answer: C

Answer Explanation:

3D35, DIV I/II FP Vent Exh Radiation Monitor Upscale Trip is associated with isolations and actuations which result from fission product detection following a dropped fuel assembly. The examinee must identify protective and nonprotective radiation monitor conditions. This causes actuation of SGTS.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. 16D1, RB Refueling Area Fifth Floor High Radiation 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 Radiation 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, Control Center Makeup Air Radiation 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, DIV I/II FP Vent Exh Radiation Monitor Upscale Trip

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b)(11) Purpose and operation of radiation monitoring systems, including alarms and survey equipment.

Fermi 2 NRC Exam Usage

ILO 2009 Exam
ILO 2019 Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
Fundamental (Low) Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295023 Refueling Accidents
295023.AK2 Knowledge of the relationship between Refueling Accidents and the following systems or components: (CFR: 41.7 / 45.8)
295023.AK2.07 SGTS/FRVS

Associated objective(s):

Emergency and Abnormal Operating Procedures Performing Training

Cognitive Terminal

Given abnormal plant operating conditions and parameters, perform the required actions for the appropriate operator response in accordance with approved Fermi 2 Alarm Response Procedures, Abnormal Operating Procedures, and Emergency Operating Procedures: Identify symptoms for entry into emergency and abnormal operating procedures. (RO)

11	K/A Importance: 3.9			**Points: 1.00**
R11	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	102649

The plant is operating in MODE 1 when a small steam leak develops in the Drywell.

The Primary Containment Monitoring System (PCRMS) is in service with no alarms indicated.

The CRS enters 29.100.01, Sheet 2, Primary Containment Control, on high Drywell temperature of 145°F.

Drywell pressure is 0.7 psig (19" WC) and rising 0.05 psig every 15 minutes.

Based on these plant conditions, what action(s) should be taken?

A. Verify SGTS is running and vent the Torus.

B. Place RHR in Torus Cooling and Torus Spray.

C. Verify RBHVAC is running and vent the Drywell.

D. Scram the reactor in anticipation of an automatic scram.

Answer: C

Answer Explanation:

The EOPs, step PCP-1, direct venting the drywell to keep DW pressure <1.68 psig in accordance with 29.ESP.07, step 1.0.
The examinee should recognize that DW pressure is high but not rising fast, so venting the DW is appropriate to attempt to keep DWP less than the EOP entry and to prevent unnecessary isolations and actuations if 1.68 psig were reached.
The examinee must then determine that it is preferrable to vent through RBHVAC, if available.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. A steam leak would indicate particulate in the air. The candidate could expect the vent path to be from the Torus and through SGTS to reduce radioactive release; However, there are no alarms on PCRMS which indicates no (or little) radioactive particulates to scrub and, since DWP has not exceeded 1.68 psig, a Secondary Containment Isolation has not yet occurred, therefore RBHVAC should still be in service.
B. Is plausible and incorrect because there are elevated containment parameters. The candidate may determine that containment cooling for pressure reduction is necessary at this time.
D. Is plausible and incorrect because the EOPs have been entered. The candidate may see this option as correct if they deduce that scramming the reactor is a conservative action. However, this is not the correct answer because venting the drywell is directed and should allow the operators to perform a controlled shutdown without placing the plant through a scram transient.

Reference Information:
29.ESP.07, Primary Containment Venting

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

Fermi 2 NRC Exam Usage
ILO 2013 Exam
ILO 2017 Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)
Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
295024 High Drywell Pressure
G2.1.19 Ability to use available indications to evaluate system or component status (CFR: 41.10 / 45.12)

Associated objective(s):
Emergency Support Procedures
Cognitive Terminal
Given relevant plant conditions, Discuss the steps for venting and purging the Primary Containment, in accordance with plant and management expectations and in accordance with Fermi 2 Emergency Operating Procedures.

12	K/A Importance: 3.7			Points: 1.00
R12	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	102616

The MSIVs have spuriously closed with the plant at 100% power.

The reactor scrammed and the EOPs were entered when Reactor Pressure exceeded the High RPV Pressure Scram Setpoint.

The Low-Low Set function of the SRVs is unavailable.

You are using SRVs to stabilize RPV Pressure less than the scram setpoint per 29.100.01, RPV Control EOP.

Which instrument(s) below would you use to monitor pressure during this event AND are required by LCO 3.3.3.1, Post Accident Monitoring Function 1 - Reactor Vessel Pressure, to be OPERABLE?

1. B21-R623A, Post Accident Monitoring Recorder, on H11-P601, Div 1 ECCS Panel.
2. C32-R609, Reactor Pressure Recorder, on H11-P603, Reactor Controls Panel.
3. C32-R605A(B), Div 1(2) RPV Pressure Indicators, on H11-P603, Reactor Controls Panel.

A. 1 ONLY

B. 1 and 2 ONLY

C. 1 and 3 ONLY

D. 1, 2 AND 3

Answer: A

Answer Explanation:

Per LCO 3.3.3.1 Table 3.3.3.1-1, 2 wide-range Reactor Pressure instruments are required to be OPERABE to support Function 1 - Reactor Vessel Pressure.
44.120.001, Accident Monitoring Reactor Vessel Pressure Division 1 Channel Calibration describes that this surveillance ensures compliance with LCO 3.3.3.1 for Table 3.3.3.1-1 Function 1 by assuring calibration of B21-R623A, Post Accident Monitoring Recorder.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. 2 is plausible because the C32-R609, Reactor Pressure Recorder is a 0-1500 psig pressure recorder, which is the same range as the B21-R623A and is located on the H11-P603 Reactor Controls panel. The candidate could incorrectly determine that this instrument is also required by LCO 3.3.3.1, which is incorrect because LCO 3.3.3.1 only requires 2 Function 1 instruments to be OPERABLE, which are the B21-R623A and B21-R623B.
C. 3 is plausible because C32-R605A(B) are divisional pressure indicators, indicating wide-range pressure from 0-1200 psig, located in the control room on the H11-P603. If pressure control was being controlled using the Main Turbine Bypass Valves, these are the indicators the examinee would use to monitor pressure. It is plausible that the candidate could determine that these are PAM instruments because they are divisional and on the Reactor Controls Panel. This is incorrect because LCO 3.3.3.1 requires 2 Function 1 instruments to be OPERABLE, which is satisfied by OPERABILITY of the B21-R623A and B21-R623B.
D. The examinee could determine that both 2 and 3 are correct for the reasons given above and, with instrument 1 being correct, determine that all 3 are PAM instruments required by LCO 3.3.3.1 that could be used to monitor pressure during this event. However, this is incorrect because B21-R623A allows for monitoring of wide range RPV level AND pressure during a transient and is the TS required PAM instrument.

Reference Information:

29.100.01, RPV Control EOP
LCO 3.3.3.1
44.120.001, Accident Monitoring Reactor Vessel Pressure Division 1 Channel Calibration.

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
Fundamental (Low) Cognitive Level
New
NRC Early Review
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295025 High Reactor Pressure
G2.4.3 Ability to identify post-accident instrumentation (CFR: 41.6 / 45.4)

Associated objective(s):

RPV Control

Cognitive Terminal
Given appropriate procedures and conditions, Describe the Control Room indicators for monitoring RPV Control entry conditions, in accordance with plant/management expectations

13	K/A Importance: 3.8			Points: 1.00
R13	Difficulty: 3.00	Level of Knowledge: Low	Source: NEW	102690

The plant is operating at 100% power, when an SRV opens.

AOP 20.000.25, Failed SRV, has been entered.

Despite operator actions to attempt to close the SRV, it remains stuck open.

(1) At what suppression pool temperature is the operator required to place the Mode Switch in Shutdown?

(2) Why is this action required at this temperature?

A. (1) 95°F

(2) Prevents challenging the containment design limits from steam released to the suppression pool with the plant at power.

B. (1) 110°F

(2) Prevents challenging the containment design limits from steam released to the suppression pool with the plant at power.

C. (1) 95°F

(2) This is the lowest temperature above which operation of pumps with suction from the torus will cause increased equipment wear or damage.

D. (1) 110°F

(2) This is the lowest temperature above which operation of pumps with suction from the torus will cause increased equipment wear or damage.

Answer: B

Answer Explanation:

Per 29.100.01 Sheet 2 and per 20.000.25 Override statement and Action B.1, at 110°F, the Mode Switch must pe placed in shutdown to prevent challenging containment design limits. Above this temperature, there is a higher risk of steam release in suppression pool to compromise torus integrity.

The BWROG requires this action at this temperature because they define it as the "TS required shutdown temperature." Per LCO 3.6.2.1, at Fermi 2, this temperature is 110F and the basis for maintaining average suppression pool temperature below 110°F is given in the bases section for the LCO, which is RO level of knowledge. The basis states (in summary): This requirement ensures that the unit will be shut down at > 110°F. The pool is designed to absorb decay heat and sensible heat but could be heated beyond design limits by the steam generated if the reactor is not shut down.

Therefore, to answer this question, the examinee must know that the operational implication of suppression pool temperature above 110°F is that the MS must be placed in S/D to prevent heating the suppression pool beyond design limits which could challenge containment integrity.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. This temperature/action combination is incorrect. However, the basis listed for the action is correct. The examinee may select this option if they incorrectly believe that the shutdown must take place at 95°F instead of 110°F.

C. This is only partially correct. 95°F is the temperature at which all available Torus cooling must be placed in service. However, the basis is incorrect. Per 29.100.01 Sheet 6, Note 2 states 140°F is the temperature above which increased equipment wear can occur. Note 4 states that 150°F is the temperature above which operation of pumps taking suction from the torus above NPSH or vortex limits may cause equipment damage. The examinee may select this option if they recall these cautions but incorrectly recall the temperature values above which the limits are a concern.

D. This temperature/action combination is incorrect. 95°F is the temperature at which all available Torus cooling must be placed in service. The basis is incorrect. See the explanation of Sheet 6 Notes 2 and 4 for distractor C.

Reference Information:

29.100.01 Sheet 2, Primary Containment Control
29.100.01 Sheet 6, Cautions and Curves
LCO 3.6.2.1 BASES

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b) (8) Components, capacity, and functions of emergency systems.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295026 Suppression Pool High Water Temperature
295026.EK1 Knowledge of the operational implications and/or cause and effect relationships of the following as they apply to Suppression Pool High Water Temperature: (CFR: 41.8 to 41.10)
295026.EK1.03 Primary containment integrity

Associated objective(s):

Primary Containment Control

Cognitive Terminal

Given appropriate procedures and conditions, Describe the expected plant/system response for actions directed by 29.100.01 Sh 2, Primary Containment Control, in accordance with plant/management expectations

14	K/A Importance: 3.8			Points: 1.00
R14	Difficulty: 2.00	Level of Knowledge: High	Source: NEW	103367

You are the Control Room LNO on shift in the Main Control Room.

The shift started the day with SRV R tagged out with its fuses removed.

A scram subsequently occurred due to a steam leak in the Drywell.

(1) Above which of the following Drywell Temperatures would an Emergency Depressurization (ED) be required?

(2) When directed to do so by the CRS, how will you perform the ED?

A. (1) 242°F
(2) Open 4 ADS SRVs only

B. (1) 340°F
(2) Open 4 ADS SRVs only

C. (1) 242°F
(2) Open 4 ADS SRVs and one additional SRV

D. (1) 340°F
(2) Open 4 ADS SRVs and one additional SRV

Answer: D

Answer Explanation:

Per 29.100.01, Sheet 2 Primary Containment Control:

If Drywell Temperature cannot be maintained less than 340°F, Emergency Depressurization of the RPV is required. The ED is to be performed by opening 5 SRVs, ADS preferred. Since one of the ADS SRVs is unavailable, the CRLNO must choose another SRV to ensure 5 SRVs are opened.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. (1) This part is INCORRECT. 242°F is the temperature at which Drywell spray must be initiated and EECW to and from the drywell is secured. The candidate may choose this option if they recall this temperature value from the Drywell Temperature leg of Sheet 2 and falsely think that it is the correct ED temperature.
(2) This part is INCORRECT. 5 SRVs must be opened. If an ADS SRV is unavailable, the operator must open a different SRV to make up for it. The candidate may choose this option if they think that the minimum number of SRVs required for an ED is 4 SRVs.

B. (1) This part is correct.
(2) This part is INCORRECT. 5 SRVs must be opened. If an ADS SRV is unavailable, the operator must open a different SRV to make up for it. The candidate may choose this option if they think that the minimum number of SRVs required for an ED is 4 SRVs.

C. (1) This part is INCORRECT. 242°F is the temperature at which Drywell spray must be initiated and EECW to and from the drywell is secured. The candidate may choose this option if they recall this temperature value from the Drywell Temperature leg of Sheet 2 and falsely think that it is the correct ED temperature.
(2) This part is correct.

Reference Information:

29.100.01 SH 2, Primary Containment Control

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295028 High Drywell Temperature (Mark I and II Only)
295028.EA1 Ability to operate and/or monitor the following as they apply to High Drywell Temperature: (CFR: 41.7 / 45.6)
295028.EA1.05 Safety relief valves

Associated objective(s):

Primary Containment Control

Cognitive Terminal

Given appropriate procedures and conditions, Describe the plant conditions that would require use of the alternative actions contained in 29.100.01 Sh 2, Primary Containment Control, including: in accordance with plant/management expectations: a. Emergency Depressurization; b. Torus Spray; c. Drywell Spray; d. Venting the Drywell;

15	K/A Importance: 3.8			**Points: 1.00**
R15	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	102615

A reactor startup and heatup is in progress with the plant in MODE 2.

A large break in the Torus causes Torus Water Level to rapidly drop below -112 inches.

The crew has entered 20.000.21, Reactor Scram AOP, and all Immediate Actions have been taken.

(1) Reactor Pressure currently at which of the following values would require action to lower pressure per the EOPs?

(2) With Torus Water Level currently below -112", what action should be taken to lower pressure?

A. (1) 50 PSIG.
(2) Depressurize the RPV by opening 5 SRVs (ADS preferred)

B. (1) 150 PSIG.
(2) Depressurize the RPV by opening 5 SRVs (ADS preferred)

C. (1) 50 PSIG.
(2) Rapidly depressurize the RPV ignoring cooldown rates using the Main Condenser and other steam loads.

D. (1) 150 PSIG.
(2) Rapidly depressurize the RPV ignoring cooldown rates using the Main Condenser and other steam loads.

Answer: D

Answer Explanation:

Note: This is a BANK question that was used on previous Fermi 2 NRC exams. However, during validation, several issues were brought up regarding the credibility of plant conditions given in the stem for the previous (bank) version. Changes were made to the question, per the validator's comments, to attempt to make the question operationally valid. The changes were not significant enough to warrant changing the question status to NEW or MODIFIED.

Per 29.100.01 SH 2, Primary Containment Control, Reactor Scram is required before TWL reaches -38" (Step TWL-4) and ED is required when TWL cannot be kept >-38".

Per 29.100.01 SH 1, RPV Control, A TWL below -112 inches would be below the level of the SRV T-Quenchers and could possibly pressurize the Torus. Therefore, SRVs cannot be used to depressurize and rapidly depressurizing the RPV, ignoring cooldown rates, using another system is required. 52 psig is a significant number for the candidates to know because it defines the term "Decay Heat Removal Pressure (DHRP)" for Fermi 2. Per the BWROG EPGs, Appendix B, the definition of DHRP is "The lowest differential pressure between the RPV and the suppression chamber at which steam flow through the Minimum Number of SRVs Required for Emergency Depressurization (MNSRED) is sufficient to remove all decay heat from the core." The EPGs then go on to say that "the DHRP is utilized to define the depressurized state of the RPV." The candidate should recognize that, if RPV pressure is above 52 psig then actions need to be taken to depressurize below the DHRP. If pressure is at or below the DHRP, then additional actions to depressurize are not necessary since, by definition, the plant is depressurized.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. (1) 50 PSIG is incorrect and plausible because the branch at ED-6 only requires action if reactor pressure is > 52 PSIG above torus pressure. The candidate should recognize that, if RPV pressure is above 50 psig then actions need to be taken to depressurize below the DHRP. If pressure is at or below the DHRP, then additional actions to depressurize are not necessary since, by definition, the plant is depressurized.
(2) This is incorrect. The candidate may choose this option if they fail to recall that SRVs cannot be opened with torus water level <-112 inches. Opening 5 ADS SRVs would be the correct method if torus level were above 112 inches.
B. (1) This part is correct.
(2) This is incorrect. The candidate may choose this option if they fail to recall that SRVs cannot be opened with torus water level <-112 inches. Opening 5 ADS SRVs would be the correct method if torus level were above 112 inches
C. (1) 50 PSIG is incorrect and plausible because the branch at ED-6 shows that no action is needed if already at 50 PSIG or below. The candidate should recognize that, if RPV pressure is above 50 psig then actions need to be taken to depressurize below the DHRP. If pressure is at or below the DHRP, then additional actions to depressurize are not necessary since, by definition, the plant is depressurized.
(2) This part is correct.

Reference Information:

29.100.01 SH 1, RPV Control

29.100.01 SH 2, Primary Containment Control

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILO 2018 Exam
ILO 2019 Retake Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295030 Low Suppression Pool Water Level
295030.EA2 Ability to determine and/or interpret the following as they apply to Low Suppression Pool Water Level: (CFR: 41.10 / 43.5 / 45.13)
295030.EA2.03 Reactor pressure

Associated objective(s):

Primary Containment Control

Cognitive Terminal

Given appropriate procedures and conditions, Describe the plant conditions that would require use of the alternative actions contained in 29.100.01 Sh 2, Primary Containment Control, including: in accordance with plant/management expectations: a. Emergency Depressurization; b. Torus Spray; c. Drywell Spray; d. Venting the Drywell;

16	K/A Importance: 4.0			Points: 1.00
R16	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	115567

A LOCA has occurred, and the following indications exist:

- RPV Pressure is 900 psig and lowering.
- Drywell Pressure is 2.5 psig and rising.
- RPV Water Level is 80" and lowering.
- All Condenser pumps are tripped.
- HPCI and RCIC are isolated.
- SBFW is unavailable.

You have been directed to maximize injection to the RPV using the CRD Pumps in accordance with 29.ESP.04, RPV Injection using CRD Pumps.

Which of the following sets of actions will accomplish this directive?

(1) Place the CRD flow controller in MANUAL.
(2) Start the second CRD Pump.

Then...

A. (3) Close the Flow Control Valve using C11-K612, CRD Flow Controller.
(4) Close C1152-F003, CRD Drive/Cooling Water Pressure Control Valve.

B. (3) Throttle open the Flow Control Valve using C11-K612, CRD Flow Controller.
(4) Open C1152-F003, CRD Drive/Cooling Water Pressure Control Valve.

C. (3) Throttle open the Flow Control Valve using C11-K612, CRD Flow Controller.
(4) Close C1152-F003, CRD Drive/Cooling Water Pressure Control Valve.

D. (3) Close the Flow Control Valve using C11-K612, CRD Flow Controller.
(4) Open C1100-F034, CRD Charging Water Header Isolation Valve.

Answer: B

Answer Explanation:

Per 29.ESP.04, the CRD Flow Control Valve is throttled open, and the CRD PCV is opened, to minimize headloss in the system and maximize flow to the RPV via the cooling water header.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. This combination of actions is plausible because they would close off flow downstream and maximize pressure on the Charging Header, which would increase flow to the RPV if a scram signal was present. However, flow through this path is restricted because C11-F034 is normally throttled, and the charging header has 4 restricting orifices. Additionally, these actions are not in accordance with 29.ESP.04.

C. This combination of actions is plausible because the candidate could incorrectly recall the flowpath through the CRD system and determine that the cooling water header was between the FCV and PCV, thus concluding that opening the FCV while closing the PCV would increase pressure on / flow through the cooling water header. Furthermore, the actions of opening the FCV and closing the PCV are performed in an ATWS event, so a candidate could recall those actions but fail to recall the conditions under which they are performed. However, closing the PCV will block cooling water flow, which is the desired flowpath as specified in 29.ESP.04.

D. This combination of actions is plausible because they would minimize downstream flow, while maintaining cooling water flow to the CRD drive mechanisms (due to the block on the FCV permitting 15 gpm of flow when shut), but increase pressure and flow through the Charging Header, which would increase flow to the RPV if a scram signal was present. However, flow through this path is still restricted because of the 4 restricting orifices in the charging header. Additionally, these actions are not in accordance with 29.ESP.04.

Reference Information:

29.ESP.04, RPV Injection using CRD Pumps.
M-5703-1, CRD System FOS

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILT 2020 Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295031 Reactor Low Water Level
G2.4.12 Knowledge of operating crew responsibilities during emergency and abnormal operations (CFR: 41.10 / 45.12)

Associated objective(s):

17	K/A Importance: 3.5			Points: 1.00
R17	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	102727

The MODE Switch was placed in SHUTDOWN and a SCRAM did NOT occur:

- ATWS Actions have been performed.
- Reactor Power is 50%.
- All 8 RPS Trip System A and B Group Scram Lights are OFF.
- 3D6, SCRAM VALVE PILOT AIR HDR PRESS HIGH / LOW is NOT in Alarm.

In addition to attempting to drift and manually drive control rods in, the P603 operator's next action will be to order / execute which of the following?

A. Vent the Scram Air Header.

B. Deenergize Scram Solenoids.

C. Open the Scram Test Switches.

D. Vent CRD Over Piston Volumes.

Answer: A

Answer Explanation:

Note: This question was found in the Fermi 2 Exam Bank. Could not find evidence of previous NRC exam usage.

Per 29.ESP.03 ALTERNATE CONTROL ROD INSERTION METHODS.
Based on the conditions given in the stem of the question, conditions indicate that RPS has actuated (indicated by 8 blue RPS Scram Group lights being OFF) and the Scram Air Header is still pressurized (3D6 is not in alarm).

The examinee must evaluate these conditions and determine that the correct course of action is to perform 29.ESP.03 Section 7.0, Vent the Scram Air Header.

Distractor Explanation:
The distractors are incorrect and plausible because:
B. This is a valid strategy given in 29.ESP.03 when RPS does not actuate (8 blue lights lit) and 3D6 NOT in ALARM. However, the conditions of RPS in the stem indicate that RPS has actuated, as indicated by the 8 blue lights being not lit, therefore De-Energizing the Scram Solenoids is not the correct strategy.
C. This is a valid strategy given in 29.ESP.03 when RPS does actuate (8 blue lights NOT lit) and 3D6 IS in ALARM with 10 or less rods failing to scram. However, the stem of the questions indicates that 3D6 is NOT in alarm, therefore opening the scram test switches is not the correct strategy.
D. This is a valid strategy given in 29.ESP.03 for any control rod that cannot be inserted to full-in using the other (preferred) alternate rod insertion methods. Since nothing in the stem indicates that the other methods have been attempted, and since this method may release radioactive steam or water from the RPV and expose the performed to higher than normal radiation levels, this action is incorrect at this time.

Reference Information:
29.ESP.03

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

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown
295037.EA2 Ability to determine and/or interpret the following as they apply to SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown: (CFR: 41.10 / 43.5 / 45.13)
295037.EA2.09 SCRAM air header pressure

Associated objective(s):
Emergency Support Procedures
Cognitive Terminal
Given relevant plant conditions, From memory, list the steps necessary to manually initiate Alternate Rod Insertion, in accordance with plant and management expectations and in accordance with Fermi 2 Emergency Operating Procedures.

18	K/A Importance: 3.8			**Points: 1.00**
R18	Difficulty: 2.00	Level of Knowledge: Fund	Source: BANK	102789

Following an unisolable steam leak in the Turbine Building Steam Tunnel the following conditions exist:

- An Offsite Radiation Release is in progress.
- 29.100.01 Sheet 5, Radioactivity Release has been entered.
- Turbine Building Ventilation has TRIPPED and ISOLATED.

How will the Turbine Building Ventilation System be operated under these conditions and why?

A. Maintain Turbine Building Ventilation ISOLATED to lower the radioactivity released.

B. Maintain Turbine Building Ventilation ISOLATED to prevent an unmonitored release.

C. Defeat the isolation and RESTART Turbine Building Ventilation to ensure the release is monitored.

D. Defeat the isolation and RESTART Turbine Building Ventilation to lower the radioactivity release rate.

Answer: C

Answer Explanation:

Per 29.100.01, Sheet 5, TBHVAC is restarted per RR-OR1 by defeating interlocks as necessary per 29.ESP.25, which defeats the high radiation trip/isolation. The candidate must recall that the Turbine Building is NOT an airtight structure, and radioactivity release inside the building would lead to an unmonitored ground level release. Operating TBHVAC is allowed because it discharges radioactivity through an elevated, monitored release point.

Per BWROG EPGs/SAGs, Appendix B, Vol II Radiation Release Control, Defeating isolations and interlocks is appropriate when entry of this guideline has been required in order to minimize the possibility of unmonitored ground level releases.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. This distractor is true for Reactor Building HVAC, which automatically isolates when High Radiation is detected, and the candidate could assume that maintaining TBHVAC shut down and isolated is required.
B. This distractor is true for Reactor Building HVAC, which is exhausted through Standby Gas Treatment and discharged to a monitored stack when High Radiation is detected.
D. The candidate could assume that dilution of the Turbine Building would lower the specific activity released, however, the reason TBHVAC is restarted is to discharge from an elevated and monitored release path and not to lower activity release.

Reference Information:

29.100.01, Sheet 5, Secondary Containment Control and Radiation Release.
BWROG EPGs/SAGs, Appendix B, Vol II Radiation Release Control.

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.

Fermi 2 NRC Exam Usage

ILO 2009 Exam
ILO 2019 Retake Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
Fundamental (Low) Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295038 High Offsite Radioactivity Release Rate
295038.EK1 Knowledge of the operational implications and/or cause and effect relationships of the following as they apply to High Offsite Radioactivity Release Rate: (CFR: 41.8 to 41.10)
295038.EK1.06 Filtered vs. nonfiltered release

Associated objective(s):

Secondary Containment Control and Radioactive Release

Cognitive Terminal

Given plant procedures and plant conditions as appropriate, State the basis for the Override Statements contained in 29.100.01 Sh 5, Secondary Containment Control and Radioactive Release, in accordance with management expectations.

Current View

19	K/A Importance: 3.5			**Points: 1.00**
R19	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	103207

Which of the following would require entry into 20.000.22, Plant Fires?

A. Fire Alarm received ONLY.

B. Start of the Electric Fire Pump ONLY.

C. Fire Alarm received AND Halon discharging into the area ONLY.

D. Loss of position indication on a valve in an area protected by Fire Suppression equipment ONLY.

Answer: C

Answer Explanation:

Per 20.000.22, Plant Fires AOP and 20.000.22 BASES:

A confirmed fire is a fire that is either reported in person, or secondary indications received such as fire pump auto start, protection system discharge or abnormal indications on equipment in the vicinity of the alarm area, or at the operating shifts discretion.

With the receipt of a Fire Alarm coincident with Halon injection (an installed fire suppression system for the area), the crew would have indications from two diverse sets of instruments and logic (Fire Detection vs Fire Suppression) indicating the Fire Alarm is "confirmed" and, therefore, an entry condition into 20.000.22

Distractor Explanation:

Distractors are incorrect and plausible because:

A. Receipt of a Fire Alarm is the first indication of a fire that the operators would receive. However, by itself with no secondary indication, it would not require entry into the Plant Fires AOP. Additionally, fire detectors fail in the plant, on occasion, and the Plant Fires AOP is not entered without confirmation.
C. Fire Pump auto start is one of the indications listed that can be used to confirm a fire in Note 1 of 20.000.22, Plant Fires. However, by itself start of a Fire Pump would not require entry into the Plant Fires AOP. For example, a Fire Pump could start due to maintenance in the area causing low pressure to be sensed on the fire header pressure switch used to start the pump and entry into the Plant Fires AOP would not be required.
D. Abnormal indications received on plant equipment is one of the indications listed that can be used to confirm a fire in Note 1 of 20.000.22, Plant Fires. However, by itself, receipt of abnormal system indications, even if that system is located in an area protected by fire protection/suppression equipment, would not require entry into the Plant Fires AOP because that abnormal indication could be cause by a blown fuse, etc.

Reference Information:

20.000.22, Plant Fires AOP
20.000.22 BASES

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b) (8) Components, capacity, and functions of emergency systems.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

600000 Plant Fire on Site
600000.AK2 Knowledge of the relationship between Plant Fire on Site and the following systems or components: (CFR: 41.7 / 45.7)
600000.AK2.09 Installed fire suppression systems

Associated objective(s):
Emergency and Abnormal Operating Procedures Performing Training
Cognitive Terminal
Given abnormal plant operating conditions and parameters, perform the required actions for the appropriate operator response in accordance with approved Fermi 2 Alarm Response Procedures, Abnormal Operating Procedures, and Emergency Operating Procedures: Apply notes and cautions as directed by the EOP / AOP. (RO)

20	K/A Importance: 3.5			Points: 1.00
R20	Difficulty: 2.00	Level of Knowledge: Fund	Source: BANK	102791

The plant is operating at 80% power during a reactor startup with the following MTG indications:

S13-R804, MTG Gross Megawatts .... 800 MW
S13-R805, MTG Gross Megavars .... 100 MVAR Out

A disturbance on the DTE Main Electrical Grid subsequently causes the following MTG indications:

S13-R804, MTG Gross Megawatts .... 800 MW
S13-R805, MTG Gross Megavars .... 120 MVAR In

What is the current operating condition of the MTG and what action could the operator take to restore the Fermi 2 MTG to the pre-transient condition in accordance with AOP 20.300.GRID?

A. The MTG is currently over-excited.
Operate the Turbine Speed/Load Controls in the raise direction.

B. The MTG is currently over-excited.
Operate the Voltage Reg Control SW 90CS in the raise direction.

C. The MTG is currently under-excited.
Operate the Turbine Speed/Load Controls in the raise direction.

D. The MTG is currently under-excited.
Operate the Voltage Reg Control SW 90CS in the raise direction.

Answer: D

Answer Explanation:

Indications shown are of a voltage disturbance on the main electrical grid that caused a reduction of reactive (MVAR) load.

The operational implication of this, and what the examinee should determine, is that this disturbance has caused the MTG to be operating Under-Excited, meaning field current (excitation current) on the rotor is insufficient to carry the requisite reactive load. For reference (not provided), AOP 20.300.GRID Enclosure A indicates that the conditions shown in the stem of the question place the MTG in an Under-excited (Leading Power Factor) condition. The examinee is required to evaluate the conditions and come to this conclusion on their own.

To cause MVARS out of the machine, and restore MTG MVARs to the previous value, the examinee should determine that it is necessary to raise MTG output voltage (Reactive Load when tied to the grid) using the Voltage Reg Control SW 90CS until VARS are positive (out). This guidance can be seen on Page 27 of 23.118 Section 7.0, Online Generator Voltage Adjustments (again, not provided but required to be known from memory). Guidance for this is also in 20.300.GRID, Grid Disturbance AOP, Condition J.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. The candidate could determine that the conditions shown place the MTG in an over-excited condition, which is incorrect as can be seen on AOP 20.300.GRID Enclosure A. The candidate could also conclude that the Turbine Speed/Load Controls must be placed in the raise direction to restore MTG MVARs to the previous value, which is incorrect as described in 23.118 Section 7.0.
B. The candidate could determine that the conditions shown place the MTG in an over-excited condition, which is incorrect as can be seen on 23.118, Enclosure G and AOP 20.300.GRID Enclosure A. The candidate could correctly conclude that the Voltage Reg Control Switch must be placed in the raise direction to restore MTG MVARs to the previous value.
C. The candidate could determine that the conditions shown place the MTG in an under-excited condition, which is correct as can be seen on 23.118, Enclosure G and AOP 20.300.GRID Enclosure A. The candidate could then conclude that the Turbine Speed/Load Controls must be placed in the raise direction to restore MTG MVARs to the previous value, which is incorrect as described in 23.118, Section 7.0 and AOP 20.300.GRID.

Reference Information:

23.118, Main Generator and Generator Excitation System SOP, Enclosure G (Generator Operating Guidelines).
20.300.GRID, Grid Disturbance AOP

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.

Fermi 2 NRC Exam Usage
ILO 2018 Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)
Bank
Closed Reference
Fundamental (Low) Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
700000 Generator Voltage and Electric Grid Disturbances
700000.AK1 Knowledge of the operational implications and/or cause and effect relationships of the following as they apply to Generator Voltage and Electric Grid Disturbances: (CFR: 41.4, 41.5, 41.7, 41.10 / 45.8)
700000.AK1.05 Voltage disturbance

Associated objective(s):
Emergency and Abnormal Operating Procedures Performing Training
Cognitive Terminal
Given abnormal plant operating conditions and parameters, perform the required actions for the appropriate operator response in accordance with approved Fermi 2 Alarm Response Procedures, Abnormal Operating Procedures, and Emergency Operating Procedures: Perform other EOP / AOP actions per site procedures as directed. (RO)

21	K/A Importance: 4.1			**Points: 1.00**
R21	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	103228

The plant is operating at 70% power when multiple alarms are received, and the following conditions are noted:

- RPV level 192 inches and LOWERING
- N RFPT speed RISING
- S RFPT speed LOWERING
- Steam Flow/Feed Flow Recorder steam flow > feed flow

Both SBFW pumps are started and injecting at rated flow.

RPV level is now 178 inches and LOWERING rapidly.

Given these conditions, which of the following actions will be taken in accordance with plant procedures?

A. Place Mode Switch in Shutdown.

B. Manually initiate and inject with HPCI.

C. Manually initiate and inject with RCIC.

D. Place the Recirculation System A & B Flow Limiter 2/3 Defeat Switch in DEFEAT.

Answer: A

Answer Explanation:

Per immediate actions 20.107.01 IA:

Operators are required to place mode switch in SHUTDOWN, as this combination of RFPs and SBFW pumps is not recovering level.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. HPCI is not within the bounds of the analysis for increased subcooling. It is not the approved method of water addition for the situation given. 20.107.01 has an override that states "IF HPCI initiates with SBFW also in operation, THEN Place Reactor Mode Switch in SHUTDOWN." If the candidate fails to recall this override, they might opt to utilize HPCI to quickly restore RPV level.
C. There is insufficient time to turn the transient before a L3 SCRAM. It takes the same amount of time to start and inject with RCIC as it does with SBFW. Loss of 14" is an indicator that L3 would occur before RCIC could be placed in service and turn level. The candidate may think that RCIC is the next logical means for raising level if they do not consider the fact that they are so close to L3.
D. The 2/3 defeat should be placed in NORMAL per 20.107.01 condition C. The candidate may choose this option if they think this action is needed to avoid a 2/3 Limiter runback due to potential loss of a RFP.

Reference Information:

20.107.01 Immediate actions

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILO 2017 Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295009 Low Reactor Water Level
295009.AA2 Ability to determine and/or interpret the following as they apply to Low Reactor Water Level: (CFR: 41.10 / 43.5 / 45.13)
295009.AA2.01 Reactor water level

Associated objective(s):

Emergency and Abnormal Operating Procedures Performing Training

Cognitive Terminal

Given abnormal plant operating conditions and parameters, perform the required actions for the appropriate operator response in accordance with approved Fermi 2 Alarm Response Procedures, Abnormal Operating Procedures, and Emergency Operating Procedures: Without reference to procedures, perform AOP immediate actions. (RO)

22	K/A Importance: 4.2			**Points: 1.00**
R22	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	105247

The CRS, CRLNO and P603 Operator are in the Main Control Room.

29.100.01 Sheet 2, Primary Containment Control, has been entered on High Torus Water Temperature ONLY.

The CRS directed the CRLNO to place both divisions of RHR in Torus Cooling and MAXIMIZE cooling.

The current configuration of Division 1 RHR is as follows:

- RHR Pump A is running.
- E1150-F028A, Div 1 RHR Torus Iso Vlv is full open.
- E1150-F024A, Div 1 RHR Torus Clg Iso is full open.
- E1150-F007A, Div 1 RHR Pumps Min Flow Vlv is full open.
- Division 1 RHR System Flow is 8,500 gpm.

What are the next SEQUENTIAL actions the CRLNO should perform?

A. Place Division 2 RHR in Torus Cooling.

B. Close E1150-F007A then place Division 2 RHR in Torus Cooling.

C. Start Division 1 RHRSW, throttle closed E1150-F048A, then place Division 2 RHR in Torus Cooling.

D. Close E1150-F007A, start Division 1 RHRSW, throttle closed E1150-F048A, then place Division 2 RHR in Torus Cooling.

Answer: D

Answer Explanation:

The examinee should interpret the control room indications, and the direction from the CRS, and determine that Division 1 RHR is not yet in Torus Cooling with cooling maximized as directed.

When in the EOPs, the LNO is authorized to operate the RHR system per 23.205 Enclosure A (Hard Card). Per Enclosure A, the examinee should first recognize that the E1150-F007A, Div 1 RHR Min Flow Valve, failed to close and is therefore diverting flow away from the RHR Heat Exchanger, which is impacting the ability of the RHR system to cool the Torus and remedy the High Torus Water Temperature. Next, the examinee should determine that the best way to lower Torus Water Temperature is to (1) start RHRSW to remove heat from RHR water as it circulates from and back to the Torus and (2) throttle closed the E1150-F048A, Div 1 RHR HX Bypass Valve, to maximize flow through the HX and therefore maximize cooling to meet the CRS' direction.

Distractor Explanation:

Distractors are incorrect and plausible because:

NOTE: Deferring the placement of RHRSW in service and throttling closed the E1150-F048A is a normal action when the EOPs are entered on High Drywell Pressure, since the priority is to place Torus Sprays in service first, to attempt to arrest the Drywell Pressure rise BEFORE 9 psig is reached in the Torus. The examinee could recall performing these actions at a later time and determine that it is acceptable to place Div 2 RHR in Torus Cooling and then come back to maximize cooling on Div 1 RHR. This is incorrect because deferring these actions, without High Drywell Pressure and the need to spray the Torus quickly, is not supported by the procedure.

A. The examinee could see that the E1150-F028A and F024A are open, interpret this as meeting the CRS's directive to place Div 1 RHR in Torus Cooling, and then move on to placing Div 2 RHR in Torus Cooling to "maximize cooling". This is incorrect because, per 23.205 Enclosure A, the E1150-F007A should be closed at this flow, RHRSW should be in service and the E1150-F048A should be closed to maximize cooling. The examinee should know that deferring actions to maximize Torus Cooling are only allowed when it is desired to place RHR in Torus Sprays.
B. The examinee could recognize that the E1150-F007A failed to close when it should have and determine that, once it is closed, with the E1150-F028A and F024A open, this would meet the CRS's directive to place Div 1 RHR in Torus Cooling, and then move on to placing Div 2 RHR in Torus Cooling. This is incorrect because, per 23.205 Enclosure A, RHRSW should be in service and the E1150-F048A should be closed to maximize cooling. The examinee should know that deferring actions to maximize Torus Cooling are only allowed when it is desired to place RHR in Torus Sprays.
C. The examinee could fail to recognize that the E1150-F007A failed to close when it should have and determine that the only actions required to meet the CRS' directive are to start RHRSW and close the E1150-F048A, both of which are required actions to maximize Torus Cooling. However, with the E1150-F007A open, flow is being diverted from the Torus Cooling loop, which is impacting the ability to cool the Torus.

Reference Information:

29.100.01 Sheet 2, Primary Containment Control EOP.
23.205, RHR System SOP.

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295013 High Suppression Pool Water Temperature
G2.2.44 Ability to interpret control room indications to verify the status and operation of a system and understand how operator actions and directives affect plant and system conditions (CFR: 41.5 / 43.5 / 45.12)

Associated objective(s):

Primary Containment Control

Cognitive Terminal

Given appropriate procedures and conditions, Describe the expected plant/system response for actions directed by 29.100.01 Sh 2, Primary Containment Control, in accordance with plant/management expectations

23	K/A Importance: 3.1			**Points: 1.00**
R23	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	102807

You are the P603 Operator.

The running CRD pump has tripped.

You performed/directed all Actions of 20.106.01, CRD Hydraulics System Failure, Condition A, CRD Pump Failure.

The Reactor Building NO reports that ALL field actions of Condition A, CRD Pump Failure, are complete and the standby CRD pump is ready for start.

Subsequent starting of the standby CRD pump will cause changes in which of the following?

A. ONLY Reference Leg Backfill System flows.

B. ONLY Reactor Recirc Pump Seal Purge pressures.

C. BOTH Reactor Recirc Pump Seal Purge pressures AND Reference Leg Backfill System flows.

D. NEITHER Reactor Recirc Pump Seal Purge pressures NOR Reference Leg Backfill System flows.

Answer: B

Answer Explanation:

The examinee should recall that 20.106.01, CRD Hydraulics System Failure, Action A directs isolating of Reference Leg Backfill. The examinee should determine that RR Seal Purge, however, remains in operation and is not isolated by the above actions. Therefore, per NOTE 1 of the AOP, the operator should be aware that "Starting the CRD Pump can impact RR seal purge pressures."

Distractor Explanation:

Distractors are incorrect and plausible because:

A. Reference leg backfill is supplied by the CRD system, just upstream of the location where RR seal purge taps off. The examinee could incorrectly recall that the actions of Condition A of the AOP cause RR Seal Purge to be isolated to prevent pressure perturbations on the RR Pump Seals. This is incorrect, however, because Reference leg backfill, and NOT RR seal purge, gets isolated prior to starting a tripped CRD pump.

C. The examinee could fail to recall that Reference Leg Backfill is isolated per the actions of Action A of 20.106.01, and therefore determine that BOTH RR Seal Purge pressures and backfill system flows would be impacted. This is incorrect since Action A isolates Reference Leg Backfill prior to attempting a start of the CRD Pump so backfill flows will NOT be impacted.

D. The examinee could incorrectly recall that BOTH Reference Leg Backfill AND RR Seal Purge are isolated, prior to starting a CRD Pump, to minimize the impact on those systems and therefore determine that neither indications would be impacted. This is incorrect, however, because ONLY Reference leg backfill, and NOT RR seal purge, gets isolated prior to starting a tripped CRD pump.

Reference Information:

20.106.01, CRD Hydraulics System Failure

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference

High Cognitive Level

New

RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295022 Loss of Control Rod Drive Pumps

295022.AK2 Knowledge of the relationship between Loss of Control Rod Drive Pumps and the following systems or components: (CFR: 41.7 / 45.8)

295022.AK2.01 Recirculation system

Associated objective(s):

Emergency and Abnormal Operating Procedures Performing Training

Cognitive Terminal

Given abnormal plant operating conditions and parameters, perform the required actions for the appropriate operator response in accordance with approved Fermi 2 Alarm Response Procedures, Abnormal Operating Procedures, and Emergency Operating Procedures: Apply notes and cautions as directed by the EOP / AOP. (RO)

24	K/A Importance: 4.0			**Points: 1.00**
R24	Difficulty: 3.00	Level of Knowledge: Fund	Source: NEW	105329

Primary Containment is being vented to control containment pressure within the PCPL curve.

(1) From which location will the CRS preferentially direct containment venting to take advantage of fission product scrubbing?

(2) When will the preferred vent path be unavailable for use?

A. (1) Torus

(2) When the Torus vent path becomes submerged.

B. (1) Drywell

(2) When the Drywell Vent Path becomes submerged.

C. (1) Drywell

(2) When the Drywell to Torus Vacuum Breaker openings become submerged.

D. (1) Torus

(2) When the Torus to Reactor Building Vacuum Breaker openings become submerged.

Answer: A

Answer Explanation:

Per UFSAR 11.4.3.11.3:
The vent path will be from the Torus to take advantage of fission product scrubbing. The majority of iodine and particulates would be removed by venting through the Torus.

Per 29.100.01 SH2, Primary Containment Control and EPGs/SAGs Appendix B Vol I (Introduction) General Bases and Strategies Section 5.4, Primary Containment Venting: When Torus Water Level is <570', the preferred vent path is from the Torus. This is to take advantage of the scrubbing action of the Suppression Pool prior to venting to the environment, even though the strategy is the vent irrespective of offsite rad release rates. Once Torus Water Level reaches 570' (elevation of the Torus Vent), that path is no longer usable, and the vent path is transferred to the Drywell.

Distractor Explanation:
Distractors are incorrect and plausible because:

B. (1) The examinee may determine that the preferred vent path is from the Drywell, to take advantage of the scrubbing action that occurs when Drywell Sprays are in service. This is plausible because Drywell Sprays does provide some fission product scrubbing as described in EPGs/SAGs Appendix B Vol I (Introduction) General Bases and Strategies (top of Page B.I-5-13). This is incorrect because, although Drywell Sprays will scrub some fission products from the environment, venting from the Torus is preferred because the scrubbing action of gasses passing through the water in the Torus is more effective.
(2) If the examinee chose Part (1), then it is plausible to assume the examinee would determine that Drywell venting could take place until the Drywell vent path is submerged, much like happens when the Torus vent path is submerged in the correct response. However, since Drywell is not the preferred vent path, this entire line of thinking is incorrect.
C. (1) The examinee may determine that the preferred vent path is from the Drywell, to take advantage of the scrubbing action that occurs when Drywell Sprays are in service. This is plausible because Drywell Sprays does provide some fission product scrubbing as described in EPGs/SAGs Appendix B Vol I (Introduction) General Bases and Strategies (top of Page B.I-5-13). This is incorrect because, although Drywell Sprays will scrub some fission products from the environment, venting from the Torus is preferred because the scrubbing action of gasses passing through the water in the Torus is more effective.
(2) If the examinee chose Part (1), then the examinee could determine that a good stopping point for using the Drywell Vent path is when the ability to break vacuum in the Drywell is lost, upon submerging the Drywell to Torus Vacuum Breakers, since this elevation (+45" in the Torus) appears in several locations on 29.100.01 Sheet 2, Primary Containment Control. However, since Drywell is not the preferred vent path, this entire line of thinking is incorrect
D. (1) This part is correct.
(2) If the examinee correctly determined that the Torus is the preferred vent path, then it is plausible that the examinee could determine that a good stopping point for using this path is when the Torus to RB vacuum breakers become submerged because the ability to break vacuum that may be caused by venting the Torus would not occur. This is incorrect because the transition point from Torus to Drywell venting occurs when the Torus vent is submerged.

Reference Information:
UFSAR Paragraph 11.4.3.11.3
29.100.01 SH2, Primary Containment Control
EPGs/SAGs Appendix B Vol I (Introduction) General Bases and Strategies Section 5.4, Primary Containment Venting (starting on Page B.I-5-6).

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference

Fundamental (Low) Cognitive Level

New

RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295029 High Suppression Pool Water Level

295029.EK1 Knowledge of the operational implications and/or cause and effect relationships of the following as they apply to High Suppression Pool Water Level: (CFR: 41.8 to 41.10)

295029.EK1.02 Venting the suppression pool (Mark I containment)

Associated objective(s):

Primary Containment Control

Cognitive Terminal

Given appropriate procedures and conditions, Discuss the different methods of venting the Primary Containment, specifying which methods would be most appropriate for given conditions, in accordance with plant/management expectations

25	K/A Importance: 3.8			**Points: 1.00**
R25	Difficulty: 2.00	Level of Knowledge: High	Source: NEW	102707

Reactor Building radiation levels are elevated. The following are the current readings:

1. ARM Channel 1 reads 60 mr/hr (2nd floor airlock)
2. ARM Channel 7 reads 70 mr/hr (SE corner)
3. ARM Channel 9 reads 65 mr/hr (NW corner)
4. ARM Channel 11 reads 330 mr/hr (HPCI SB)
5. ARM Channel 12 reads 70 mr/hr (1st floor Neut. Equip. room)
6. ARM Channel 13 reads Downscale (1st floor Neut. Control area)
7. ARM Channel 14 reads 80 mr/hr (RBSB Suppress Pool area)

Based on these readings, which of the following is required?

A. No action, there is no indication of exceeding a Maximum Normal area radiation level.

B. Enter 29.100.01 SH5 due to area radiation level(s) being above Maximum Normal operating level.

C. Place the Mode Switch in Shutdown due to two areas greater than the Maximum Normal operating level.

D. Verify trip of Reactor Building HVAC and automatic start of both divisions of Standby Gas Treatment System.

Answer: B

Answer Explanation:

Per 29.100.01 SH5:

Two channels, Channel 11 HPCI SB and Channel 14 RBSB Suppress Pool area, have exceeded their respective maximum normal values of 300 mr/hr and 75 mr/hr. This requires entry into 29.100.01 SH5 on "Area rad level > Max Norm".

Distractor Explanation:

Distractors are incorrect and plausible because:

A. This is incorrect, since two channels have exceeded Max Normal. The examinee may choose this option if they fail to recall the Maximum Normal radiation levels requiring entry into the EOPs.

C. This is partially correct since two areas are greater than the Max Normal radiation level. However, this condition does not require a shutdown. The examinee may choose this option if they fail to recall that two areas greater than maximum normal is an EOP entry condition. They may identify this as an EOP entry condition, but incorrectly believe that the next step in the EOP chart is to shut down. However, the reactor is not shutdown (normal GOP shutdown) until one parameter exceeds MAX SAFE in 2 or more areas per SC-7. Additionally, a scram would not be required unless it is determined that a primary system is discharging into secondary containment, and it cannot be isolated. In this condition, a scram would be required prior to any parameter reaching MAX SAFE per SC-5.

D. This is incorrect because none of the values given exceed the criteria for trip of RBHVAC, which is >16,000 cpm in the RBHVAC exhaust plenum or >3 mr/hr in the Fuel Pool Vent exhaust duct. The examinee may select this option if they forget the RBHVAC trip criteria and believe that one of the values has exceeded RBHVAC trip.

Reference Information:

29.100.01 SH5, Secondary Containment and Rad Release

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295033 High Secondary Containment Area Radiation Levels
295033.EA1 Ability to operate and/or monitor the following as they apply to High Secondary Containment Area Radiation Levels: (CFR: 41.7 / 45.6)
295033.EA1.01 Area radiation monitoring system

Associated objective(s):

Secondary Containment Control and Radioactive Release

Cognitive Terminal

Given plant procedures and plant conditions as appropriate, List the conditions requiring entry or re-entry into 29.100.01 Sh 5, Secondary Containment Control and Radioactive Releaseand how the Operator obtains the information, in accordance with management expectations.

26	K/A Importance: 3.7			**Points: 1.00**
R26-V2	Difficulty: 3.00	Level of Knowledge: High	Source: MODIFIED	115127

A problem with the control loop for Reactor Building Differential Pressure causes the following:

- Receipt of 8D46(17D46), Div I(II) Reactor Building Pressure High/Low.
- T41-R800A and B, Div 1 and 2 CR and RB Differential Pressure Recorders indicate RB differential pressure is reading +2.7 inches WC and rising.
- Two RBHVAC Supply and two RBHVAC Exhaust Fans are in operation.

Which of the following indicates the appropriate response and the reason for this response?

A. Trip RBHVAC Supply and Exhaust Fans and start the SGTS to prevent damage to RBHVAC ductwork.

B. Verify the RBHVAC Supply and Exhaust Fans automatically trip, and SGTS automatically starts to prevent damage to RBHVAC ductwork.

C. Trip RBHVAC Supply and Exhaust Fans and start SGTS to prevent the unmonitored release of potentially contaminated air from Secondary Containment.

D. Verify the RBHVAC Supply and Exhaust Fans automatically trip, and SGTS automatically starts to prevent the unmonitored release of potentially contaminated air from Secondary Containment.

Answer: C

Answer Explanation:

Note: Fermi 2 no longer has an EOP entry condition on High Secondary Containment D/P. Also, there is not an AOP associated with this condition, nor is there an APE in NUREG-1123 for High Secondary Containment Differential Pressure. This abnormal condition will now be addressed, at Fermi 2, using Alarm Response Procedures (ARPs) as the Abnormal/Emergency Procedure, making this an acceptable Tier 1 question.

The Reactor Building HVAC System maintains a negative pressure of minus 0.125 inches to minus 0.5 inches differential pressure (dP) water column (wc) in the Reactor Building with respect to outside air. This prevents the release of potentially contaminated air from unmonitored openings in the Secondary Containment. The examinee should recognize that this abnormal condition may be contributing to the release of potentially contaminated air outside of secondary containment via an uncontrolled release path.

The examinee should recall that ARPs 8D46 and 17D46 require, for high RB Pressure, verification of 2 RBHVAC trains OR one division of SGTS in operation. The examinee should recall that, at +2.5" WC the supply and exhaust fans should have tripped, therefore manual action is necessary to trip the fans. Then, per ARPs 8D46 and 17D46, a division of SGTS needs to be started. This will satisfy the ARP requirements and restore negative pressure in the RB to prevent the release of potentially contaminated air outside of secondary containment via an uncontrolled release path.

Distractor Explanation:

A. Is plausible because the RBHVAC Supply and Exhaust fans do trip at high RB pressure, 2.5 inches WC. For a pressure this high, it is plausible to assume the fans would trip to protect the integrity of the RBHVAC ductwork. The examinee could determine that RBHVAC fans need to be tripped and SGTS started for this reason, but the reason to do so is to re-establish negative pressure to prevent the release of potentially contaminated air outside of secondary containment via an uncontrolled release path.
B. Is plausible because most RBHVAC system trips occur due to Secondary Containment Isolations, which also result in an automatic start of SGTS. The examinee could determine that, when the trip setpoint is reached, the RBHVAC Supply and Exhaust fans will trip and SGTS will start and, for a pressure this high, these actions will occur to protect the integrity of the RBHVAC ductwork. This is incorrect because (1) SGTS does not auto start on trip of RBHVAC for high building d/p thus manual action is required for this abnormal condition and (2) the reason to do so is to re-establish negative pressure to prevent the release of potentially contaminated air outside of secondary containment via an uncontrolled release path.
D. Is plausible because most RBHVAC system trips occur due to Secondary Containment Isolations, which also result in an automatic start of SGTS. The examinee could determine that, when the trip setpoint is reached, the RBHVAC Supply and Exhaust fans will trip, and SGTS will start. This is incorrect because SGTS does not auto start on trip of RBHVAC for high building d/p thus manual action is required for this abnormal condition.

Reference Information:

23.426 RBHVAC System SOP, Section 1.1 System Description for explanation of why negative pressure is maintained in the RB as well as a list of RBHVAC fan trips.
8D46(17D46), Div I(II) Reactor Building Pressure High/Low.

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference

High Cognitive Level

Modified

NRC Early Review

RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

295035 Secondary Containment High Differential Pressure

295035.EK3 Knowledge of the reasons for the following responses or actions as they apply to Secondary Containment High Differential Pressure: (CFR: 41.5 / 45.6)

295035.EK3.02 Secondary containment ventilation alignment

Associated objective(s):

Secondary Containment Control and Radioactive Release

Cognitive Terminal

Given plant procedures and plant conditions as appropriate, Describe the expected plant/system response for actions directed by 29.100.01 Sh 5, Secondary Containment Control and Radioactive Release, in accordance with management expectations.

27	K/A Importance: 3.6			Points: 1.00
R27-V3	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	103499

A LOCA resulted in a plant scram from 10% power due to High Drywell Pressure.

RPV Water Level was maintained, throughout the event, by high pressure injection systems.

Plant conditions are:

- RPV Water Level is steady at 197" on the condensate system.
- Drywell Pressure has been lowered to 0.2 psig and is steady.

The CRLNO has been directed to Shutdown Division 1 RHR from the LPCI Mode, in accordance with 23.205, RHR System SOP, Section 8.1 and restore LPCI to a standby lineup.

Consider the following RHR related RESET pushbuttons below:

(1) E1150-F015A Isolation RESET
(2) Hi Drywell Press & Lo Reac Level RESET

Which one(s) will have to be depressed to perform this evolution, if any?

A. (1) ONLY

B. (2) ONLY

C. BOTH (1) AND (2)

D. NEITHER (1) NOR (2)

Answer: B

Answer Explanation:

Per 23.205 Sections 8.1 and 8.2:

Shutting down RHR from the LPCI mode requires pushing the Hi Drywell Press & Lo Reac Level RESET pushbutton to break the seal-in established when an RHR initiation signal (Level 1 or High Drywell Pressure) signal is received and allows placing the RHR Pumps back in standby. This can only be accomplished after the auto initiation signal is no longer present (level >Level 1 and Hi Drywell Pressure <1.68 psig) since these signals do not clear when the initiating signal clears.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. The examinee could determine that it is necessary to depress the E1150-F015A Isolation Reset pushbutton, which is true if RHR were in SDC at the start of the transient, to restore the system to standby. Per 23.205 P&L 3.1.10, If LPCI initiation is required, the system will automatically realign and initiate without operator action except for when in SDC Mode both E1150-F015A and E1150-F015B, Div 1 (2) LPCI Inbd Iso Vlvs, are closed by PCIS System Logic - Level 3, they must be reset before auto realignment occurs. Use of the E1150-F015A Isolation RESET is how that occurs. If the examinee was familiar with the F015A reset pushbutton but not familiar with the initiating reset pushbutton, or determined the system initiation logic automatically reset when level was >L1 and High DWP was clear, the examinee could select this option. However, when resetting RHR logic for a LOCA that was not initiated from the SDC mode, use of the F015A reset pushbutton is not required while use of the initiation logic reset pushbutton is.
C. The examinee could determine that it is necessary to depress the E1150-F015A Isolation Reset pushbutton, which is true if RHR were in SDC at the start of the transient, to restore the system to standby. Per 23.205 P&L 3.1.10, If LPCI initiation is required, the system will automatically realign and initiate without operator action except for when in SDC Mode both E1150-F015A and E1150-F015B, Div 1 (2) LPCI Inbd Iso Vlvs, are closed by PCIS System Logic - Level 3, they must be reset before auto realignment occurs. Use of the E1150-F015A Isolation RESET is how that occurs. The examinee could determine that resetting the F015A AND resetting initiation logic was necessary. However, when resetting RHR logic for a LOCA that was not initiated from the SDC mode, use of the F015A reset pushbutton is not required.
D. The examinee could determine that isolation of the E1150-F015A does NOT need to be reset, which is correct since RHR was NOT in SDC at the start of the transient. The examinee could also determine that system initiation logic automatically reset when level was >L1 and High DWP was clear, since the stem of the question stated that RPV water level was maintained throughout the transient. This could lead the examinee to conclude that, for this event, it is not necessary to press either pushbutton. This is incorrect since a Hi DWP condition did exist, and the High DWP condition would remain sealed in, even when the condition cleared, requiring use of the Hi Drywell Press & Lo Reac Level RESET pushbutton to reset RHR initiation logic.

Reference Information:

23.205, RHR System SOP, Sections 8.1 and 8.2, Shutdown From LPCI Mode Div 1 and 2.
I-2205-02, RHR Relay Logic "A" Part 1
I-2205-03, RHR Relay Logic "A" Part 2

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

203000 RHR/LPCI: Injection Mode
203000.A4 Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
203000.A4.06 System reset following automatic initiation

Associated objective(s):

Residual Heat Removal

Cognitive Terminal

In accordance with approved plant procedures, given the condition of the system: Describe general Residual Heat Removal System operation, including component operating sequence, normal operating parameters, and expected system response.

28	K/A Importance: 3.6			Points: 1.00
R28	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	102869

A Loss of Coolant Accident (LOCA) has occurred.

2 minutes later, loss of Division II 345KV offsite power occurred.

All equipment responded as expected with the following exceptions:

- EDG 11 failed to start.
- 65F Positions F6 and F8 indicate TRIPPED.

The plant depressurized through the leak.

The CRS then directs the CRLNO to prepare to place RHR in the SDC Mode.

Which of the following lists ALL of the RHR pumps that are available to support placing RHR in this 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:

Note: The original, BANK, version of this question was written for Torus Spray. This version was revised to change the affected mode of RHR to Shutdown Cooling. Although it was changed it is still BANK due to not meeting the NUREG-1021 requirements to be classified as a MODIFIED question.

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 to not 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.

The examinee must also recognize that, although EDG 11 failed to start, that EDG is on the Division 1 side, which is powered from 120kV offsite power and, therefore, Division 1 powered RHR pumps are not impacted.

Therefore, the examinee must determine that only RHR Pumps A, B and C are available to support placing RHR in the SDC Mode. Note: A and C are Div 1 Pumps and B is a Div 2 Pump.

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 E1150-F611A, RHR Div I Injection Bypass. This could lead the examinee to conclude that all of Division 1 RHR is unavailable to support SDC since this valve is used to place RHR in the SDC mode. This could lead the candidate to determine that, since Div 1 RHR is not available for SDC, then only RHR Pump B (the only available Div 2 Pump) is available to support SDC. This is incorrect because the failure of EDG 11 to start on a LOCA signal will not impact the associated bus until offsite power (Div 1, 120kV offsite power) is lost. With Div 1 offsite power available, power to all Division 1 RHR valves is available and 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 SDC. 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 SDC. 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.

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.

Fermi 2 NRC Exam Usage

ILO 2019 Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

205000 SDC Shutdown Cooling System (RHR Shutdown Cooling Mode)
205000.K2 Knowledge of electrical power supplies to the following: (CFR: 41.7)
205000.K2.01 Pump motors

Associated objective(s):

Residual Heat Removal

Cognitive Terminal

In accordance with approved plant procedures, given the condition of the system: Describe the normal and alternate power supplies to Residual Heat Removal System components.

29	K/A Importance: 3.6			**Points: 1.00**
R29	Difficulty: 2.00	Level of Knowledge: Low	Source: NEW	102927

The plant is in MODE 1.

SRV J is INOPERABLE.

A malfunction of the HPCI System then causes it to be declared INOPERABLE.

How will this impact Reactor Power, if at all?

A. The Mode Switch must be placed in Shutdown Immediately.

B. Power must be reduced, within 1 hour, to satisfy the requirements of LCO 3.0.3.

C. Power level will not have to change if RCIC is verified to be OPERABLE Immediately.

D. Power level will not have to change if either SRV J or HPCI is restored to OPERABLE within 72 hours.

Answer: B

Answer Explanation:

Per Technical Specifications LCO 3.5.1 Condition K, HPCI and one or more ADS valves INOPERABLE requires entry into LCO 3.0.3 immediately.
The examinee must recall that SRV J is an ADS SRV. The examinee must then recall that an ADS SRV and HPCI being INOP requires entry into LCO 3.0.3. The examinee must recognize that LCO 3.0.3 requires action, within 1 hour, to place the plant in Mode 2 within 7 hours.

Note: This question is RO knowledge because ROs are required to know plant conditions that require immediate (<1-hour) TS actions. Detailed knowledge of LCO 3.0.3 requirements is not needed to answer this question, since that is SRO-Only required knowledge.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The examinee could determine that TS requires the Mode Switch to be placed in Shutdown Immediately, which is a required Action of TS in various places, such as LCO 3.6.2.1 when Torus Water Temperature exceeds 110^{0}F. This is incorrect because, although TS does require a plant Shutdown, the Required Completion Time is not Immediate.
C. HPCI being INOPERABLE requires an immediate verification of RCIC OPERABILITY per Action E.1 of LCO 3.5.1. IF HPCI and RCIC are both INOPERABLE, this puts the plant in an unspecified condition requiring entry into LCO 3.0.3. The examinee could determine that this verification, if satisfactory, would satisfy TS and prevent the need for further action. This is incorrect because LCO 3.5.1 Condition K requires entry into LCO 3.0.3, for the conditions specified in the stem, regardless of the status of RCIC.
D. The examinee could fail to recall that the combination of failures given in the stem require entry into LCO 3.5.1 Condition K. Or the examinee could recall that Condition K entry is required but determine that required Completion Time is 72 hours vice Immediately, which is plausible because several combinations of LCO 3.5.1 equipment inoperabilities have Completion Times of 72 hours, such as Condition C and Condition F (which also includes HPCI). However, this is incorrect because LCO 3.5.1 Condition K requires entry into LCO 3.0.3, for the conditions specified in the stem, Immediately and, if 72 hours were to elapse, LCO 3.0.3 would have been violated.

Reference Information:

Fermi 2 Technical Specifications.

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.

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
206000 HPCI High-Pressure Coolant Injection System (BWR 2, 3, 4)
206000.K3 Knowledge of the effect that a loss or malfunction of the High-Pressure Coolant Injection System will have on the following systems or system parameters: (CFR: 41.7 / 45.4)
206000.K3.04 Reactor power

Associated objective(s):

High Pressure Coolant Injection

Cognitive Terminal

Given the system operating conditions/parameters, in accordance with approved plant procedures: Describe the HPCI System technical specification limiting conditions for operation, their bases, the associated surveillance requirement(s), and their relationship to operability.

30	K/A Importance: 4.5			**Points: 1.00**
R30	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	102928

Which of the following Core Spray Pump configurations is the MINIMUM needed to satisfy the design spray flow requirements necessary to ensure that Adequate Core Cooling is maintained?

A. Only Core Spray Pump A running.

B. Both Core Spray Pumps A and B running.

C. Both Core Spray Pumps A and C running.

D. Core Spray Pumps A, B, C and D running.

Answer: C

Answer Explanation:

Adequate spray cooling is provided in BWR/3 through BWR/6 designs, assuming a bounding axial power shape, when design spray flow requirements are satisfied and RPV water level is at or above the elevation of the jet pump suctions. The covered portion of the core is then cooled by submergence while the uncovered portion is cooled by the spray flow.

For Fermi 2, design spray flow requirements are satisfied by one division of Core Spray loop flow >/= 5725 gpm.

The examinee should determine that, per 29.ESP.01, Supplemental Information, Section 16.0 Pump Capacities Table, the Core Spray pumps have a maximum capacity of 3175 gpm at 0 psig RPV pressure. Therefore, the examinee must recall that two pumps, in the same division, are necessary to satisfy spray flow requirements to ensure ACC and recognize that the MINIMUM pump configuration that meets this requirement is A and C (both Division 1 pumps) running.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. Plausible because the examinee could fail to recall the capacity of one CS pump and determine that just one pump running would maintain ACC. This is incorrect because two pumps are needed, in one division, to satisfy the spray flow requirements to ensure ACC.
B. Plausible because this configuration includes two pumps, which are needed to establish at least 5725 gpm. This is incorrect because, although one pump per division would satisfy the required flow, the spray flow pattern from each spray header would be insufficient to cool all regions of the core, therefore ACC would not be met.
D. Plausible because this configuration would meet ACC requirements; However, it does not represent the MINIMUM number of Core Spray pumps that are needed to establish the design spray flow necessary to ensure ACC.

Reference Information:

29.ESP.01 Supplemental Information.

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
High Cognitive Level
NRC Early Review
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

209001 LPCS Low-Pressure Core Spray System
209001.K5 Knowledge of the operational implications or cause and effect relationships of the following concepts as they apply to the Low-Pressure Core Spray System: (CFR: 41.5 / 45.3)
209001.K5.07 Adequate core cooling

Associated objective(s):

Core Spray System

Cognitive Terminal

In accordance with approved plant procedures, given the condition of the system: Explain the importance of Core Spray System to plant safety.

31	K/A Importance: 3.8			Points: 1.00
R31	Difficulty: 3.00	Level of Knowledge: Fund	Source: BANK	102867

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:

Per 23.139:

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.

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.

Fermi 2 NRC Exam Usage
ILO 2019 Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)
Bank
Closed Reference
Fundamental (Low) Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
211000 SLCS Standby Liquid Control System
211000.A1 Ability to predict or monitor changes in parameters associated with operation of the Standby Liquid Control System, including: (CFR: 41.5 / 45.5)
211000.A1.01 Tank level

Associated objective(s):
Standby Liquid Control
Cognitive Terminal
In accordance with approved plant procedures, given the condition of the system: Explain the basic principles of operation for the Standby Liquid Control System and the major components and equipment.

32	K/A Importance: 4.3			**Points: 1.00**
R32	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	102848

The plant is shut down in a refueling outage with under vessel 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 resetting a scram during shutdown testing.

Distracter 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 failure 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

Operating Experience

LER 96-021 Fermi Auto Scram on SDV during Shutdown

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.

Fermi 2 NRC Exam Usage

ILO 2015 Exam
ILO 2019 Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

212000 RPS Reactor Protection System
212000.A3 Ability to monitor automatic operation of the Reactor Protection System, including: (CFR: 41.7 / 45.7)
212000.A3.09 System actuation

Associated objective(s):

Reactor Protection System
Cognitive Terminal
In accordance with approved plant procedures, given various controls and indications for system operations: Describe Reactor Protection System automatic features.

33	K/A Importance: 3.7			**Points: 1.00**
R33	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	103607

The plant was operating at 100% power when the B RPS MG Set tripped. Actions were taken and currently all 8 RPS blue lights are lit.

9D70 DIV 1 120V RPS BUS 1A POWER FAILURE annunciator subsequently alarms.

What affect will this have on the Local Power Range Monitors (LPRMs)?

A. All LPRMs lose power resulting in a FULL scram.

B. ONLY LPRMs 1 and 3 lose power resulting in a HALF scram.

C. All LPRMs remain energized from the Quadruple Low Voltage Power Supplies via RPS Bus A.

D. All LPRMs remain energized from the Quadruple Low Voltage Power Supplies via RPS Bus B.

Answer: D

Answer Explanation:

Per ST-OP-315-0024-001 and ST-OP-315-0027-001,

Power is auctioneered such that a loss of RPS power results in the APRM, LPRM and RBM remaining energized and functional. Power from RPS Bus B was initially lost when RPS MG Set B tripped. However, operator action to restore power was successful, as indicated by 8 RPS lights being lit.

When 9D70 alarmed, this indicates that RPS Bus A has failed and is no longer supplying auctioneered power to Quad Low Volt Power Supplies. Therefore, D is the correct answer.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. LPRMs will still receive power from RPS bus B Alternate Power Transformer. The candidate may select this option if they think that the loss of RPS Bus 1A in combination with RPS MG B trip will cause a loss of power condition to all LPRMs.

B. The trip of RPS MG Set B will cause a half scram initially. However, after action is taken to switch RPS power to the Alternate Power Transformer, the half scram is reset. This is indicated by the 8 RPS lights being lit. The candidate may select this option if they think that the half scram was not yet reset .

C. 9D70 alarming indicates that RPS Bus A is no longer supplying power to QLVPS. Operator action is required to restore power from RPS Bus A. The candidate may select this option of they mistakenly think that RPS Bus A is still supplying power, due to automatic transfer to the alternate power supply, and that the trip of RPS MG B took out all power supplied by RPS Bus B.

Reference Information:

ST-OP-315-0024-001 (Power Range Neutron Monitoring System)
ST-OP-315-0027-001 (Reactor Protection 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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

212000 RPS Reactor Protection System
212000.K3 Knowledge of the effect that a loss or malfunction of the Reactor Protection System will have on the following systems or system parameters: (CFR: 41.7 / 45.4)
212000.K3.03 Nuclear instrumentation

Associated objective(s):

Reactor Protection System

Cognitive Terminal

In accordance with approved plant procedures, given various controls and indications for system operations: Discuss the RPS interrelationships with other systems.

34	K/A Importance: 2.6			Points: 1.00
R34	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	103647

Complete the following statement regarding how gamma compensation is achieved in the IRM system.

IRM detectors have a ___(1)___ applied voltage than SRM detectors and accomplish gamma compensation via ___(2)___.

A. (1) higher
(2) mean square analog unit

B. (1) lower
(2) mean square analog unit

C. (1) higher
(2) pulse height discriminator

D. (1) lower
(2) pulse height discriminator

Answer: B

Answer Explanation:

Per ST-OP-315-0023-001:

IRM detectors work on the same principle as SRM detectors. However, since Intermediate Range neutron flux is significantly higher than Source Range, the same gas amplification is not required nor is as high a voltage. Therefore, (1) Lower is the correct answer because the lower voltages allow the gamma compensation method of part (2) below to work in the Intermediate Range.

The output from IRM detectors is a varying DC current from neutron and gamma events. The signal contains an AC component as well. Neutrons are the main contributor to the AC component, so the DC current is filtered out by the a (2) mean square analog unit using Campbell's Theorem.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. (1) This part is incorrect. The candidate may select this option if they mix up Source and Intermediate range operation and mistakenly think that IRM detectors require high voltage to operate.
   (2) This part is correct.
C. (1) This part is incorrect. The candidate may select this option if they mix up Source and Intermediate range operation and mistakenly think that IRM detectors require high voltage to operate.
   (2) This part is incorrect. The candidate may select this option if they mix up Source and Intermediate range operation and mistakenly think that gamma pulses are filtered out by a pulse height discriminator. Only Source Range utilizes pulse height discrimination.
D. (1) This part is correct.
   (2) This part is incorrect. The candidate may select this option if they mix up Source and Intermediate range operation and mistakenly think that gamma pulses are filtered out by a pulse height discriminator. Only Source Range utilizes pulse height discrimination.

Reference Information:

ST-OP-315-0023-001 (Intermediate Range Monitoring / Source Range Monitoring Systems)

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b) (6) Design, components, and function of reactivity control mechanisms and instrumentation.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

215003 IRM Intermediate Range Monitor System
215003.K5 Knowledge of the operational implications or cause and effect relationships of the following concepts as they apply to the Intermediate Range Monitor System: (CFR: 41.5 / 45.3)
215003.K5.02 Gamma discrimination

Current View

Associated objective(s):

Intermediate Range Monitoring

Cognitive Terminal

In accordance with approved plant procedures, given the condition of the system: Explain the basic principles of operation for the Intermediate Range Monitoring System and the major components and equipment.

35	K/A Importance: 3.4			Points: 1.00
R35	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	103027

The plant is in MODE 2 with a reactor startup in progress.

Control rod withdrawal results in the following SRM channel indications:

- SRM A = 3 X 10^5 counts per second.
- SRM B = 1 X 10^5 counts per second.
- SRM C = 5 X 10^4 counts per second.
- SRM D = 6 X 10^4 counts per second.

This condition will result in which of the following plant responses?

A. ONLY a FULL control rod withdrawal block

B. A FULL scram AND a FULL control rod withdrawal block

C. A HALF scram on RPS channel A AND a FULL control rod withdrawal block

D. A HALF scram on RPS channel A AND a HALF control rod withdrawal block

Answer: A

Answer Explanation:

Per SOP 23.602, SRM System, P&L 3.4: SRM Channels provide SRM Upscale Trip to the Reactor Protection System (RPS). Individual Upscale Trips are normally jumpered out by installation of links at the Trip System A (B) NSS Shutoff System Reactor Protection System, RR H11-P609 (RR H11-P611). The shorting links are only removed during fuel/handling evaluations. Removal and installation of the shorting links will result in half scrams in the RPS Circuitry

Only SRM A is above the upscale trip setpoint of $2x10^5$. The examinee must recall that, in mode 2, the SRM shorting links are a normally installed design feature that bypasses all SRM inputs to RPS. As a result, the examinee must determine that ONLY a full control rod block will be received since rod block logic is 1 out of 4 and is NOT affected by the shorting links.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. is incorrect since the shorting links prevent any input to RPS from SRMs. Applicants may select this if they do not recall that the shorting links will be installed in this condition or do not recall the effect of shorting links on SRM trip logic.

C. is incorrect since the shorting links prevent any input to RPS from SRMs. Applicants may select this if they do not recall that the shorting links will be installed in this condition or the effect of shorting links on SRM trip logic, and further incorrectly believe that SRM scram signals have coincident logic.

D. is incorrect since the control rod block logic for SRM channels is 1 out of 4, therefore, a full control rod block will occur, shorting links prevent any SRM input to RPS, and SRM scram logic is 1 out of 4. Applicants may select this if they do not recall the correct rod block logic arrangement for SRM channels, the effect of shorting links on SRM RPS logic, and further incorrectly believe that SRM scram signals have coincident logic.

Reference Information:

SOP 23.602, SRM 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.

Fermi 2 NRC Exam Usage

ILO 2019 Retake Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

215004 SRMS Source Range Monitor System
215004.K4 Knowledge of Source Range Monitor System design features and/or interlocks that provide for the following: (CFR: 41.7)
215004.K4.07 SRMS channel bypass

Associated objective(s):
Source Range Monitoring
Cognitive Terminal
In accordance with approved plant procedures, given the condition of the system: Discuss design considerations, capabilities, and limitations related to Source Range Monitoring System component operation.

36	K/A Importance: 4.3			**Points: 1.00**
R36	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	103707

You are on shift in the Main Control Room as the P603 Operator.

The plant is in MODE 1 at 98% power.

All OPRMs are INOPERABLE and a troubleshooting plan is being developed.

A plant transient subsequently occurs.

You and the STA have verified on the Power/Flow Map that the reactor is operating in the "Scram" Region as defined by the COLR.

You observe the following on the APRMs:

- The amplitude of power oscillations are more than 3 times what they were before the transient.
- The frequency of the oscillations is more consistent and are occurring with a period of about 2 seconds.

Which of the following actions should you perform?

A. Insert the CRAM Array.

B. Place the Mode Switch in Shutdown.

C. Maintain power stable and monitor for indications of Thermal-Hydraulic Instability.

D. Raise Recirculation Flow to establish margin to the "Stability Awareness" Region.

Answer: B

Answer Explanation:

Per MOP19, Reactivity Management, Section 5.12, Transients, Sub-section 5.12.2, Thermal Hydraulic Instabilities:

1. If Thermal Hydraulic Instabilities are observed, the Mode Switch will be placed in SHUTDOWN.

24.000.01 Attachment 34b, Core Thermal-Hydraulic Instability has monitoring criteria to aid the operator in determining the existence of Thermal Hydraulic Instabilities:

CAUTION

ANY one or more of the following may be indications of Neutron Flux Instability

- **Sustained increase in APRM or LPRM peak to peak noise level reaching two or more times its initial level, and occurring with a characteristic period of less than three seconds**.
- LPRM period of 1.5 to 2.5 seconds
- APRM period of 1.5 to 2.5 seconds (core wide oscillations)
- APRM period of 0.75 to 1.25 seconds (regional oscillations)
- Oscillations on the SRM period meters
- Recurring LPRM upscale and/or downscale alarms on a 2 to 3 second cycle
- Recurring APRM upscale and/or downscale alarms on a 2 to 3 second cycle
- **Peak-to-peak LPRM/APRM oscillations change from irregular time intervals and amplitudes to more consistent time intervals and peak values**
- OPRM counts increasing and amplitude increasing > 1.00.

NOTE: The stem of the question only includes indications of THI, provided by the APRMs, to be consistent with the K/A statement.
The examinee must recognize that the APRM indications provided represent indications of THI and, per MOP19 Reactivity Management, require the Mode Switch be placed in Shutdown.

NOTE: The information in this question is of particular importance at Fermi 2 because of an event that occurred on 3/19/15 that resulted in an automatic reactor scram generated from a valid OPRM Upscale condition. CARD (Corrective Action Resolution Document) 15-22090 was written due to process and programmatic weaknesses that contributed to this scram. One outcome of the CARD was to revise 24.000.01 Attachment 34b to describe how to monitor for THI with appropriate APRM indications, such as are included in the stem of this question. Another outcome was to revise MOP19 to incorporate clearer guidelines, such as those in the answer choices for this question.

Distractor Explanation:
Distractors are incorrect and plausible because:
A. Inserting the CRAM Array would add margin to the stability awareness region and is required by MOP19 Step 5.12.2.3 if the reactor is operating in the Exit region. However, this is incorrect because the stem states the reactor is operating in the Scram region and provides indications of THI and MOP19 requires the Mode Switch be placed in Shutdown.
C. The examinee may not recognize the indications provided in the stem of the question, from 24.000.01 Attachment 34b, as indications of THI. This is incorrect because the stem provides indications of THI consistent with those in 24.000.01 Attachment 34b and MOP19 requires the Mode Switch be placed in Shutdown.
D. Raising Recirculation Flow would add margin to the stability awareness region and regions where THI are more likely to occur. Adjustment of RRMG set speeds to stay out of the Scram and Exit regions of the P/F map is allowed by 20.138.01, Uncontrolled RR Flow Change AOP. However, this is incorrect because the stem provides indications of THI and MOP19 requires the Mode Switch be placed in Shutdown.

Reference Information:
24.000.01 Attachment 34b, Core Thermal-Hydraulic Instability.
MOP19, Reactivity Management.
CARD 15-22090, Evaluate Reactor Scram from OPRM Upscale during Single Loop 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.

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Closed Reference
Fundamental (Low) Cognitive Level
New
NRC Early Review
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
215005 Average Power Range Monitor/Local Power Range Monitor System
G2.1.37 Knowledge of procedures, guidelines, or limitations associated with reactivity management (CFR: 41.1 / 41.5 / 41.10 / 43.6 / 45.6)

Associated objective(s):

Power Range Monitoring and Rod Block Monitoring

Cognitive Terminal

In accordance with approved plant procedures, given various controls and indications for system operations: Discuss effective monitoring of the Power Range Neutron Monitoring System using local, remote, computer displays and alarms.

37	K/A Importance: 3.3			Points: 1.00
R37	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	102647

The plant is operating at 100% power with HPCI out of service when a loss of feedwater occurs. RCIC automatically initiated when reactor water level lowered to 100 inches.

Several minutes later, indications are as follows:

- Reactor Water level is 118 inches (steady)
- RCIC flow is 350 gpm (steady)
- RCIC controller is in Automatic
- RCIC Steam Line Diff Press is +154" WC (slowly rising)

Based on these conditions, what operator action is REQUIRED?

A. Shutdown RCIC IAW 23.206, RCIC System.

B. Place RCIC pump flow controller in manual and adjust output to raise RCIC flow.

C. Trip RCIC, and close E51-F007, Inboard Stm Isol Valve, and E51-F008, Outboard Stm Isol Valve.

D. Maintain RCIC pump flow controller in automatic and adjust the setpoint to raise RCIC turbine speed.

Answer: C

Answer Explanation:

Note: This question is from the Fermi 2 Exam bank and was not used on a previous NRC exam.

Per 1D85, the operator must identify that RCIC Steam Line Diff Press has exceeded the trip/isolation setpoint (+87" WC rising). 1D85, RCIC Steam Line Diff Press High, would be alarming because RCIC steam line flow is above the high flow isolation setpoint. This condition should have caused RCIC Turbine to trip and E5150-F007 and E5150-F008 to close automatically. Since an automatic isolation did not occur as designed, the actions should be taken by the operator.

The operator must determine the need to trip RCIC and close E51-F007 Inboard Stm Isol Valve and F008 Outboard Stm Isol Valves to satisfy the actions of 1D85.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. Normal shutdown of RCIC is inappropriate in this condition, as automatic isolations should have occurred due to exceeding RCIC Steam Line Diff Press High limit. MOP01, enclosure E requires that manual action be taken (to isolate RCIC in this case) if an automatic action failed to occur. The candidate may choose this answer if they identify that steam line D/P is higher than normal (but fails to identify that an automatic action setpoint has been exceeded) and a RCIC shutdown would put the system in a safer condition. Although a system shutdown would reduce steam flow, the additional time it would take would continually add high pressure and temperature steam to the area. Additionally, once RCIC is shutdown, it is possible the steam leak would still not be isolated if the leak was down stream of the isolation valves but upstream of the system's steam shutoff valves.
B. Indications of a steam leak are present, therefore RCIC trip an isolation is required. The candidate might choose this option if they do not identify that the RCIC Steam Line Diff Press setpoint has been exceeded. They may, however, see the need to take manual action to raise RCIC flow to restore reactor water level. A candidate that does not fully understand the operation of the RCIC pump flow controller may expect the controller to automatically raise flow to raise level. If that expected action does not occur, the candidate may see taking the controller to manual and raising flow as the correct path forward.
D. Indications of a steam leak are present, therefore RCIC trip an isolation is required. The candidate might choose this option if they do not identify that the RCIC Steam Line Diff Press setpoint has been exceeded. They may see that RCIC Flow is lower than normal, and that flow would need to be raised in order to raise level back to normal.

Reference Information:

1D85

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b) (9) Shielding, isolation, and containment design features, including access limitations.

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
217000 RCIC Reactor Core Isolation Cooling System
217000.K1 Knowledge of the physical connections and/or cause and effect relationships between the Reactor Core Isolation Cooling System and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)
217000.K1.07 Leak detection

Associated objective(s):
Reactor Core Isolation Cooling
Cognitive Terminal
Given the system operating conditions/parameters, in accordance with approved plant procedures: Identify alarm response procedures associated with the RCIC System.

38	K/A Importance: 4.2			**Points: 1.00**
R38	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	102890

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.

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.

Fermi 2 NRC Exam Usage

ILO 2019 Exam

ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank

Closed Reference

High Cognitive Level

RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

217000 RCIC Reactor Core Isolation Cooling System

217000.K5 Knowledge of the operational implications or cause and effect relationships of the following concepts as they apply to the Reactor Core Isolation Cooling System: (CFR: 41.5 / 45.3)

217000.K5.10 Reactor level control

Associated objective(s):

Reactor Core Isolation Cooling

Cognitive Terminal

In accordance with approved plant procedures, given the condition of the system: Describe general RCIC System operation, including component operating sequence, normal operating parameters, and expected system response.

39	K/A Importance: 4.1			**Points: 1.00**
R39	Difficulty: 2.00	Level of Knowledge: Fund	Source: BANK	103648

The plant is in a transient where the ADS Countdown Timer has started counting down.

(1) Which of the following installed design features is utilized to prevent ADS automatic initiation?

(2) If ADS operation is determined to be required at a later time, which method is used to manually initiate ADS?

A. (1) Place ADS Inhibit Sw Logic A and Logic B key switches in INHIBIT.

(2) Depress the OPEN pushbuttons for the 5 ADS valves.

B. (1) Place ADS Inhibit Sw Logic A and Logic B key switches in INHIBIT.

(2) Place ADS Inhibit Sw Logic A and Logic B key switches in NORMAL.

C. (1) Simultaneously depress the ADS Division I and II Timer Logic RESET pushbuttons.

(2) Depress the OPEN pushbuttons for the 5 ADS SRVs.

D. (1) Simultaneously depress the ADS Division I and II Timer Logic RESET pushbuttons.

(2) Stop depressing the ADS Division I and II Timer Logic RESET pushbuttons and allow the ADS Countdown Timer to count down.

Answer: A

Answer Explanation:

Note: The bank source for this question is the Fermi 2 2012 Audit Exam. No evidence of use on an actual NRC exam could be found.

Per SOP 23.201 Section 5.4:
1. IF the SM or Emergency Operating Procedures direct preventing ADS initiation, manually override ADS as follows:
  a. Place ADS Inhibit Sw Logic A key switch in INHIBIT.
  b. Place ADS Inhibit Sw Logic B key switch in INHIBIT.
  c. Verify 1D27, ADS OUT OF SERVICE A/B LOGIC, alarms.
  d. IF ADS is determined to be required at a later time, open 5 ADS valves; refer to Section 5.2, Manual Safety Relief Valve Operation.
2. Per Section 5.2, To open selected SRV, depress OPEN pushbutton.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. Placing the Inhibit Sw Logic A and Logic B key switches in INHIBIT is the procedurally approved method to manually override ADS and placing the ADS Inhibit Sw Logic A and Logic B key switches in NORMAL would cause the ADS Countdown Timer to again start counting down, which would lead to the ADS valves opening. However, this is not the procedurally directed method of manual ADS valve operation once ADS has been inhibited. Furthermore, if manual ADS operation is required, it would be required now and not after allowing for the ADS Countdown Timer to finish counting down.
C. Simultaneously depressing the ADS Division I and II Timer Logic RESET pushbuttons would prevent the ADS Countdown Timer from timing down. However, this method is not procedurally allowed, and it would require someone to continuously (ever 105 seconds) perform this action, which is not an efficient use of resources. Depressing the open pushbuttons for the 5 ADS SRVs is the procedurally allowed method for manual ADS initiation.
D. Simultaneously depressing the ADS Division I and II Timer Logic RESET pushbuttons would prevent the ADS Countdown Timer from timing down. However, this method is not procedurally allowed, and it would require someone to continuously (ever 105 seconds) perform this action, which is not an efficient use of resources. If the operator subsequently stopped depressing the ADS Division I and II Timer Logic RESET pushbuttons, this would cause the ADS Countdown Timer to count down, which would allow for ADS operation. However, neither of these methods is the procedurally directed method of manual ADS valve operation.

Reference Information:

SOP 23.201, SRVs and ADS SOP, Section 5.4.

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.

Fermi 2 NRC Exam Usage

ILO 2012 Audit
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
Fundamental (Low) Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

218000 ADS Automatic Depressurization System
218000.K4 Knowledge of Automatic Depressurization System design features and/or interlocks that provide for the following: (CFR: 41.7)
218000.K4.02 Allow manual initiation of ADS logic

Associated objective(s):

Automatic Depressurization System

Cognitive Terminal
Given the system operating conditions/parameters, in accordance with approved plant procedures: Identify operating procedures associated with ADS.

40	K/A Importance: 4.0			Points: 1.00
R40	Difficulty: 3.00	Level of Knowledge: High	Source: MODIFIED	102827

The plant is at 100% power when a change in plant conditions results in the following:

- Main Steam Line High Flow Channel A TRIP.
- Main Steam Line High Flow Channel B TRIP.

What will the Main Steam Isolation Valve (MSIV) indicating lights show 10 seconds later?

A. All MSIV RED OPEN indicating lights will be lit.

B. All MSIV GREEN CLOSED indicating lights will be lit.

C. The B2103-F022A-D, Inboard MSIV, GREEN CLOSED indicating lights will be lit.
The B2103-F028A-D, Outboard MSIV, RED OPEN indicating lights will be lit.

D. The B2103-F022A-D, Inboard MSIV, RED OPEN indicating lights will be lit.
The B2103-F028A-D, Outboard MSIV, GREEN CLOSED indicating lights will be lit.

Answer: B

Answer Explanation:

This question requires the candidate to interpret the information provided by some indicating lights associated with the Primary Containment Isolation System (PCIS) and then determine the impact of that prediction on MSIV indicating light status.

Per ARP 2D36, with channel A or C tripped, a trip of either channels B or D will satisfy the 1 out of 2 taken twice logic and full MSIV isolation will occur. Full Isolation logic is (A OR C) AND (B OR D). Therefore, B is the correct answer, and the candidate must determine that the MSIV green closed indicating lights will be lit because a logic has been satisfied to cause a full isolation.

NOTE: The Bank version of this question was used on the 2021 ILT NRC Exam. In that question, Instruments B and D were tripped, so isolation logic was not satisfied, and A was the correct response. This version modified the conditions in the stem to cause a previously incorrect response to now be the correct answer.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. The candidate could incorrectly recall MSIV isolation logic as 2 out of 2 taken once or [Full isolation = (A AND C) OR (B AND D)]. With this assumption, and with the A and B channels tripped, the candidate could determine that a full isolation has not occurred. This is incorrect because logic has been satisfied for a full isolation. NOTE: This was the previously correct response for the Bank version of this question.

C. The candidate could incorrectly recall MSIV isolation logic as 2 out of 2 taken once or [Inbd isolation = (A AND B)] OR [Otbd isolation = (C AND D)]. With this assumption and the A and B channels tripped, the candidate could determine that only the Inbd MSIVs would indicate closed (green).

D. The candidate could incorrectly recall MSIV isolation logic as 2 out of 2 taken once or [Otbd isolation = (A AND B)] OR [Inbd isolation = (C AND D)]. With this assumption and the A and B channels tripped, the candidate could determine that only the Otbd MSIVs would indicate closed (or green).

Reference Information:

ARP 2D36 NSSS Isolation Ch B/D Trip
ST-OP-315-0048, PCIS System Student Text
ST-OP-315-0005, Nuclear Boiler System Student Text

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
Modified
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

223002 PCIS Primary Containment Isolation System/Nuclear Steam Supply Shutoff
223002.A3 Ability to monitor automatic operation of the Primary Containment Isolation System/Nuclear Steam Supply Shutoff, including: (CFR: 41.7 / 45.7)
223002.A3.01 System indicating lights and alarms

Associated objective(s):

Primary Containment isolation System

Cognitive Terminal

In accordance with approved plant procedures/references, given various controls and indications for operation of the Primary Containment Isolation System: Discuss effective monitoring and control of the system using local and remote controls, indications, computer displays, alarms, and data-logging devices.

41	K/A Importance: 3.2			**Points: 1.00**
R41-V2	Difficulty: 3.00	Level of Knowledge: Fund	Source: NEW	103690

If a loss of Division 2 AC power lasted greater than 4 hours, which SRVs would still have power available for operation from the Main Control Room if NO actions are taken outside of the Main Control Room?

A. L, M and N

B. D, K, F, G and C

C. H, E, R, P, J, A and G

D. H, E, R, P, J, A and B

Answer: D

Answer Explanation:

Loss of all Div 2 AC power results in loss of power to the Div 2 ESF Battery Chargers. ESF Batteries at Fermi 2 have a 4-hour capacity.
This will cause loss of power to Div 2 DC busses 2PB2-5 and 2PB2-6, among others. This will result in loss of power to some SRV control power circuits.
The examinee must recall that SRVs L, M and N are powered from Div 2 DC bus 2PB2-5.
The examinee must also recall that SRVs D, K, F, G and C are powered from Div 2 DC bus 2PB2-6. While SRV G has an alternate power supply, from 2PC3-5, this source is from the Dedicated Shutdown (3L) System and requires an operator to position a transfer switch on the DSD Panel, which was not stated in the stem of the question.
The examinee must also recall that SRVs A, B, H, E, R, P and J are powered from 2PA2-5, with alternate power from 2PA2-6, neither of which was impacted by AC power loss specified in the stem of the question.
Therefore, the examinee must conclude that only SRVs A, B, H, E, R, P and J will have power available and will remain available for operation from the Main Control Room.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. SRVs M, L and N are all SRVs at Fermi 2. However, Schematic I-2095-01, at Grid E-6, shows these SRVs being powered from 2PB2-5. Since this is a Div 2 DC source supplied by chargers fed by Div 2 AC power, SRVs L, M and N would not have power available.
B. SRVs D, K, F, G and C are all SRVs at Fermi 2. However, Schematic I-2095-01, at Grid C-6, shows these SRVs being powered from 2PB2-6. Since this is a Div 2 DC source supplied by chargers fed from Div 2 AC power, SRVs D, K, F, G and C would not have power available.
C. SRVs A, H, E, R, P and J are all SRVs at Fermi 2 and they are powered from dual power sources 2PA2-5 and 2PA2-6, as can be seen on Schematic I-2095-01, at Grid H-7 and at Grid D-7. Since these sources are supplied by chargers fed from Div 1 AC power, they will still have power available. SRV G is a Low-Low Set SRV, like SRV A, which could lead the examinee to determine that SRV G would remain powered when the above actions are taken. This is incorrect because Schematic I-2095-01, at Grid C-6, shows SRV G as being powered from 2PB2-6, a Div 2 DC source. Since the stem indicates that Div 2 power has been lost, 2PB2-6 will be affected and SRV G will not have this power source available. The examinee could also recall something about SRV G having a dual power supply, the second power source coming from 2PC3-5. While this is partially correct, Schematic Diagram I-2095-04 Grid D-7 shows that this source requires manual operator action at the Dedicated Shutdown Panel to transfer the alternate source to SRV G. Therefore, since the stem of the question did not state this action was taken, SRV G will not have power available.

Reference Information:

I-2095-01, ADS/SRV System General Information
I-2095-04, Schematic Diagram for SRVs F, G and H

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference

Fundamental (Low) Cognitive Level

New

NRC Early Review

RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

239002 SRV Safety Relief Valves

239002.K6 Knowledge of the effect of the following plant conditions, system malfunctions, or component malfunctions on the Safety Relief Valves: (CFR: 41.7 / 45.5 to 45.8)

239002.K6.03 AC power

Associated objective(s):

Nuclear Boiler System

Cognitive Terminal

In accordance with approved plant procedures, given the condition of the system: Describe the normal and alternate power supplies to Nuclear Boiler system components.

42	K/A Importance: 3.6			Points: 1.00
R42	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	105007

Six (6) seconds after a scram, DCS logic will cause the C32-R618, Master Feedwater Level Controller, to setdown to __(1)__.

This setdown function will occur __(2)__.

A. (1) 150"

(2) regardless of RPV Startup LCV Mode Switch position.

B. (1) 173"

(2) regardless of RPV Startup LCV Mode Switch position.

C. (1) 150"

(2) only if the RPV Startup LCV Mode Switch position is in RUN.

D. (1) 173"

(2) only if the RPV Startup LCV Mode Switch position is in RUN.

Answer: A

Answer Explanation:

Per 3D157, Post Scram FW Logic Actuated:

At 6 seconds after the scram signal is received, DCS logic causes the C32-R618, Master Feedwater Level Controller Setpoint to set down 47" below the normal setpoint. Since the normal setpoint is 197", this means the Setpoint 6 seconds after the scram will be 150". Note that the setpoint (SP) setdown to 150" occurs regardless of RPV Startup LCV Mode Switch position. Therefore, SP setdown will still occur with the switch in START or RUN.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. 173" is a commonly recalled level setpoint. Also, since most scrams from power result in receipt of a Level 3 signal at 173" the examinee could plausibly determine that the reason Level 3 is reached on most scrams is because DCS sets down the setpoint to 173". This is incorrect because the reason Level 3 is reached on most scrams is because of the accompanying void collapse. This response is also incorrect because DCS sets down to 150". Setpoint Setdown does occur regardless of Startup LCV Mode Switch Position.

C. 150" is the correct setdown setpoint and the examinee could determine that setpoint would only occur if the switch is in RUN, which is plausible because every other feature of Post Scram Feedwater Logic (PSFWL) will only occur with the switch in RUN, as specified in the Auto Actions section for ARP 3D157. This is incorrect, however, because the setdown feature occurs regardless of switch position.

D. 173" is a commonly recalled level setpoint. Also, since most scrams from power result in receipt of a Level 3 signal at 173" the examinee could plausibly determine that the reason Level 3 is reached on most scrams is because DCS sets down the setpoint to 173". This is incorrect because the reason Level 3 is reached on most scrams is because of the accompanying void collapse. This response is also incorrect because DCS sets down to 150". Setpoint Setdown does occur regardless of Startup LCV Mode Switch Position. Also the examinee could determine that setpoint setdown would only occur if the switch is in RUN, which is plausible because every other feature of Post Scram Feedwater Logic (PSFWL) will only occur with the switch in RUN, as specified in the Auto Actions section for ARP 3D157. This is incorrect, however, because the setdown feature occurs regardless of switch position.

Reference Information:

3D157, Post Scram FW Logic Actuated
23.107.01, Rx Feedwater and Condensate System SOP

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

259002 RWLCS Reactor Water Level Control System
259002.A3 Ability to monitor automatic features of the Reactor Water Level Control System, including: (CFR: 41.7 / 45.7)
259002.A3.06 Reactor water level setpoint setdown following a reactor SCRAM

Associated objective(s):

Reactor Feedwater

Cognitive Terminal

In accordance with approved plant procedures, given various controls and indications for system operations: Identify normal and alarm values for significant monitored Reactor Feedwater system parameters.

43	K/A Importance: 3.9			**Points: 1.00**
R43	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	105107

The purpose of the Reactor Water Level Control System is to maintain reactor water level DURING POWER OPERATIONS to prevent what two negative consequences from occurring?

A. (1) Submerging the Core Spray System spargers, rendering the system unavailable in the event of LOCA

(2) Loss of suction path for RWCU system, leading to higher background radiation levels.

B. (1) Submerging the Core Spray System spargers, rendering the system unavailable in the event of LOCA.

(2) Reduced NPSH increases the probability of Reactor Recirculation Pump cavitation.

C. (1) Loss of turbine efficiency, increased turbine wear, and increased radioactive particulate in the balance of the Plant.

(2) Loss of suction path for RWCU system, leading to higher background radiation levels.

D. (1) Loss of turbine efficiency, increased turbine wear, and increased radioactive particulate in the balance of the Plant.

(2) Reduced NPSH increases the probability of Reactor Recirculation Pump cavitation.

Answer: D

Answer Explanation:

Per UFSAR 7.7.1.3,

"Function: The feedwater control system automatically controls the flow of feedwater into the RPV so that the water in the vessel is maintained within predetermined levels during all modes of plant operation. The range of water level is based on the requirements of the steam separators, including limiting carryover and carryunder, which affects turbine performance and recirculation pump operation."

Reactor water level is maintained in specific bands to prevent carryover and carryunder from occurring. In order to answer the question, the candidate must know what carryover and carryunder are without being prompted.

Per ST-OP-315-0046-001, Feedwater Control System Student Text, System Description (Page 6), the examinee must recall that:

The negative consequences of carryover are (1) loss of turbine efficiency, increased turbine wear, and increased radioactive particulate in the balance of the Plant.

The negative consequences of carryunder are (2) reduced NPSH increases the probability of Reactor Recirculation Pump cavitation

Distractor Explanation:

Distractors are incorrect and plausible because:

A. (1) This is incorrect. Though this consequence may be true, it is not the purpose for preventing carryover from occurring. The candidate may select this option if they see this as a higher consequence than carryover or if they think it is a negative consequence of carryover.
(2) This is incorrect. Although RWCU can be affected by low reactor water level, it is not the primary concern of carryunder. The candidate may select this option if they incorrectly believe that it is of higher consequence than cavitation of Recirc pumps, or if they believe this is a consequence of carryunder.
B. (1) This is incorrect. Though this consequence may be true, it is not the purpose for preventing carryover from occurring. The candidate may select this option if they see this as a higher consequence than carryover or if they think it is a negative consequence of carryover.
(2) This part is correct.
C. (1) This part is correct.
(2) This is incorrect. Although RWCU can be affected by low reactor water level, it is not the primary concern of carryunder. The candidate may select this option if they incorrectly believe that it is of higher consequence than cavitation of Recirc pumps or jet pumps, or if they believe this is a consequence of carryunder.

Reference Information:

UFSAR 7.7.1.3

ST-OP-315-0046-001, Feedwater Control System Student Text.

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

259002 RWLCS Reactor Water Level Control System
G2.1.27 Knowledge of system purpose and/or function (CFR: 41.7)

Associated objective(s):

Reactor Feedwater

Cognitive Terminal

In accordance with approved plant procedures, given the condition of the system: Explain the importance of Reactor Feedwater system to plant safety.

44	K/A Importance: 2.8			Points: 1.00
R44	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	103727

HPCI and SGTS both received an auto start signal.

T4600-F406, HPCI to SGTS Iso Valve, failed to open.

2D62, HPCI Condenser Vacuum Tank Pressure High is subsequently received.

HPCI Vacuum Tank Pressure is reported locally as 2" Hg Vacuum and lowering.

RPV Water Level is 145" and steady.

HPCI is the only High Pressure Injection Source of water to the RPV.

How will HPCI respond?

A. HPCI will continue to operate since the Barometric Condenser Vacuum Pump is not required for operation in an emergency.

B. HPCI cannot operate properly without a discharge path for the Barometric Condenser Vacuum Pump and will automatically trip.

C. HPCI cannot operate properly without a discharge path for the Barometric Condenser Vacuum Pump and must be manually tripped.

D. HPCI will continue to run since HPCI System trips associated with the Barometric Condenser Vacuum Pump are bypassed on auto start.

Answer: A

Answer Explanation:

2D62, HPCI Cndr Vac Tank Pressure High, IF condenser vacuum does not increase and HPCI is not required to maintain RPV water level, HPCI should be shutdown IAW 23.202, HPCI System SOP.

However, since the stem of the question indicates that HPCI is needed to maintain RPV water level, then HPCI should not be shutdown.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. The examinee could see the High Vacuum Tank Pressure as being an automatic trip since HPCI trips on High Exhaust Pressure and Barometric Condenser Vacuum Tank pressure could be confused with that parameter. However, there are no automatic trips for high Barometric Condenser Vacuum Tank pressure.

C. The examinee could see the High Vacuum Tank Pressure as reason to manually trip HPCI in lieu of automatic trip, since HPCI trips on High Exhaust Pressure and Barometric Condenser Vacuum Tank pressure could be confused with that parameter. Or the examinee could recognize that an automatic trip is not associated with high Barometric Condenser Vacuum Tank pressure but determine that the correct action is to shut HPCI down anyway. However, there are no automatic trips for high Barometric Condenser Vacuum Tank pressure and, per ARP 2D62, HPCI should not be shut down if needed to maintain RPV water level.

D. This is partially correct. HPCI will continue to run, however not because of the reason listed. Barometric Condenser Vacuum Pump trips will not automatically bypass. The candidate may select this option if they know that HPCI will continue to operate due to not needing Barometric Condenser Vacuum Pumps but fail to recall that they do not have trips that are automatically bypassed upon HPCI auto start.

Reference Information:

2D62, HPCI Cndr Vac Tank Pressure High
23.202, HPCI System SOP

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

261000 SGTS Standby Gas Treatment System
261000.K3 Knowledge of the effect that a loss or malfunction of the Standby Gas Treatment System will have on the following systems or system parameters: (CFR: 41.7 / 45.6)
261000.K3.04 High-pressure coolant injection system (BWR 3, 4)

Associated objective(s):

Standby Gas Treatment System

Cognitive Terminal

In accordance with approved plant procedures, given various controls and indications for system operations: Identify the basic Standby Gas Treatment System interrelationships with other plant systems.

45	K/A Importance: 3.2			Points: 1.00
R45-V2	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	105370

The plant is in MODE 5.

Replacement of System Service Transformer (SST) 65 is going to take place so busses off of SST 65 have been de-energized.

The CRS wants to restore C1106-C001B, West CRD Pump, to service.

Breaker 64T has been racked in and closed.

Which of the following Maintenance Tie Feeder Breakers will you close and what action is required to ensure load current limits through breaker 64T are not exceeded?

Rack in and close Maintenance Tie Feeder Breaker...

A. E9 and monitor every 4 hours to ensure load is <960 amps through 64T.

B. F9 and monitor every 4 hours to ensure load is <960 amps through 64T.

C. E9 and trip 64T if a LOCA occurs to prevent exceeding 960 amps through 64T.

D. F9 and trip 64T if a LOCA occurs to prevent exceeding 960 amps through 64T.

Answer: A

Answer Explanation:

Per 23.321, Engineered Safety Features Auxiliary Electrical Distribution System SOP: Attachment 1B, Page 1 of 5, shows the West CRD Pump as being supplied by Bus 65E Pos E11. Therefore, the examinee must determine that 65E Position E9, Maintenance Tie Breaker, must be closed to restore power to Bus 65E.
The examinee must also recall that, per P&L 3.5, when power is provided to Division 2 from Division 1 via Maintenance Tie Breaker 64T, the continuous current through breaker 64T must not exceed 960 amps. So when the CRD pump is restored, the operator should monitor current every 4 hours (and document on Attachment 4) to ensure this limit is not exceeded (mentioned throughout the procedure).

Distractor Explanation:
Distractors are incorrect and plausible because:

B. Plausible because ESF Bus 65F is also a Division 2 bus that could be supplied by Breaker 64T. This is incorrect because the West CRD Pump is powered from Bus 65E Position E9.
C. Plausible because there are several notes that describe the undesirable consequences of a LOCA signal occurring and the possibility of paralleling 2 EDGs through the maintenance tie feeder breakers. This could lead the examinee to conclude that, if a LOCA were to occur, manual action would be necessary to prevent exceeding 960 amps through 64T. This is incorrect because, if a LOCA signal occurs, 64T will trip automatically.
D. Plausible because the examinee could fail to recall that both Maintenance Tie Feeder Breakers cannot be closed and the examinee could conclude that, if a LOCA were to occur, manual action would be necessary to prevent exceeding 960 amps through 64T so all that is required is to monitor for load current limits. This is incorrect because the SOP prohibits closing both Maintenance Tie Feeder Breakers at the same time and because 64T will trip automatically on a LOCA.

Reference Information:
23.321, Engineered Safety Features Auxiliary Electrical Distribution System SOP

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.

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
262001 AC Electrical Distribution
262001.A1 Ability to predict and/or monitor changes in parameters associated with operation of the AC Electrical Distribution, including: (CFR: 41.5 / 45.5)
262001.A1.04 Load currents

Associated objective(s):
4160/480V Electrical Distribution
Cognitive Terminal
In accordance with approved plant procedures, given various controls and indications for system operations: Describe 4160/480V Electrical Distribution System precautions and limitations.

46	K/A Importance: 3.4			Points: 1.00
R46	Difficulty: 2.00	Level of Knowledge: Fund	Source: BANK	102648

A failure of UPS "A" inverter occurs.

UPS "A" loads will now be supplied by the UPS...

A. "B" rectifier from Bus 72R.

B. "A" rectifier from the UPS battery.

C. "A" voltage regulator from Bus 72M.

D. "A" voltage regulator from Bus 72R.

Answer: D

Answer Explanation:

Per 23.308.01: Each UPS unit contains automatic load transfer logic that will actuate a static transfer switch upon failure of the inverter. In this case, the inverter has completely failed, resulting in auto transfer of loads to the alternate supply voltage regulator, which is supplied by bus 72R.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. incorrect because UPS B rectifier cannot supply the A distribution cabinet unless the A inverter is functional. Applicants may choose this because the UPS B rectifier IS capable of supplying power to UPS A loads if the A rectifier or bus 72M fails. However, this is not possible with failure of the A inverter
B. incorrect because the battery cannot supply loads to the UPS distribution cabinet unless the inverter is functional. Additionally, the A rectifier is not fed by the battery and cannot provide power to loads unless the inverter is functional. Applicants may choose this if they do not recall the basic functional layout of the UPS system.
C. incorrect since the alternate supply for UPS A is 72R. Applicants may choose this if they confuse the alternate supply (72R) with the normal supply (72M).

Reference Information:

23.308.01, UPS SOP

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.

Fermi 2 NRC Exam Usage

ILO 2019 Retake Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
Fundamental (Low) Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

262002 UPS Uninterruptable Power Supply (AC/DC)
262002.K6 Knowledge of the effect of the following plant conditions, system malfunctions, or component malfunctions on the Uninterruptable Power Supply (AC/DC): (CFR: 41.7 / 45.7)
262002.K6.03 Static switch/inverter

Associated objective(s):

UPS

Cognitive Terminal
In accordance with approved plant procedures, given various controls and indications for system operations: Describe Uninterruptible Power Supply System automatic features.

47	K/A Importance: 2.9			**Points: 1.00**
R47	Difficulty: 3.00	Level of Knowledge: High	Source: MODIFIED	103048

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

- Division 1 130V ESF Batteries are undergoing an equalizing charge.
- T4100-B033, Battery Room AC Unit is in operation.
- Division 1 and 2 Battery Room Temperatures are at 72°F.
- T4100-C007(C008), Division 1 Battery Room East (West) Exhaust Fans, are in AUTO and NOT running.

The following subsequently occurs:

- 8D22, Aux Building Battery Room A/C Unit Trouble Alarm, is received.
- NO AIR FLOW ACROSS BATT ROOM A/C UNIT white light is LIT on the H11-P808 panel.
- T4100-C007 & C008 are still in AUTO and NOT running.

Which of the following is required and for what reason?

A. Start T4100-C007 & C008 to prevent unacceptable room temperatures.

B. Start T4100-C007 & C008 to prevent the buildup of explosive hydrogen gas.

C. Verify T4100-C007 & C008 auto start when Battery Room ambient temperature exceeds 75°F, to prevent unacceptable room temperatures.

D. Verify T4100-C007 & C008 auto start when high hydrogen concentration is detected in the Battery Room, to prevent buildup of explosive hydrogen gas.

Answer: B

Answer Explanation:

From 23.426, Reactor Building Heating Ventilation and Air Conditioning:

Air Conditioner (T4100-B033) fan units will operate continuously, but compressor will cycle on and off to supply cool air to Battery Room when Essential Battery Room ambient temperature exceeds 75°F. In AUTO, Exhaust Fans (T4100-C007 and T4100-C008) will auto start if air flow stops, preventing undesirable buildup of explosive hydrogen gas in the Battery Room(s).

From ARP 8D22, the Initiating Device(Setpoint) is T41-N049A(B) Aux Bldg Battery Room A/C Unit Fan DP Switch (0.5" wc increasing). The Auto Action is T4100-C007 & C008 should start. The Initial Response of the operator, per Step 1, is to Verify NO AIR FLOW ACROSS BATT ROOM A/C UNIT white light is ON and to Verify T4100-C007(C008), Division 1 Battery Room East(West) Exhaust Fans have auto started.
Verify implies the act of taking manual action if the plant has not responded as expected. This can be found in MOP01, Enclosure E, Page 1 of 7, Operator Fundamentals for Licensed Operators, which states, "Verify and report automatic system actuations or response, which includes operator actions if the plant has not responded as expected" and in Enclosure E, Page 2 of 7, which states "Take manual actions (in accordance with procedure direction, if available) when automatic actions do not occur."

Therefore, the examinee should recognize that T4100-C007 & C008 should have auto started on low flow of the T4100-B033 unit. The examinee should then determine that the correct action is to attempt to manually start the fans to prevent undesirable buildup of explosive hydrogen gas in the Battery Room.

The original version of this question was R49 On the Fermi 2 2019 Retake NRC Exam. This version was modified to require the operator to recognize that an automatic action should have taken place, and the need to perform that action manually.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. This distractor would be true if the battery room exhaust fans started, to draw air across the cooling coils and cool the battery rooms, upon a low air flow condition on the Battery Room AC unit to prevent excessive room temperatures. However, the exhaust fans auto start, if air flow stops, to prevent an undesirable buildup of explosive hydrogen gas in the Battery Rooms.

C. This distractor would be true if the battery room exhaust fans auto started when room temperature exceeds 75°F, which is how the battery room AC unit compressor operates. If the examinee determined that the exhaust fans draw air across the cooling coils and are needed to cool the room, and the fans will start based on room temperature, then this answer would be selected. This answer is incorrect because the AC fans operate continuously (for ventilation) and the compressor cycles (for cooling) based on room temperature, but the exhaust fans will only auto start upon receipt of a no air flow condition from the battery room AC unit to prevent an undesirable buildup of explosive hydrogen gas in the Battery Rooms.

D. This distractor would be true if the battery room exhaust fans auto started if hydrogen sensors in the room detected a high hydrogen concentration. This is plausible because the fans do automatically start to prevent an undesirable buildup of explosive hydrogen gas in the Battery Rooms and because other systems at Fermi 2, like the Hydrogen Water Chemistry system for example, have Hydrogen monitors that cause automatic actions if high hydrogen is detected. This answer is incorrect because fans auto start upon receipt of a no air flow condition and not due to high hydrogen concentration.

Reference Information:

8D22, Aux Building Battery Room A/C Unit Trouble Alarm.
23.426, Reactor Building Heating Ventilation and Air Conditioning.
MOP01, Conduct of 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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
Modified
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

263000 DC Electrical Distribution
263000.A2 Ability to (a) predict the impacts of the following on the DC Electrical Distribution and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operations: (CFR: 41.5 / 43.5 / 45.6)
263000.A2.02 Loss of ventilation during charging

Associated objective(s):

DC Electrical Distribution

Cognitive Terminal

In accordance with approved plant procedures, given the condition of the system: Explain the basic principles of operation for the DC Electrical Distribution System and the major components and equipment.

48	K/A Importance: 4.1			Points: 1.00
R48	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	102628

All 4 Emergency Diesel Generators started due to a LOCA.

After evaluation, the CRS has determined that the EDGs should be shut down from the Main Control Room (MCR).

RPV Water Level is 197" and steady.

Drywell Pressure is 8 psig and slowly lowering.

How can an EDG be shut down from the MCR?

A. Take the EDG CMC Switch to stop.

B. Reset Core Spray logic, then take the EDG CMC Switch to stop.

C. Install jumpers in the Digital Load Sequencer cabinet, then take the EDG CMC Switch to stop.

D. Place the Emergency Signal Bypass keylock switch in Bypass, then take the EDG CMC Switch to stop.

Answer: D

Answer Explanation:

Per 23.307, 8.3.2.2: "If a LOCA signal is present and the plant is stable, place Emergency Signal Bypass Keylock switch in BYPASS". Question states that LOCA signal is still present, so the Emergency Signal Bypass Keylock switch must be placed in BYPASS.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. This action will not work, since the LOCA signal is still active. The candidate may select this option if they think that the LOCA signal does not need to be clear or bypassed to shut down the diesel from the MCR.
B. Since the EDG started due to LOCA signal and a High drywell pressure still exists, this answer is incorrect. If the candidate believes that a reset of Core Spray logic is a viable solution for shutting down EDGs, despite the high drywell pressure, they may select this option.
C. This is incorrect. Load Sequencing does not occur due to LOCA signal, and this action would not do anything to the running diesel. The candidate may select this option if they incorrectly believe that the LOCA signal caused a load shed / load sequence that would need to be bypassed.

Reference Information:

23.307, Emergency Diesel Generator 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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

264000 EGE Emergency Generators (Diesel/Jet)
264000.A4 Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
264000.A4.04 Starting, loading, unloading, and stopping of emergency generator

Associated objective(s):

Emergency Diesel Generator

Cognitive Terminal

In accordance with approved plant procedures/references, under all conditions of the Emergency Diesel Generator System: Describe system operation, including component operating sequence, normal operating parameters, and expected system response.

49	K/A Importance: 3.8			Points: 1.00
R49-V2	Difficulty: 4.00	Level of Knowledge: High	Source: NEW	103667

The plant is at 100% power with the following Compressed Air System parameters:

NOTE: Only Division 1 NIAS is shown for the purpose of this question.

- P50-R800A, Div 1 NIAS to Dryer Unit Pressure Ind ....100 psig steady
- P50-R870, IAS Header Pressure Ind ....100 psig steady
- P50-R802, Station Air Header Pressure Ind ....100 psig steady
- P50-R801, NIAS Header Pressure Recorder (Red Pen, Div 1) ....100 psig steady

The following subsequently occurs:

- ARP 7D51, Div I Control Air System Trouble is received.
- Investigation shows clogging of the Division 1 NIAS Dryer.
- Division 1 NIAS Dryer Differential Pressure is 4.0 psid and RISING.

(1) How will the above failure affect system pressures?

(2) What action should be taken to mitigate the consequences of this failure?

A. (1) P50-R800A .... 100 psig steady
P50-R801 (Red Pen, Div 1) ..... 90 psig lowering
(2) Cross-Connect Div 1 and Div 2 NIAS

B. (1) P50-R800A .... 100 psig steady
P50-R801 (Red Pen, Div 1) ..... 90 psig lowering
(2) Close P5000-F440, Div 1 Control Air Iso Valve, and start the Div 1 Control Air Compressor

C. (1) P50-R800A .... 90 psig lowering
P50-R801 (Red Pen, Div 1) ..... 90 psig lowering
(2) Cross-Connect Div 1 and Div 2 NIAS

D. (1) P50-R800A .... 90 psig lowering
P50-R801 (Red Pen, Div 1) ..... 90 psig lowering
(2) Close P5000-F440, Div 1 Control Air Iso Valve, and start the Div 1 Control Air Compressor

Answer: A

Current View

Answer Explanation:

M-5730-3, NIAS Control Air System Div I & II FOS the Div 1 NIAS Air Dryer can be seen at Grid F-3.
P50-R800A, Div 1 NIAS to Dryer Unit Pressure Ind can be seen at Grid G-6.
P50-R801, NIAS Header Pressure Recorder can be seen at Grid D-5.
For Part (1), the examinee must recall that P50-R800A indicates upstream of, and P50-R801 indicates downstream of, the Div 1 NIAS Air Dryer. Therefore, the examinee must determine that P50-R800A will remain steady while P50-R801 will indicate a lowering air pressure (Red Pen) for a Div 1 NIAS Dryer Malfunction.
For Part (2), the examinee must determine that the correct course of action is to Cross-Connect NIAS per ARP 7D51, Subsequent Action 2.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. Part (1) is correct. Part (2) is plausible because the examinee could determine that the Control Air Dryer is upstream of the P5000-F440 or determine that the Control Air Compressor discharge does not go through the Dryer (i.e., if the Dryer is only needed to support NIAS when supplied by IAS). This is incorrect because closing the P5000-F440 and starting the CAC keeps the Air Dryer in the system flow so this will not mitigate the consequences of the malfunction.
C. Part (1) is plausible if the examinee determined that the component being referred to in the stem of the question was the in-service NIAS Filter (P5002-D037A or P5002-D038A) as can be seen on M-5730-3 at Grid G-8. Only one of these filters are in service at a time and if the in-service filter were clogging, as indicated by rising filter D/P similar to what is presented in the stem of the question, then ALL pressures downstream of the filter would be lowering, including pressures sensed by P50-R800A and P50R801 (Red Pen). Part (2) is the correct action for a clogged Control Air Dryer and would also correct the condition of a clogged NIAS Filter if that is what the examinee assumed for part (1).
D. Part (1) is plausible if the examinee determined that the component being referred to in the stem of the question was the in-service NIAS Filter (P5002-D037A or P5002-D038A) as can be seen on M-5730-3 at Grid G-8. Only one of these filters are in service at a time and if the in-service filter were clogging, as indicated by rising filter D/P similar to what is presented in the stem of the question, then ALL pressures downstream of the filter would be lowering, including pressures sensed by P50-R800A and P50R801 (Red Pen). Part (2) is plausible because lowering NIAS pressures could be corrected by isolating Div 1 NIAS by closing P5000-F440 (M-5730-3 Grid G-6 just downstream of the NIAS Filters) and starting the Division 1 NIAS Control Air Compressor (M-5730-3 Grid H-3, taps in just downstream of the F440 at Grid G-5). IF the in-service NIAS filter were clogged, performing these actions could stabilize NIAS header pressure and allow the in-service filter to be swapped since the NIAS filters are upstream of the P5000-F440. This entire response is incorrect because the stem of the question refers to a different filter/dryer, therefore system response and operator actions would both be different. Specifically, isolating Div 1 NIAS and starting the Div 1 NIAS Control Air Compressor would not correct the problem because air still flows through the Div 1 NIAS Dryer that is malfunctioning.

Reference Information:

23.129, Station and Control Air System SOP
7D51, Div I Control Air System Trouble
7D56, Interruptible Control Air Dryer Trouble
M-5730-3, NIAS Control Air System Div I & II FOS

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.

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
300000 Instrument Air System
300000.A2 Ability to (a) predict the impacts of the following on the Instrument Air System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operations: (CFR: 41.5 / 45.6)
300000.A2.01 Air dryer and filter malfunctions

Associated objective(s):
Compressed Air Systems

Cognitive Terminal

In accordance with approved plant procedures/references, given various controls and indications for operation of the Compressed Air System: Describe the system response to loss of electrical power, various component or equipment failures, and abnormal operating conditions, as applicable.

50	K/A Importance: 2.8			Points: 1.00
R50-V3	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	113508

All RBCCW Flow has been lost.

The EECW system has responded as designed.

If no operator actions are taken, how will the Reactor Recirculation Motor Generator (RRMG) sets respond?

The RRMG sets will...

A. not be impacted.

B. trip on high RRMG air temperature ONLY.

C. trip on high RRMG lube oil temperature ONLY.

D. trip on high RRMG lube oil temperature OR on high RRMG air temperature.

Answer: D

Answer Explanation:

Per 23.138.01, RR System SOP, Enclosure A, the RRMG sets trip on either high RRMG Air Temperature (260F) or High Lube Oil Temperature (210F). The examinee must first determine that the RRMG set oil and air coolers are cooled by RBCCW and not EECW. For reference, the easiest place to see this relationship is in the RBCCW SOP, 23.127, Attachment 1C, starting on Page 10, where it lists the various RBCCW to RRMG Set Cooling Coil valves and, starting on Page 11, where i lists the various RBCCW to RRMG set Oil Cooler valves. Please note that this is the RBCCW valve lineup section. There are other sections for Div 1 and Div 2 EECW and the RRMG sets are not on those lineups.

Thus, the examinee must determine that loss of RBCCW will cause loss of cooling water to both the RRMG set oil coolers and to the RRMG set cooling coils (air coolers) which could cause a trip on either high air or high oil temperature.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. The examinee could incorrectly recall that the RRMG air and oil coolers are cooled by EECW and would not be impacted. This is Incorrect because they are cooled by RBCCW.
B. The examinee could incorrectly recall that either the RRMG air coolers are the only components impacted by loss of RBCCW OR incorrectly recall that there is ONLY a trip associated with high area air temperature and NOT high oil temperature. This is incorrect because both the oil and air coolers are cooled by RBCCW and loss of cooling to either can cause a trip.
C. The examinee could incorrectly recall that either the RRMG oil coolers are the only components impacted by loss of RBCCW OR incorrectly recall that there is ONLY a trip associated with high oil temperature and NOT high air temperature. This is incorrect because both the oil and air coolers are cooled by RBCCW and loss of cooling to either can cause a trip.

Reference Information:

23.138.01, RR System SOP
23.127, RBCCW/EECW SOP.

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
NRC Early Review
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

400000 CCW Component Cooling Water System
400000.K1 Knowledge of the physical connections and/or cause and effect relationships between the Component Cooling Water System and the following systems: (CFR: 41.4 to 41.5 / 41.7 to 41.9 / 45.6 to 45.8)
400000.K1.09 Recirculation flow control system

Associated objective(s):

Reactor Building Closed Cooling Water/Emergency Equipment Cooling Water

Cognitive Terminal

In accordance with approved plant procedures/references, given various controls and indications for operation of the RBCCW/EECW System: Discuss the system interrelationships with other plant systems.

51	K/A Importance: 2.9			**Points: 1.00**
R51-V2 (POST SUBMITTAL)	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	103747

A leak has developed in the TBCCW system.

The leak has overcome the capacity of the Makeup Level Control Valve.

(1) If TBCCW Head Tank Level lowers sufficiently, the TBCCW Pumps are designed to trip at what value?

(2) IF TBCCW Head Tank Level lowers beyond the above value, and the pumps do NOT trip, which of the following describes indications that will worsen as TBCCW head tank level continues to lower?

A. (1) -7" on P43-R401, TBCCW Head Tank Level Ind.
(2) Higher pump noise level and reduced system flow rate.

B. (1) -18" on P43-R401, TBCCW Head Tank Level Ind.
(2) Higher pump noise level and fluctuating pump discharge pressure.

C. (1) -7" on P43-R401, TBCCW Head Tank Level Ind.
(2) Higher pump motor current and fluctuating pump discharge pressure.

D. (1) -18" on P43-R401, TBCCW Head Tank Level Ind.
(2) Higher pump motor current and fluctuating pump discharge pressure.

Answer: B

Answer Explanation:

Per 23.128, TBCCW System SOP, P&L 3.2 (page 5):
For Part (1) the TBCCW Pumps should trip at -18" (indicated on P43-R401) or 6" from tank bottom.

Per BC02Sr4:
For Part (2) the occurrence of gas binding would be indicated by low flow and low discharge pressure readings. Additionally, the pump would be doing less work so the examinee should conclude that the motor would be drawing minimum current. A fully gas bound (no flow condition) pump will generally exhibit very low or no discharge pressure. Discharge pressure will fluctuate in a partially gas bound pump. Noise level may increase because normally the liquid acts to dampen the transmission of bearing noise.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. Part (1) -7" is plausible because this is the alarm point for ARP 5D14, TBCCW Head Tank Level Low. Also, there is some confusion amongst operators regarding the TBCCW Head Tank Level indication, and when the pumps trip, because some documents reference tank bottom while some documents reference 0". Because of this, the trip at -18" (indicated on P43-R401) occurs when there is actually 6" of water in the tank. The proximity of 6" to -7" in this distractor option is therefore plausible, but incorrect, because the trip occurs at -18", indicated on P43-R401. Part (2) is correct in this distractor.
C. Part (1) -7" is plausible because this is the alarm point for ARP 5D14, TBCCW Head Tank Level Low. Also, there is some confusion amongst operators regarding the TBCCW Head Tank Level indication, and when the pumps trip, because some documents reference tank bottom while some documents reference 0". Because of this, the trip at -18" (indicated on P43-R401) occurs when there is actually 6" of water in the tank. The proximity of 6" to -7" in this distractor option is therefore plausible, but incorrect, because the trip occurs at -18", indicated on P43-R401. Part (2) is plausible because fluctuating pump discharge pressure is true and reduced system flow rate is true, however, higher pump motor current is false, making this distractor incorrect because motor current LOWERS since the motor is performing less work due to the reduced flow.
D. Part (1) is correct since the pumps trip at -18". Part (2) is plausible because fluctuating pump discharge pressure is true and reduced system flow rate is true, however, higher pump motor current is false, making this distractor incorrect because motor current LOWERS since the motor is performing less work due to the reduced flow.

Reference Information:

BC02Sr4, Generic Fundamentals: Pumps student text
5D14, TBCCW Head Tank Level High/Low

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b) (4) Secondary coolant and auxiliary systems that affect the facility.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

291004.K1.03 Pumps (CENTRIFUGAL) Consequences of air/steam binding
400000 CCW Component Cooling Water System

Associated objective(s):

Turbine Building Closed Cooling Water

Cognitive Terminal

In accordance with approved plant procedures/references, given various controls and indications for operation of the TBCCW System: Describe the system response to loss of electrical power, various component or equipment failures, and abnormal operating conditions, as applicable.

52	K/A Importance: 3.4			Points: 1.00
R52	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	103687

While walking down panels in the Main Control Room, the CRLNO noted the following valves have lost valve position indication on H11-P602:

- E1150-F073, RHRSW to RPV Emergency Injection Isolation Valve.
- E1150-F075, RHRSW to RPV Emergency Injection Isolation Valve.

To which of the following MCCs should the CRLNO direct the NO to investigate loss of power to these valves?

A. MCC 2PB-1

B. MCC 72C-F

C. MCC 72F-4A

D. MCC 72C-3A

Answer: C

Answer Explanation:

Per 23.205, RHR System SOP, Attachment 2B, Division 2 RHR Electrical Lineup Page 2 of 4:

E1150-F073 and E1150-F075, RHR Service Water (RHRSW) to RPV Emergency Injection Isolation Valves, are powered from the Class 1E 480V MCC 72F-4A. Therefore, the examinee must determine that it is to this MCC that an NO must be dispatched.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. E1150-F023 can be seen in 23.205 Attachment 2B as being powered from MCC 2PB-1. However, this is incorrect because the valves in the stem of the question are powered from Class 1E 480V MCC 72F-4A.
B. E1150-F015B and F017B can be seen in 23.205 Attachment 2B as being powered from MCC 72C-F. However, this is incorrect because the valves in the stem of the question are powered from Class 1E 480V MCC 72F-4A.
D. E1150-F0047A, F003A and F048A can be seen in 23.205 Attachment 2A as being powered from MCC 72C-3A. However, this is incorrect because the valves in the stem of the question are powered from Class 1E 480V MCC 72F-4A.

Reference Information:
23.205, RHR 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.

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
510000 SWS Service Water System
510000.K2 Knowledge of electrical power supplies to the following: (CFR: 41.7)
510000.K2.02 Service water system valves (Class 1E)

Associated objective(s):
Residual Heat Removal Service Water
Cognitive Terminal
In accordance with approved plant procedures, given the condition of the system: Describe the normal and alternate power supplies to Residual Heat Removal Service Water System components.

53	K/A Importance: 3.3			Points: 1.00
R53	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	103067

Answer the following questions regarding the operational significance of two key pressure indications associated with the CRD Hydraulic System and LCO 3.1.5, Control Rod Scram Accumulators:

With the reactor in MODE 1 or 2,

(1) What is the reactor steam dome pressure that is used to determine how long the crew has to take action for multiple inoperable control rod scram accumulators?

(2) What is the charging water header pressure below which action must be taken for multiple inoperable control rod scram accumulators?

A. (1) 600 psig
(2) 940 psig

B. (1) 600 psig
(2) 1010 psig

C. (1) 900 psig
(2) 940 psig

D. (1) 900 psig
(2) 1010 psig

Answer: C

Answer Explanation:

Per LCO 3.5.1, Control Rod Scram Accumulators:
(1) 900 psig is the key reactor steam dome pressure that is used to determine which Condition (A, B, or C) is entered. Note: Because this pressure is associated with Required Actions of 1-hour or less (see Conditions B and C), then it is RO required knowledge even though the information is found "below the line."
(2) 940 psig is the key charging water header pressure that is used in LCO 3.1.5 Conditions B and C to determine that action must be taken for multiple inoperable CRD rod scram accumulators. Note: Because this pressure is associated with Required Actions of 1-hour or less (see Conditions B and C), then it is RO required knowledge even though the information is found "below the line."

Distractor Explanation:

Distractors are incorrect and plausible because:

A. Part (1) 600 psig is plausible because, per the AOP Bases for Immediate Action IA.1, by design control rod scram can be accomplished without accumulator pressure when the reactor vessel pressure is at or above 600 psig. Scramming the reactor when reactor pressure is below 900 psig, upon receipt of the first accumulator low-pressure alarm, on a withdrawn control rod, that follows a loss of charging water header pressure, is a conservative action to ensure reactor pressure is adequate to fully insert control rods. The examinee could recall this basis and the corresponding pressure of 600 psig and select this response. This is incorrect because the question is asking the indicated pressure at which actions are taken and not the bases for that pressure. Part (2) is correct.
B. Part (1) 600 psig is plausible because, per the AOP Bases for Immediate Action IA.1, by design control rod scram can be accomplished without accumulator pressure when the reactor vessel pressure is at or above 600 psig. Scramming the reactor when reactor pressure is below 900 psig, upon receipt of the first accumulator low-pressure alarm, on a withdrawn control rod, that follows a loss of charging water header pressure, is a conservative action to ensure reactor pressure is adequate to fully insert control rods. The examinee could recall this basis and the corresponding pressure of 600 psig and select this response. This is incorrect because the question is asking the indicated pressure at which actions are taken and not the bases for that pressure. Part (2) 1010 psig is plausible because it is the setpoint for the accumulator trouble alarm. Since this alarm is referenced throughout the AOP for CRD Hydraulic System Failure as a determining point for what actions to take, then the examinee could confuse that alarm, and its setpoint, with the charging water header pressure specified in LCO 3.1.5. However the key charging water header pressure is 940 psig.
D. Part (1) is correct. Part (2) 1010 psig is plausible because it is the setpoint for the accumulator trouble alarm. Since this alarm is referenced throughout the AOP for CRD Hydraulic System Failure as a determining point for what actions to take, then the examinee could confuse that alarm, and its setpoint, with the charging water header pressure specified in LCO 3.1.5. However the key charging water header pressure is 940 psig.

Reference Information:

LCO 3.5.1, Control Rod Scram Accumulators
3D10, CRD Accumulator Trouble
20.106.01, CRD Hydraulic System Failure.
20.106.01 - BASES

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.

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
201001 CRDH Control Rod Drive Hydraulic System
201001.K5 Knowledge of the operational implications or cause and effect relationships of the following concepts as they apply to the Control Rod Drive Hydraulic System: (CFR: 41.5-7 / 41.10 / 45.1-6 / 45.12-13)
201001.K5.03 Pressure indication

Associated objective(s):
Control Rod Drive Mechanism
Cognitive Terminal
In accordance with approved plant procedures, given the condition of the system: Describe general Control Rod Drive Mechanism operation, including component operating sequence, normal operating parameters, and expected system response.

54	K/A Importance: 3.0			**Points: 1.00**
R54	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	105227

A plant startup is in progress with Reactor Power at 9% when the Feedwater Control System Steam Flow digital output fails downscale.

Which one of the following describes the effect on the Rod Worth Minimizer (RWM)?

A. The RWM will enforce the rod sequence at all power levels.

B. The RWM will not enforce the rod sequence at any power level.

C. The RWM will enforce the rod sequence until feedwater flow exceeds 12.275%.

D. Rod movement would be prevented by a rod select error enforced by the RWM.

Answer: A

Answer Explanation:

Per 23.608, RWM System SOP, Section 1.1, System Description:

The RWM enforces adherence to the selected (computer program) control rod sequence up to the Low Power Setpoint (LPSP). RWM Sequence Enforcement restricts movement of Control Rods that are not in compliance with the rod by rod order selected as listed in a programmed sequence below the LPSP. No rod motion that would result in an insert or withdraw error is permitted. The LPSP is determined by the digital outputs of the Feedwater Control System (FWCS), which are driven by flow transmitters used for steam and feedwater flow input to the FWCS. When increasing power, LPSP enforcement is in effect until total feedwater flow is > 12.275% and total steam flow is > 12.25%.

Therefore, with the steam flow output of the FWCS failed low, total steam flow will not go above 12.25% and the RWM will enforce its programmed sequence at all power levels.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. The examinee could confuse the RWM with the RBM and incorrectly recall that the RWM enforces rod blocks at higher power levels, while the RBM enforces rod blocks at lower power levels. This could lead the examinee to determine that the LPSP is reached (therefore rod sequence enforced) when total feedwater flow is > 12.275% and total steam flow is > 12.25%. This could lead the examinee to determine that the LPSP would never be reached, and the rod sequence not enforced, at any power levels with the steam flow signal from the FWCS failed low. Also, this answer would be correct if the stem indicated that total steam flow failed upscale, vice downscale, since the RWM would never go above LPSP enforcement. However, with total steam flow failed low, the RWM will always think power is below the LPSP, therefore the RWM will enforce at all power levels.

C. The examinee could determine that LPSP enforcement is in effect until total feedwater flow is > 12.275% OR total steam flow is > 12.25%. If this were true, the LPSP would be exceeded if feedwater flow ONLY exceeded its value of 12.275%. This is incorrect because the logic requires BOTH total feedwater flow to exceed 12.275% AND total steam flow to exceed 12.25%.

D. The examinee could determine that a RWM rod block is enforced automatically if it receives a bad input from the FWCS. This is similar to the FWCS automatically transferring water level control to Single Element when it receives a bad input. However, this is incorrect when applied to the RWM since an automatic rod block is not generated for this condition.

Reference Information:

23.608, RWM System SOP

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.

Fermi 2 NRC Exam Usage

ILO 2013 Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

201006 RWMS Rod Worth Minimizer System (BWR 2, 3, 4, 5)
201006.K6 Knowledge of the effect of the following plant conditions, system malfunctions, or component malfunctions on the Rod Worth Minimizer System: (CFR: 41.7 / 45.7)
201006.K6.02 Reactor water level control input

Associated objective(s):

Rod Worth Minimizer

Cognitive Terminal

In accordance with approved plant procedures, given various controls and indications for system operations: List the automatic features of Rod Worth Minimizer system operations.

55	K/A Importance: 2.9			Points: 1.00
R55-V3	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	103907

What is the power supply to G3303-C001A, South RWCU Recirc Pump B?

A. 72E Pos 2D.

B. 2PB-1 Pos 6B.

C. 72C-4A Pos 1A.

D. 72L-4A Pos 7A.

Answer: A

Answer Explanation:

Per 23.707, RWCU System SOP, Attachment 2 Page 1 of 6, the power supply to G3303-C001A, South RWCU Recirc Pump is 72E Pos 2D.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. On 23.707, RWCU System SOP, Attachment 2 Page 1 of 6 it can be seen that G3352-F004 is powered from 2PB-1 Pos 6B. This is incorrect because the South RWCU Recirc Pump is Bus 72E Pos 2D.
C. On 23.707, RWCU System SOP, Attachment 2 Page 1 of 6 it can be seen that G3352-F034 is powered from 72L-4A Pos 7A. This is incorrect because the South RWCU Recirc Pump is Bus 72E Pos 2D.
D. On 23.707, RWCU System SOP, Attachment 2 Page 3 of 6 it can be seen that the RWCU Hold Pump A is powered from 72C-4A Pos 1A. This is incorrect because the South RWCU Recirc Pump is Bus 72E Pos 2D.

Reference Information:

23.707, RWCU System SOP

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

204000 RWCU Reactor Water Cleanup System
204000.K2 Knowledge of electrical power supplies to the following: (CFR: 41.7)
204000.K2.01 Pumps

Associated objective(s):

Reactor Water Cleanup

Cognitive Terminal

In accordance with approved plant procedures, given the condition of the system: Describe the normal and alternate power supplies to Reactor Water Cleanup system components.

56	K/A Importance: 3.2			Points: 1.00
R56	Difficulty: 2.00	Level of Knowledge: Fund	Source: BANK	103247

Reactor Power is 10% with a startup in progress.

An EDGE ROD is selected for withdrawal.

What is the status of rod blocks provided by the Rod Block Monitors (RBMs)? How would this compare to the status of the rod blocks if power was 40% with the SAME rod selected?

A. All rod blocks would be active for both conditions.

B. All rod blocks would be bypassed for both conditions.

C. Rod blocks would be bypassed at the lower power and active at the higher power.

D. Rod blocks would be active at the lower power and bypassed at the higher power.

Answer: B

Answer Explanation:

The candidate should recall that when an edge rod is selected, regardless of power level, both RBM A and B are automatically bypassed.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. This would be true for an interior rod selected and if the RBM activated at 10% power, which is plausible since the Rod Worth Minimizer becomes bypassed >10% power the candidate could determine that the RWM is bypassed at the same power level that the RBM is activated, which makes logical sense but is incorrect.
C. This would be true for an interior rod but is incorrect for an edge rod.
D. This would be true for an interior rod and if the RBM was active at lower powers rather than higher powers, which is plausible because the RWM is active at lower powers so the candidate could confuse the RBM with the RWM regarding when each are active and when each are bypassed. However, this is incorrect for an edge rod.

Reference Information:

23.607 Rod Block Monitor SOP

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.

Fermi 2 NRC Exam Usage

ILO 2019 Retake Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
Fundamental (Low) Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

215002 RBMS Rod Block Monitor System (BWR 3, 4, 5)
215002.A4 Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
215002.A4.03 Trip/channel bypasses

Associated objective(s):

Power Range Monitoring and Rod Block Monitoring

Cognitive Terminal

In accordance with approved plant procedures, given various controls and indications for system operations: Discuss effective monitoring of the Power Range Neutron Monitoring System using local, remote, computer displays and alarms.

57	K/A Importance: 4.2			**Points: 1.00**
R57	Difficulty: 2.00	Level of Knowledge: High	Source: NEW	102887

The plant is in MODE 1 at 100% power with Torus Water Management System operating in Cleanup Mode.

A leak from a fire header running through the Torus Room results in receipt of 2D82, RB Torus Sump Level Hi-Hi.

Conditions are as follows:

- TWMS remains in operation.
- Both Torus Area Floor Drain Sump Pumps are running.

What action(s) will the CRLNO take per ARP 2D82?

A. Trip Torus Area Floor Drain Sump Pumps.

B. Trip TWMS pumps and isolate the system.

C. Keep TWMS in service and verify it isolates at -2".

D. Perform 29.ESP.21, Defeat of TWMS Isolations and Torus Level Control.

Answer: B

Answer Explanation:

Per 2D82:

Upon receipt of Torus Sump Level High-High annunciator, verify the following:

- Torus Area Floor Drain Sump Pumps (back of COP H11-P601) are running.
- TWMS Pumps (COP H11-P807) have tripped.
- TWMS System has isolated.
- All TWMS valves close.

The stem of the question states that TWMS is still operating, therefore the automatic function did not execute properly. The operator is required to isolate the TWMS system per the ARP since automatic action failed to occur.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. Plausible because ODE-10 requires entry into 29.ESP.27, Torus Leak isolation, for a "Large Torus Leak." 29.ESP.27 in turn requires the Torus Area Floor Drain Sump Pumps to be turned OFF. This is to satisfy the requirements of ODE-10, EOP Expectations, to preserve a volume of water in the Torus room to maintain viable Low Pressure ECCS (Core Spray) under the worst-case torus leak scenario. Per Design Calc DC-4689, "If all of the water in the Torus leaks into the Torus Room, level will equalize at a Torus level of approximately -97" to -99.5" (assuming Torus level starts at +2" to -2"). This is well below the Vortex limit for RHR (LPCI), but near the Vortex limit for Core Spray." The candidate may incorrectly determine that the correct action to take at this time is to trip (turn off) the sump pumps for this reason. However, these actions are only taken for a large torus leak, the symptoms of which have not been provided in the stem of the question. The correct action at this time is to trip and isolation the TWMS system as it may be a source of leakage that may prevent the need to enter and perform actions in 29.ESP.27.

C. This action is incorrect per the ARP. The candidate may select this option if they recognize that the sump pumps running will lower sump level. However, this will not have an effect on Torus Water Level.

D. This is incorrect since the system did not isolate as required. The candidate may select this option if they recall that isolations were supposed to occur, but incorrectly think that defeating the isolation signals to maintain TWMS in operation is the proper plan of action.

Reference Information:

2D82, RB Torus Sump Level Hi-Hi and Lo-Lo

29.ESP.21, Defeat of TWMS Isolations and Torus Level Control

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference

High Cognitive Level

New

RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

223001 PCS Primary Containment System and Auxiliaries

G2.4.50 Ability to verify system alarm setpoints and operate controls identified in the alarm response procedure (CFR: 41.10 / 43.5 / 45.3)

Associated objective(s):

Containment Systems

Cognitive Terminal

In accordance with approved plant procedures/references, given the operating conditions and parameters for the Containment: Identify normal, alarm response, and surveillance procedures associated with the system, as applicable.

58	K/A Importance: 3.7			**Points: 1.00**
R58-V2	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	102868

Which of the following is the power supply to Division 1 RHR Containment Cooling/Spray valve control logic?

A. 2IA1-3 Circuit 6

B. 2IB1-3 Circuit 7

C. 2PA2-5 Circuit 4

D. 2PB2-5 Circuit 2

Answer: C

Answer Explanation:

Per 1D8, RHR LOGIC A 125V DC BUS POWER FAILURE:

RR Distribution Cabinet 2PA2-5 Circuit 4 is one of the sources listed for RHR Logic power. This can also be seen on schematic diagram I-2205-02, RHR Logic Schematic, at grid G-8. This shows this circuit as supplying RHR logic, of which Containment Cooling/Spray valve control logic is part.
Finally, SOP 23.309 Attachment 1 lists 2PA2-5 Circuit 4 as supplying Div 1 RHR Pumps Aux Relay & Relay Logic.

Distractor Explanation:
Distractors are incorrect and plausible because:

A. Plausible because, per 23.310, 48/24VDC Electrical System Attachment 1, Position 2IA1-3 Circuit 6 is the power supply to Division 1 ECCS Trip Unit Cabinet instrument rack, which supplies power to some instruments used by the RHR system, and the examinee could confuse this power supply as being the source of power to Div 1 RHR valve control logic. This is incorrect because Div 1 RHR valve control logic is powered from Distribution Cabinet 2PA2-5 Circuit 4.
B. Plausible because, per 23.310, 48/24VDC Electrical System Attachment 1, Position 2IB1-3 Circuit 7 is the power supply to Division 2 ECCS Trip Unit Cabinet instrument rack, which supplies power to some instruments used by the RHR system, and the examinee could confuse this power supply as being the source of power to Div 1 RHR valve control logic. This is incorrect because Div 1 RHR valve control logic is powered from Distribution Cabinet 2PA2-5 Circuit 4.
D. Plausible because, per 23.309, 260/130VDC Electrical System Attachment 2, Position 2PB2-5 Circuit 2 is the power supply to Division 2 RHR Relay Logic B, which supplies power to Division 2 RHR valve control logic and the examinee could confuse this power supply as being the source of power to Div 1 RHR valve control logic. This is incorrect because Div 1 RHR valve control logic is powered from Distribution Cabinet 2PA2-5 Circuit 4.

Reference Information:
ARP 1D8, RHR Logic A 125V DC Bus Power Failure.
I-2201-71, E1150-F028A Schematic (representative of how all 3 valves operate).
23.310, 48/24VDC Electrical System.
23.309, 260/130V DC Electrical 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.

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
226001 RHR CSS RHR/LPCI: Containment Spray System Mode
226001.K2 Knowledge of electrical power supplies to the following: (CFR: 41.7)
226001.K2.03 Valve control logic

Associated objective(s):

Residual Heat Removal

Cognitive Terminal

In accordance with approved plant procedures, given the condition of the system: Describe the normal and alternate power supplies to Residual Heat Removal System components.

59	K/A Importance: 3.7			**Points: 1.00**
R59-REPLACEMENT	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	103728

A plant shutdown is in progress with reactor power currently stable at 65%.

The Turbine Flow Limiter setpoint slowly lowers to 60%.

Which one of the following describes the Governor/Pressure Regulator system response?

A. Turbine Control Valve and Turbine Bypass Valve positions remain the same.

B. Turbine Control Valves throttle close, and Turbine Bypass Valves throttle open.

C. Turbine Control Valve positions remain the same, and Turbine Bypass Valves throttle open.

D. Turbine Control Valves throttle close, and Turbine Bypass Valve positions remain the same.

Answer: B

Answer Explanation:

Per ST-OP-315-0045-001, Governor Pressure Control System:

The setpoint adjustment should have been to maintain the Turbine Flow Limiter 5% above reactor power and not 5% below reactor power. Lowering the turbine flow limiter setpoint below the reactor power setpoint will cause the Turbine Control Valves to close. The Turbine Bypass valves will open in response to a reactor pressure increase.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. Is incorrect but plausible. The examinee could incorrectly determine that setpoint was properly adjusted, which would cause no valve movement since the setpoint difference from reactor power is 5% in the stem. In accordance with 22.000.03, Power Operation 25% to 100% to 25%, the setpoint is maintained 5% above (vice below) reactor power during the shutdown.

C. Is incorrect but plausible. The examinee could incorrectly determine that the system response is a combination of responses from distractors A and C which would each be partly correct for the adjustment of the Turbine Flow Limiter and Reactor Flow Limiter.

D. Is incorrect but plausible. The examinee could incorrectly determine that the system response would be as stated in distractor A since this would be a correct response if the Reactor Flow Limit setpoint had been adjusted to 60% instead of the Turbine Flow Limit setpoint.

Reference Information:

ST-OP-315-0045-001, Governor Pressure Control 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.

Fermi 2 NRC Exam Usage

ILO 2015 Exam

ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank

Closed Reference

High Cognitive Level

RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

239001 MRSS Main and Reheat Steam System

239001.K3 Knowledge of the effect that a loss or malfunction of the Main and Reheat Steam System will have on the following systems or system parameters: (CFR: 41.7 / 45.4)

239001.K3.06 Reactor/turbine pressure regulating system

Associated objective(s):

Governor/Pressure Control

Cognitive Terminal

In accordance with approved plant procedures, given various controls and indications for system operations: Describe Governor/Pressure Control System instrumentation and controls, including symptoms of failure modes.

60	K/A Importance: 3.0			Points: 1.00
R60-V3	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	113528

The plant is operating at 100% power with Steam Jet Air Ejectors #1 and #2 in service.

The CRLNO is placing an additional SJAE in operation.

This will cause __(1)__ to move in the __(2)__ direction as additional load is being placed on the system to cool the SJAE Inter-Condenser.

A. (1) N20-F403, Condensate Bypass Line Flow Control Valve
(2) closed

B. (1) N20-F403, Condensate Bypass Line Flow Control Valve
(2) open

C. (1) P43-F405, TBCCW Differential Pressure Control Valve
(2) closed

D. (1) P43-F405, TBCCW Differential Pressure Control Valve
(2) open

Answer: A

Answer Explanation:

Per M-5719-1 Condenser Vacuum and Off-Gas System FOS the SJAE intercondensers can be seen at Grid E/F/G-7. At the top (Grid G-7) it shows that the SJAE Inter Condensers are cooled by the Condensate System (FOS M-5714)

Per M-5714-1 Condensate System FOS, the Inter-Condensers can be found at Grid B/C-6. It can also be seen that N20-F403 is a bypass flow control valve that positions to maintain constant d/p across the 4 SJAE Inter-Condensers, the 2 Off-Gas Condensers and the 1 Gland Steam Condenser.

The examinee must determine (1) it is Condensate and not TBCCW that provides cooling to the SJAEs; therefore it is the N20-F403 that will re-position. Then, the examinee must determine that (2) N20-F403 is a bypass flow control valve, meaning that it attempts to maintain constant d/p across the 7 parallel loads listed above. To maintain constant d/p, as load is placed on the system, N20-F403 will move in the closed direction.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. Part (1) is correct. For part (2) the examinee could determine that N20-F403 controls flow, through a condensate bypass line to direct flow TO the 7 parallel loads, rather than controlling d/p AROUND the loads. If this is how the examinee recalls the system, then they could plausibly determine that the valve would need to open MORE to compensate for the additional flow through the SJAE inter-condenser that was being placed in service. This is incorrect because N20-F403 controls d/p in an attempt to maintain constant d/p to the 7 parallel loads.

C. For part (1) the examinee could determine that TBCCW cools the SJAE inter-condensers, which is plausible because TBCCW provides cooling to several Off-Gas loads, such as the Mechanical Vacuum Pumps (which, incidentally, provide a similar function as the SJAEs to remove non-condensable gasses from the condenser), the Off Gas Aftercooler, etc. This is incorrect because Condensate provides cooling flow to the SJAE inter-condensers. N20-F403 is a d/p control valve in the TBCCW system that attempts to maintain a constant d/p between the TBCCW supply and return headers. If the examinee determined that TBCCW supplies cooling to the SJAE inter-condensers, the examinee could determine that this valve would move in the closed direction to maintain constant d/p. This is incorrect because Condensate provides cooling flow to the SJAE inter-condensers.

D. For part (1) the examinee could determine that TBCCW cools the SJAE inter-condensers, which is plausible because TBCCW provides cooling to several Off-Gas loads, such as the Mechanical Vacuum Pumps (which, incidentally, provide a similar function as the SJAEs to remove non-condensable gasses from the condenser), the Off Gas Aftercooler, etc. This is incorrect because Condensate provides cooling flow to the SJAE inter-condensers. For part (2) the examinee could determine that P43-F405 controls flow through TBCCW loads rather than controlling d/p between the supply and return headers. If this is how the examinee recalls the system, then they could plausibly determine that the valve would need to open to compensate for the additional flow through the SJAE inter-condenser that was being placed in service. This is incorrect because Condensate provides cooling flow to the SJAE inter-condensers.

Reference Information:

ST-OP-315-0032-001, Condenser and Auxiliaries System Student Text
M-5714-1 Condensate System FOS
M-5719-1 Condenser Vacuum and Off-Gas System FOS

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

256000 Condensate System
256000.K1 Knowledge of the physical connections and/or cause and effect relationships between the Condensate System and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)
256000.K1.07 SJAE condenser system

Associated objective(s):

Condensate

Cognitive Terminal

In accordance with approved plant procedures/references, given various controls and indications for operation of the Condensate System: Discuss the system interrelationships with other plant systems.

61	K/A Importance: 3.5			**Points: 1.00**
R61	Difficulty: 3.00	Level of Knowledge: High	Source: MODIFIED	105127

During an Emergency Shutdown and Manual Isolation of Secondary Containment, the Control Room LNO armed and depressed the Div 1 Manual Isolation pushbutton ONLY.

FIVE MINUTES AFTER this action was taken, which of the following sets of indications represents the appropriate Secondary Containment Isolation Damper status for the dampers below?

- T4100-F010, RBHVAC Supply Outboard Isolation Damper
- T4100-F011, RBHVAC Supply Inboard Isolation Damper
- T4100-F009, RBHVAC Exhaust Inboard Isolation Damper
- T4100-F008, RBHVAC Exhaust Outboard Isolation Damper

A. Red lights ON, Green lights OFF for all 4 Secondary Containment Isolation Dampers.

B. Red lights OFF, Green lights ON for all 4 Secondary Containment Isolation Dampers.

C. Red lights ON, Green lights OFF for T4100-F011 and T4100-F009.
Red lights OFF, Green lights ON for T4100-F010 and T4100-F008.

D. Red lights ON, Green lights OFF for T4100-F010 and T4100-F008.
Red lights OFF, Green lights ON for T4100-F009 and T4100-F011.

Answer: B

Answer Explanation:

Logic diagram I-2610-17 shows that, when only the Div 1 Pushbutton is Armed and Depressed (D-3), only the T4100-F011 and F009 (inboard supply and exhaust isolation dampers) receive a close signal (C-3) .
However, the logic diagram also shows that all of the RB Supply and Exhaust Fans receive a trip signal (B-4).
When the last supply and exhaust fan are shut down, all Secondary Containment Isolation Dampers will close. This cannot be seen on the logic diagram, but can be gleaned from SOP 23.426, Step 8.1.2.6 (page 34).

Therefore, the examinee must conclude that, although only a Division 1 Secondary Containment Isolation Signal was generated, ultimately ALL Secondary Containment Isolation Dampers (T4100-F008 through F011) will close (Red Lights will go OFF and Green Lights will come ON).

Distractor Explanation:

A is plausible if the examinee concludes that both the Div 1 and Div 2 manual isolation pushbuttons must be armed and depressed to cause a valid isolation signal, which is how RPS logic works. For RPS logic, one pushbutton in RPS Trip System A must be depressed, and one in Trip System B must be depressed, to initiate a full scram. The examinee could incorrectly determine that Secondary Containment Isolation Logic is the same. However, Secondary Containment Isolation Logic works as described above and shown in the logic diagram.
C is plausible because the T4100-F011 and T4100-F009 are the Secondary Containment Inboard Isolation Dampers and they are closed on a Division 1 Secondary Containment Isolation Signal, as described above, and can be seen on the logic diagram. The examinee could recognize this and determine that they would close when the Div 1 pushbutton is depressed, which is true. The examinee could then, incorrectly, determine that the T4100-F010 and T4100-F008 would remain open, regardless of what happens with the rest of the system. This is incorrect since all Secondary Containment Isolation Dampers will close once the supply and exhaust fans shut down, as described in the SOP.
D is plausible because only two Secondary Containment Inboard Isolation Dampers are closed on a Division 1 Secondary Containment Isolation Signal, as described above, and can be seen on the logic diagram. The examinee could incorrectly associate Division 1 isolation logic with the T4100-F010 and T4100-F008 and determine that only they would receive a close signal while the T4100-F009 and T4100-F011 would remain open. This is incorrect as described above and can be seen on the logic diagram.

Reference Information:

I-2610-17, Logic Diagram Secondary Containment Isolation Signals.
23.426, RBHVAC System SOP.

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
High Cognitive Level
Modified
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

290001 Secondary Containment
290001.A1 Ability to predict and/or monitor changes in parameters associated with operation of the Secondary Containment, including: (CFR: 41.5 / 45.5)
290001.A1.11 System indicating lights and alarms

Associated objective(s):

Containment Systems

Cognitive Terminal

In accordance with approved plant procedures/references, given various controls and indications for operation of the Containment: Describe the automatic features of the system.

62	K/A Importance: 3.9			**Points: 1.00**
R62	Difficulty: 2.00	Level of Knowledge: Fund	Source: BANK (GG 2021 Q37)	103947

Which of the following RPV Internal components separates the water flowing upward through the core from the water flowing downward in the downcomer annulus?

A. Core Shroud.

B. Shroud Head.

C. Jet Pump Diffuser

D. Shroud Support Plate.

Answer: A

Answer Explanation:

Bank Source (External Bank): Grand Gulf 2010 NRC Exam, Question 37. This question has never been used on a Fermi 2 ILT NRC Exam.

Per ST-OP-315-0002, RPV and Internals Student Text: The core shroud is a cylindrical stainless steel assembly which surrounds the core. It provides a barrier between upward core flow and the downward flow in the downcomer annulus. The shroud also provides vertical and lateral support for the core plate and upper grid (top guide).

Distractor Explanation:

Distractors are incorrect and plausible because:

B. The Shroud Head closes off the core outlet so that all the water and steam exiting the core is forced through the 3-stage steam separators. The Shroud Head consists of a flange and dome, with an array of standpipes welded to the dome. However, it is the Core Shroud that serves to separate the water flowing upward through the core from the water flowing downward in the downcomer annulus and not the Shroud Head.

C. Jet Pump Diffusers separate flow in the downcomer region from flow that will be exiting the downcomer into the core region at a higher pressure. However, it is the Core Shroud that serves to separate the water flowing upward through the core from the water flowing downward in the downcomer annulus and not the Jet Pump diffusers.

D. The Shroud Support Plate is a component within the internals of the RPV that provides a mounting surface for the jet pump diffusers. The shroud support plate separates the downcomer area (reactor recirculation pump suction area) from the core inlet plenum area (below core plate area). However, it is the Core Shroud that serves to separate the water flowing upward through the core from the water flowing downward in the downcomer annulus and not the Shroud Support Plate.

Reference Information:

ST-OP-315-0002, RPV and Internals Student Text.

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank

Closed Reference

Fundamental (Low) Cognitive Level

RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

290002 Reactor Vessel and Internals

290002.K4 Knowledge of Reactor Vessel and Internals design features and/or interlocks that provide for the following: (CFR: 41.7)

290002.K4.02 Flow paths within the reactor vessel

Associated objective(s):

Reactor Pressure Vessel and Internals

Cognitive Terminal

In accordance with approved plant procedures, given the condition of the system: Draw a basic RPV and Internals diagram.

63	K/A Importance: 3.2			**Points: 1.00**
R63	Difficulty: 3.00	Level of Knowledge: High	Source: NEW	104367

8D5, DIV I CONTROL ROOM A/C TROUBLE annunciator alarms and it is determined that Div 1 CCHVAC Chiller has tripped on low compressor oil pressure.

(1) Immediately after 8D5 is received, what will be the effect on Div 1 CCHVAC?

(2) What action(s) should be taken per ARP 8D5?

A. (1) It will trip on high temperature.

(2) Verify Div 2 CCHVAC auto starts following trip of Div 1 CCHVAC.

B. (1) It will trip on high temperature.

(2) Start the Division 2 CCHVAC Chiller in accordance with 23.413, Control Center HVAC.

C. (1) It will continue to operate.

(2) Direct an operator to attempt to reset the chiller lock-out by depressing the RESET pushbutton on H21-P285A, Div 1 CCHVAC Chiller Control Panel. If the trip cannot be reset, THEN start the Division 2 CCHVAC Chiller in accordance with 23.413, Control Center HVAC.

D. (1) It will continue to operate.

(2) Direct an operator to attempt to reset the chiller lock-out by depressing the RESET pushbutton on H21-P285A, Div 1 CCHVAC Chiller Control Panel. If the trip cannot be reset, THEN shift operating divisions of CCHVAC in accordance with 23.413, Control Center HVAC.

Answer: D

Answer Explanation:

Per 8D5:

CCHVAC will operate normally after the chiller trips. Since the stem states that there was only one trip of the chiller, 8D5 directs the operators to attempt to restart the chiller before entering the SOP to switch divisions of CCHVAC.
This is accomplished by directing an operator to depress the RESET pushbutton on H21-P285A, Div 1 CCHVAC Chiller Control Panel.

IF the above attempt is not successful, ARP 8D5 directs shifting operating CCHVAC divisions using SOP 23.413, CCHVAC.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. (1) This is incorrect. CCHVAC will not trip on high temperature this soon after the chiller is lost. The examinee may choose this option if they believe that since the chiller is tripped, temperature will rise fast enough to cause immediate problems with CCHVAC.
(2) This is incorrect. Since CCHVAC will not trip, Div 2 CCHVAC will not auto start. If the examinee believes that the CCHVAC trip in part (1) is correct, this option may seem like the next logical progression of events.
B. (1) This is incorrect. CCHVAC will not trip on high temperature this soon after the chiller is lost. The examinee may choose this option if they believe that since the chiller is tripped, temperature will rise fast enough to cause immediate problems with CCHVAC.
(2) This part is incorrect. If the examinee determined that CCHVAC has tripped on high temperature, the examinee may select this option if they incorrectly believe that starting the Division 2 Chiller will restore Control Room temperature and allow Division 1 CCHVAC to be re-started, which is plausible because the CCHVAC chillers cool their respective chill water loops, which are separate, but the chilled water piping is directed to a common air handling unit. This could lead the examinee to determine that the Div 2 Chiller could support Div 1 CCHVAC operation. It is also plausible because other Div 2 CCHVAC equipment, such as the Emergency Makeup Fans, are redundant components capable of supporting either division of CCHVAC. This response is incorrect because the actions per ARP 8D5 are to attempt a trip reset and, if not successful, to shift operating divisions per the SOP.
C. (1) This part is correct. CCHVAC will continue to operate.
(2) If the chiller cannot be restored, the examinee may select this option if they incorrectly believe that starting the Division 2 Chiller will maintain Control Room temperature, which is plausible because the CCHVAC chillers cool their respective chill water loops, which are separate, but the chilled water piping is directed to a common air handling unit. This could lead the examinee to determine that the Div 2 Chiller could support Div 1 CCHVAC operation. It is also plausible because other Div 2 CCHVAC equipment, such as the Emergency Makeup Fans, are redundant components capable of supporting either division of CCHVAC. This response is incorrect because the actions per ARP 8D5 are to attempt a trip reset and, if not successful, to shift operating divisions per the SOP.

Reference Information:

8D5, Div 1 Control Room A/C Trouble
20.413.01, Control Center HVAC System Failure

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.

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Closed Reference
High Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
290003 Control Room Ventilation
290003.A2 Ability to (a) predict the impacts of the following on the Control Room Ventilation and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operations: (CFR: 41.5 / 43.5 / 45.6)
290003.A2.05 Loss of chillers

Associated objective(s):
Control Center HVAC
Cognitive Terminal
Given the system operating conditions/parameters, in accordance with approved plant procedures: Identify alarm response procedures associated with the Control Center HVAC System.

64	K/A Importance: 3.1			Points: 1.00
R64	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	103007

DER-93-0356 documents failure of the HPCI steam system rupture diaphragms that resulted in personnel injuries.

As a result MOP01, Conduct of Operations, was revised to require __(1)__ announcements prior to the start of __(2)__.

A. (1) radio

(2) only steam driven plant equipment

B. (1) Hi-Com

(2) only steam driven plant equipment

C. (1) radio

(2) all major pieces of plant equipment

D. (1) Hi-Com

(2) all major pieces of plant equipment

Answer: D

Answer Explanation:

Per MOP01, Conduct of Operations:

Hi-Com announcements should be made prior to starting or stopping major pieces of equipment. This is based on DER-93-0356 where a failure of HPCI steam system rupture diaphragms resulted in personnel injury. At Fermi, the rupture diaphragms for HPCI and RCIC are top of Torus. If personnel are working in that area, they could potentially be injured by a rupture. For this reason, MOP01 specifically requires a Hi-Com announcement.. Therefore, option B is the correct answer.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. (1) Since this is a major piece of equipment being operated, a radio announcement would not be appropriate per MOP01. MOP01 requires a Hi-Com announcement for operation of major plant equipment. This is plausible because many personnel in the plant carry radios and radios are easier to hear in more plant locations than is the Hi-Com.
(2) All major plant equipment requires Hi-Com announcement, not just steam driven. This is plausible because the candidate may think "steam driven plant equipment" is correct due to the stem of the question mentioning it as part of DER-93-0356.

B. (1) This part is correct.
(2) All major plant equipment requires Hi-Com announcement, not just steam driven. This is plausible because the candidate may think "steam driven plant equipment" is correct due to the stem of the question mentioning it as part of DER-93-0356.

C. (1) Since this is a major piece of equipment being operated, a radio announcement would not be appropriate per MOP01. MOP01 requires a Hi-Com announcement for operation of major plant equipment. This is plausible because many personnel in the plant carry radios and radios are easier to hear in more plant locations than is the Hi-Com.
(2) This part is correct.

Reference Information:

MOP01, Conduct of Operations

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

G2.1.14 Knowledge of criteria or conditions that require plantwide announcements, such as pump starts, reactor trips, and mode changes (CFR: 41.10 / 43.5 / 45.12)

Associated objective(s):

Teamwork, Communications & Diagnostics
Cognitive Terminal
Given a scenario requiring teamwork, Discuss the impact teamwork and communications have in industry related events, in accordance with management standards at Fermi 2.

65	K/A Importance: 4.4			Points: 1.00
R65	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	103012

The plant is in MODE 1 at 100% power.

You are the CRLNO, and you are in the Main Control Room with the P603 Operator and the CRS.

You have to conduct an activity that requires you to operate the SS-1 Panel.

You desire a peer-check to perform this operation.

Per MOP01, Conduct of Operations, can the P603 Operator provide you a peer check? Why or why not?

A. Yes, because the SS-1 is within the At Controls Area.

B. Yes, because the P603 can conduct peer checks in the Back Panel area.

C. No, because the P603 cannot conduct peer checks in the Back Panel area.

D. No, because the P603 cannot leave the area around the P603 panel, from the P601 to the P805 panels.

Answer: C

Answer Explanation:

Per MOP01, Conduct of Operations:

First, the examinee has to recall that the SS-1 is located inside the Control Room Envelope, around back and roughly behind the P601 Panel.
Second, the examinee must recall that, per MOP01, Enclosure A, this puts the SS-1 in the "Back Panel" area.
Finally, the examinee must recall that, per MOP01, Section 3.11.2.3.a.1) the P603 Operator can be utilized for peer checks throughout the "At Controls" area ONLY.

NOTE: This question meets generic, Tier 3, requirements because the SS-1 is used for a variety of systems and evolutions and this concept could be applied to all pieces of equipment that might be operated in the "Back Panel" area.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. The examinee could either fail to recall where the SS-1 is located or fail to recall what is defined as the "At Controls" area. This answer is incorrect because the SS-1 is located on the back of the P601 panel, which puts it outside of the "At Controls" area.
B. The examinee could fail to recall that peer-checks inside the Control Room Envelope are limited to the "At Controls" area for the P603 operator. The examinee could also fail to recall where the "At Controls" area extends to and determine that the SS-1 is within that area. This is incorrect because the SS-1 is located BEHIND the P601 panel which, per MOP01 Enclosure A, is defined as the "Back Panel" area and MOP01 only allows the P603 to conduct peer checks in the "At Controls" area.
D. The examinee could determine that the P603 operator is limited to the "front horseshoe" area created by the area formed from the P601 to the P805 panels. Note that this used to be a requirement prior to MOP01 being revised to allow the P603 operator to perform peer checks in the entire "At Controls" area. This is incorrect because MOP01 now allows peer checks in the At Controls area. The reason the answer to the question is NO is because the SS-1 is located around back in a "Back Panel" area.

Reference Information:

MOP01, Conduct of Operations

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
Fundamental (Low) Cognitive Level
New
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

G2.1.30 Ability to locate and operate components, including local controls (CFR: 41.7 / 45.7)

Associated objective(s):

Admin Procedures Exercise

Cognitive Terminal

Given a condition or scenario, Describe methods for monitoring plant status, control of equipment, and maintaining proper Control Room work environment, including, in accordance with the approved Fermi 2 Conduct Manuals: a. The responsibility of the CRLNO; b. The five CRLNO Guidelines to ensure continued monitoring of plant status; c. Access to the Control Room and exceptions to the access requirements; d. Leaving the â€œAt Controls Area.â€□; e. Removing a system/component from service; f. Restoring a system/component to service; g. Performing valve, electrical, and instrument lineups; h. Breaker operations under non-emergency conditions;

66	K/A Importance: 4.0			**Points: 1.00**
R66	Difficulty: 2.00	Level of Knowledge: Fund	Source: MODIFIED	103307

Which of the following is addressed in Technical Specification Section 2.0, Safety Limits, but is NOT addressed in Section 3.0, LCOs?

A. Steam Dome Pressure.

B. Linear Heat Generation Rate (LHGR).

C. Minimum Critical Power Ratio (MCPR).

D. Power limit for low steam dome pressure or core flow.

Answer: D

Answer Explanation:

Original Source: R69 of the 2020 NRC Exam.

Question was modified by changing stem. The original version asked which options was addressed in BOTH TS Section 2.0, Safety Limits AND 3.0, LCOs. The previous version correct answer was Reactor Steam Dome Pressure.

Of the items listed, only the limit of Thermal Power shall be </= 25%, with reactor steam dome pressure <686 psig or core flow <10%, is addressed in Technical Specifications section 2.0, Safety Limits (2.1.1 Reactor Core Safety Limits) and NOT in Section 3.0 LCOs.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. Steam Dome Pressure is plausible because it is addressed in TS Safety Limit 2.1.2. However, since it is also addressed in LCO 3.4.11, it is an incorrect response to this question. This was the correct response on the original version of this question.
B. LHGR is plausible because it is an LCO, 3.2.3, and it relates to the Safety Limit for Minimum Critical Power Ratio (2.1.1.2) in that they are both concerned with maintaining the integrity of the Fuel Clad Barrier. This distractor is incorrect because LHGR is not a Safety Limit.
C. MCPR is plausible because it is addressed in TS Safety Limit 2.1.1.2. However, since it is also addressed in LCO 3.2.2, it is an incorrect response to this question.

Reference Information:

Technical Specifications Section 2.0, Safety Limits AND 3.0, LCOs.

10CFR55 RO/SRO Written Exam Content

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

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference
Fundamental (Low) Cognitive Level
Modified
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

G2.2.22 Knowledge of limiting conditions for operation and safety limits (CFR: 41.5 / 43.2 / 45.2)

Associated objective(s):

Core and Fuel

Cognitive Terminal

Given the system operating conditions/parameters, in accordance with approved plant procedures: Describe the Core and Fuel technical specification limiting conditions for operation, their bases, the associated surveillance requirement(s), and their relationship to operability.

67	K/A Importance: 3.9			Points: 1.00
R67	Difficulty: 3.00	Level of Knowledge: Fund	Source: BANK (#74 ON NINE MILE POINT EXAM).	103787

The plant is operating at 50% power when a Pressure Regulator malfunction results in Reactor pressure slowly rising from 1010 psig to 1050 psig.

Which one of the following correctly describes both of these statements?

(1) The maximum Reactor Pressure permitted by Technical Specifications.

(2) The required completion time for restoring Reactor pressure, in accordance with Technical Specifications.

A. (1) 1020 psig
(2) 15 minutes

B. (1) 1020 psig
(2) 1 hour

C. (1) 1045 psig
(2) 15 minutes

D. (1) 1045 psig
(2) 1 hour

Answer: C

Answer Explanation:

The BANK source for this question is the NRC Website (ADAMS). This was Question #74 on Nine Mile Point NRC Exam posted to the NRC website on 8.20.2020. The question was modified slightly to make it applicable to Fermi 2, but not enough to call the question NEW or MODIFIED.

Per Technical Specification LCO 3.4.11:

The maximum allowed reactor pressure is 1045 psig.
Condition A allows 15 minutes to restore pressure below this value

Distractor Explanation:
Distractors are incorrect and plausible because:

A. Plausible - Maximum pressure is 1045 psig. 1020 psig is plausible because it is the maximum normal pressure at 100% power and close to 1045 psig.
B. Plausible - Maximum pressure is 1045 psig. 1020 psig is plausible because it is the maximum normal pressure at 100% power and close to 1045 psig. 15 minutes is the required time. 1 hour is plausible because many Technical Specification completion times are 1 hour and it is the maximum an RO would be tested on.
D. Plausible - 1 hour is plausible because many Technical Specification completion times are 1
hour and it is the maximum an RO would be tested on.

Reference Information:
Technical Specification LCO 3.4.11

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

Fermi 2 NRC Exam Usage
ILT 2023 Exam

NRC Question Use (ILT 2023)
Bank
Closed Reference
Fundamental (Low) Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
G2.2.39 Knowledge of less than or equal to 1 hour technical specification action statements (This K/A does not include action statements of 1 hour or less that follow the expiration of a completion time for a technical specification condition for which an action statement has already been entered.) (CFR: 41.7 / 41.10 / 43.2 / 45.13)

Associated objective(s):
Nuclear Boiler System
Cognitive Terminal
Given the system operating conditions/parameters, in accordance with approved plant procedures: Identify Nuclear Boiler system related technical specifications, with emphasis on action statements requiring prompt actions (for example, one hour or less).

68	K/A Importance: 3.2			**Points: 1.00**
R68	Difficulty: 3.00	Level of Knowledge: Fund	Source: BANK	103088

You are a licensed operator on shift.

You are preparing to brief an operator who is assigned to inspect equipment located in a HIGH RADIATION AREA, while performing rounds, per 27.000.05, Operator Rounds.

The NO will be signed onto Radiation Work Permit RWP 23-1001 Task 2, Work in RCA/Radiation Area.

In accordance with plant administrative procedures, how will you direct the NO to perform the inspection?

A. Perform a visual inspection at the barrier to the area.

B. Obtain Radiation Protection verbal approval, then enter the area.

C. Obtain a hand-held radiation monitoring device, then enter the area.

D. Enter the area after the entry is preplanned and maintain dose ALARA.

Answer: A

Answer Explanation:
IAW 27.000.05, Operator Rounds, section 5.7:

5.7 Normal Operator Rounds method for inspecting high radiation and high contamination areas is by visual inspection at the barrier to the area. Look and listen for unusual noises, steam, or leakage.

Distractor Explanation:
B. Plausible because this would be necessary if it is required to enter the inspection area. Incorrect because entry is not allowed for day to day inspections.
C. Plausible because this practice would allow the operator to be aware of dose as he approaches hot spots within the area. Incorrect because entry is not allowed for day to day inspections.
D. Plausible because this would be necessary if it is required to enter the inspection area. Incorrect because entry is not allowed for day to day inspections.

Reference Information:
27.000.05

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(12) Radiological safety principles and procedures.

Fermi 2 NRC Exam Usage
ILO 2012 Exam
ILO 2019 Retake Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)
Bank
Closed Reference
Fundamental (Low) Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
G2.3.12 Knowledge of radiological safety principles and 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, or alignment of filters (CFR: 41.12 / 43.4 / 45.9 / 45.10)

Associated objective(s):
Admin Procedures Exercise
Cognitive Terminal
Given a condition or scenario, Describe the requirements that must be followed while accessing High Radiation, Locked High Radiation, or a Very High Radiation Areas at Fermi 2, in accordance with the approved Fermi 2 Conduct Manuals.

69	K/A Importance: 4.5			**Points: 1.00**
R69	Difficulty: 2.00	Level of Knowledge: High	Source: BANK	103087

The plant is operating at 10% power. A plant transient occurs. Which of the following indications, if indicative of an actual abnormal system operating parameter, would ALWAYS indicate an Emergency Operating Procedure (EOP) entry condition?

A. 3D168 REACTOR PRESSURE HIGH

B. 1D42 REAC VESSEL / PRESS RECORDER HI SPD MODE

C. Division 1 and Division 2 EECW White Emergency Mode lights ON

D. 3D73 TRIP ACTUATORS A1/A2 TRIPPED AND 3D74 TRIP ACUATORS B1/B2 TRIPPED

Answer: B

Answer Explanation:

Per ARP 1D42:

Both setpoints for this Alarm are EOP entry conditions. 173.4" and 1093#.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. Is incorrect and plausible because reactor pressure high is EOP, however this alarm is 1045# (1093# is the EOP).
C. Is incorrect and plausible because EECW does activate on high drywell pressure an EOP entry, however it also activates on low RBCCW pressure, which is not an EOP entry condition.
D. Is incorrect and plausible because at 100% this would cause an EOP entry condition on L3. However it does not at 10% power.

Reference Information:

ARP 1D42 setpoints

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.

Fermi 2 NRC Exam Usage

ILO 2017 Exam
ILT 2023 Exam

NRC Question Use (ILT 2023)

Bank
Closed Reference
High Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

G2.4.4 Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures (CFR: 41.10 / 43.2 / 45.6)

Associated objective(s):

Introduction to Emergency Operating Procedures

Cognitive Terminal

Given a set of plant parameters that meet the entry conditions, State the basis for concurrent entry into each of the parameter control sections of an Emergency Operating Procedure., in accordance with Fermi 2 Emergency Operating Procedures

70	K/A Importance: 3.1			**Points: 1.00**
R70	Difficulty: 3.00	Level of Knowledge: Fund	Source: NEW	104007

Which of the following sets of characteristics would cause a fission neutron in the Fermi 2 reactor to be defined as a PROMPT neutron?

A. Born 1.0 x 10^{-16} seconds after a fission event.
Accounts for more than 99% of all U-235 fission neutrons.

B. Born at a lower average kinetic energy than most other fission neutrons.
Born 1.0 x 10^{-6} seconds after a fission event.

C. More likely to leak out of the core while slowing down.
More likely to cause thermal fission of a U-235 nucleus.

D. Produced from the radioactive decay of a fission fragment.
Require a greater number of collisions to become a thermal neutron.

Answer: A

Answer Explanation:

Per BR01Sr4_Neutrons, Neutrons Student Text:

Neutrons emitted within 10^{-14} seconds of the fission event that are a direct result of the fission process are defined as *prompt neutrons*. The number of prompt neutrons emitted depends on the type of fuel used. For example, prompt neutrons account for 99.36% of all U-235 fission neutrons.

Therefore, the examinee must determine that, since the neutron in the correct response was born 10^{-16} seconds of the fission event, it was born within 10^{-14} seconds, making it prompt. And, since the neutron accounts for more than 99% of U-235 fission neutrons, it is still prompt.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. Plausible because these are characteristics of neutrons born from fission in the Fermi 2 nuclear reactor. However, these specific characteristics both describe a delayed neutron. Delayed neutrons are born with only .5 MeV of kinetic energy whereas prompt neutrons are born with an average energy of approximately 2MeV. Also, since the neutron was born 1.0×10^{-6} seconds after a fission event, that is not within 10^{-14} seconds.

C. Plausible because these are characteristics of neutrons born from fission in the Fermi 2 nuclear reactor. Since prompt neutrons are born at a higher kinetic energy, they are more likely to leak out of the core while slowing down, so that characteristic is correct for a prompt neutron. However, it is delayed neutrons that are MORE LIKELY to cause thermal fission in U-235 because they are less likely to leak out while slowing down, and not prompt neutrons so that characteristic is incorrect.

D. Plausible because these are characteristics of neutrons born from fission in the Fermi 2 nuclear reactor. However, delayed neutrons are produced from the decay of the first excited daughter of a fission fragment generated during the fission process, not prompt neutrons. The second part is a characteristic of a prompt neutron since they are born at a higher kinetic energy, they require a great number of collisions to become a thermal neutron.

Reference Information:

BR01Sr4_Neutrons, Neutrons Student Text

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.

Fermi 2 NRC Exam Usage

ILT 2023 Exam

NRC Question Use (ILT 2023)

Closed Reference

Fundamental (Low) Cognitive Level

New

RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

292001 Neutrons (CFR: 41.1)

292001.K1.02 Define prompt and delayed neutrons

Associated objective(s):
Neutrons
Cognitive Enabler
K1.02 Define prompt and delayed neutrons

71	K/A Importance: 2.8			**Points: 1.00**
R71	Difficulty: 2.00	Level of Knowledge: Fund	Source: NEW	103107

Which of the responses below accurately completes the following statements regarding fission product poisons present in the Fermi 2 reactor core?

__(1)__ is a poison present in the Fermi 2 core that is produced, in significant concentrations, as a byproduct of the fission process.

It is significant because it can __(2)__, which may result in unusually high Control Rod Notch Worths.

A. (1) Xenon

(2) depress power production in some core locations and cause peaking in others.

B. (1) Gadolinium

(2) depress power production in some core locations and cause peaking in others.

C. (1) Xenon

(2) shield some of the reactor fuel from thermal neutron flux until later in a fuel cycle.

D. (1) Gadolinium

(2) shield some of the reactor fuel from thermal neutron flux until later in a fuel cycle.

Answer: A

Answer Explanation:

Per BR06Sr4:

(1) Xenon is the major fission product poison of concern in operating power reactors. Depending on operational power level, Xenon concentration may have a significant impact on operation.

Part (2) depress the power production in some core locations and cause peaking in others is correct because fission product poisons, like Xenon, are fission products or daughters that have substantial neutron absorption cross section and do not fission (neutron capture). Because they absorb neutrons, they can remove neutrons from the neutron life cycle and reduce power in some core locations. Because the core is design to produce a constant power, the reduction in power in one portion of the core results in the increase of power in the other sections of the core. This is operationally significant because, as stated in GOP 22.000.02, Plant Startup to 25% Power, P&L 3.2.1 "Startup following a scram from previous high power operation may result in unusually high Control Rod Notch Worths due to Xenon concentrations."

Distractor Explanation:

Distractors are incorrect and plausible because:

B. (1) is plausible because Gadolinium is a poison present in the reactor core and is loaded as a burnable poison. It is incorrect because it is not produced, in significant concentrations, as a byproduct of the fission process, therefore it does not meet the definition of a fission product poison.
   (2) is correct.
C. (1) is correct.
   (2) is plausible since burnable poisons are installed in the core and are thermal neutron absorbers that effectively “shield” the fuel from thermal neutrons by absorbing the thermal neutrons because the burnable poisons have a higher cross section for absorbing thermal neutrons than the uranium fuel. Over the life of the core the burnable poisons absorb the thermal neutrons and become an isotope with no significant cross section for absorbing thermal neutrons allowing the fuel to be available for fissioning later in core life when the burnable poisons have been depleted. This is incorrect because it describes why burnable poisons are loaded into the core and not the impact of Xenon buildup that would cause higher notch worths.
D. (1) is plausible because Gadolinium is a poison present in the reactor core and is loaded as a burnable poison. It is incorrect because it is not produced, in significant concentrations, as a byproduct of the fission process, therefore it does not meet the definition of a fission product poison.
   (2) is plausible for same reason as option C.(2).

Reference Information:

BR06Sr4, BWR Generic Fundamentals - Fission Product Poisons
22.000.02, Plant Startup to 25% Power GOP, P&L 3.2.1.

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.

Fermi 2 NRC Exam Usage

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Fundamental (Low) Cognitive Level

New

RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

292006 Fission Product Poisons (CFR: 41.1)

292006.K1.01 Define fission product poison

Associated objective(s):

Fission Product Poisons

Cognitive Enabler

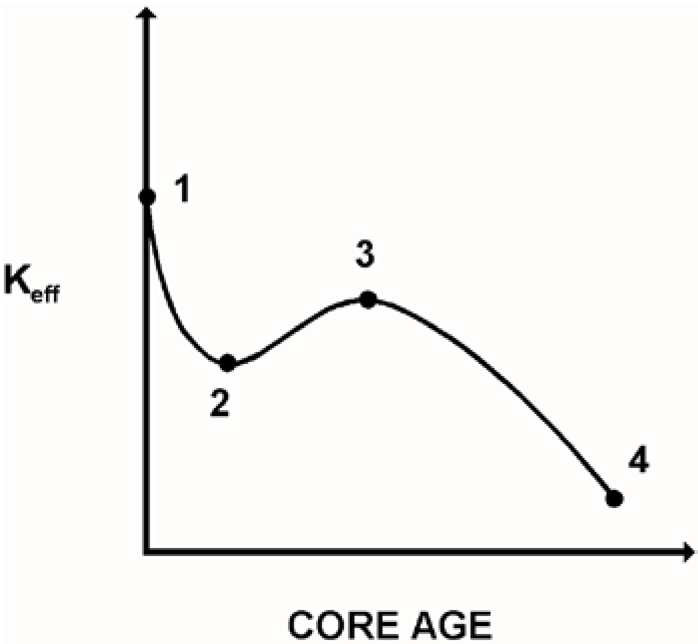
K1.01 Define fission product poison

72	K/A Importance: 2.7			Points: 1.00
R72	Difficulty: 2.00	Level of Knowledge: High	Source: BANK	103108

Reactor Engineering is conducting training and provides the information below to a group of licensed operators at Fermi 2:

The Fermi 2 reactor has been operating at 100 percent power for several weeks and is currently operating between points 2 and 3 on the curve below.

Assuming reactor recirculation flow rate remains the same, what control rod operation(s) will be needed to maintain 100 percent power until point 3 is reached?



A. Insertion for the entire period.

B. Withdrawal for the entire period.

C. Insertion at first, then withdrawal.

D. Withdrawal at first, then insertion.

Answer: A

Answer Explanation:

Per BR07Ir4_Fuel_Depletion May 2011:

Between point 2 and 3, excess reactivity is rising steadily due to burnout of burnable poisons, which requires operator action to maintain power at 100%. Since recirc flow remains constant, the operator must insert rods over the entire period to combat the addition of excess reactivity.

Distractor Explanation:

Distractors are incorrect and plausible because:

B. Withdrawal for the entire period is incorrect because rod withdrawal would add positive reactivity, which would be in addition to the positive reactivity being added by the burnout of burnable poisons between points 2 and 3 on the curve.
C. Insertion at first, then withdrawal is incorrect because this implies the excess reactivity is increasing to some high point, and then decreasing. The region of the operating curve between points 2 and 3 indicates a constantly increasing, positive reactivity trend. This would require control rod withdrawal for the entire period.
D. Withdrawal at first, then insertion is incorrect because it implies the excess reactivity is decreasing to some low point, and then increasing. The region of the operating curve between points 2 and 3 indicates a constantly increasing, positive reactivity trend. This would require control rod withdrawal for the entire period.

Reference Information:

BR07Ir4_Fuel_Depletion May 2011

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.

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NRC Question Use (ILT 2023)

Bank
Closed Reference
High Cognitive Level
Reference Provided
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

292007 Fuel Depletion and Burnable Poisons (CFR: 41.1)
292007.K1.03 Given a curve of K-effective versus core age, state the reasons for maximum, minimum, and inflection points

Associated objective(s):

Fuel Depletion and Burnable Poisons
Cognitive Enabler
K1.03 Given a curve of K-effective versus core age, state the reasons for maximum, minimum, and inflection point

73	K/A Importance: 3.2			**Points: 1.00**
R73	Difficulty: 3.00	Level of Knowledge: High	Source: BANK	104027

Which one of the following describes the relationship between the feedwater mass flow rate entering the Fermi 2 reactor vessel and the core mass flow rate at steady-state 100% reactor power?

A. The mass flow rates are about the same as long as the reactor vessel downcomer level is constant.

B. The mass flow rates are about the same as long as the reactor recirculation mass flow rate is constant.

C. The feedwater mass flow rate is much larger than the core mass flow rate because the feedwater pump differential pressure is much larger than the core differential pressure.

D. The feedwater mass flow rate is much smaller than the core mass flow rate because most of the core mass flow is returned to the reactor vessel downcomer by the steam separators.

Answer: D

Answer Explanation:

Per BT08Sr4:

In addition to the feedwater entering core, the reactor recirculation takes a suction on the downcomer region. Reactor recirculation driving head is about 1/3 of the core flow rate, 2/3 of the core flow rate is the driven fluid from the downcomer region.
The feedwater mass flow rate is much smaller than the core mass flow rate because most of the core mass flow is returned to the reactor vessel downcomer by the steam separators

Typical Values for Fermi 2 core and feedwater flows:
Feedwater: 14 million lbm/hr and Core Flow 100 million lbm/hr or about 1/6 feedwater to total core flow.
Recirc driving flow: 17 million lbm/hr per loop time two loops 34 million lbm/hr 1/3 core flow
Driven flow: 2/3 core flow 68 million lbm/hr
Driving flow plus Driven flow equals 102 million lbm/hr

Distractor Explanation:
Distractors are incorrect and plausible because:

A. The mass flow rates are about the same (FALSE) as long as the reactor vessel downcomer level is constant. (FALSE)
   Incorrect – feedwater flow rate is SMALLER than core flow rate under all conditions.
B. The mass flow rates are about the same (FALSE) as long as the reactor recirculation mass flow rate is constant. (FALSE)
   Incorrect – feedwater flow rate is SMALLER than core flow rate under all conditions.
C. The feedwater mass flow rate is much larger (FALSE) than the core mass flow rate because the feedwater pump differential pressure is much larger than the core differential pressure. (FALSE)
   Incorrect – feedwater flow rate is SMALLER than core flow rate under all conditions.

Reference Information:
BT08Sr4 BWR Generic Fundamentals - Thermal Hydraulics

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(14) Principals of heat transfer, thermodynamics and fluid mechanics.

Fermi 2 NRC Exam Usage
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NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
293008 Thermal-Hydraulics (CFR: 41.14)
293008.K1.25 (RECIRCULATION SYSTEM) Explain the reason for forced core recirculation

Associated objective(s):
Thermal Hydraulics
    Organizer
    Recirculation System

Recirculation System
    Cognitive Enabler
    K1.25 Explain the reason for forced core recirculation

74	K/A Importance: 2.8			**Points: 1.00**
R74	Difficulty: 2.00	Level of Knowledge: Fund	Source: BANK	103887

What is the primary purpose of the gap between a fuel pellet and the surrounding cladding in a fuel rod located within the Fermi 2 core?

A. To allow insertion of fuel pellets into the fuel rods.

B. To provide room for the buildup of a passive oxide layer.

C. To maintain the design fuel thermal conductivity throughout the fuel cycle.

D. To accommodate different expansion rates of the fuel pellets and the cladding.

Answer: D

Answer Explanation:

Per BT09Sr4: The primary purpose for the gap between the UO2 fuel pellet and the Zircaloy cladding is to accommodate differential expansion of fuel pellet and cladding. This prevents excessive diametrical cladding strain.

Distractor Explanation:
Distractors are incorrect and plausible because:
A. To allow insertion of fuel pellets into the fuel rods.
Incorrect – although a gap around the pellet will allow easier insertion of the pellets into the fuel rod, this is NOT the primary purpose of the gap.
B. To provide room for the buildup of a passive oxide layer.
Incorrect – normal reactor operation causes increasing concentrations of fission products, such as iodine (I) and cadmium (Cd). The presence of I and Cd may induce corrosion cracking, so the examinee could determine that the gap between the fuel pellet and the cladding allows for buildup of a passive oxide layer that would prevent such corrosion. However, this is not the purpose of the gap.
C. To maintain the design fuel thermal conductivity throughout the fuel cycle.
Incorrect – although a gap around the pellet does help maintain the design fuel thermal conductivity throughout the fuel cycle, this is NOT the primary purpose of the gap. Initially the gap is filled with high purity helium, which has a high thermal conductivity. After initial neutron exposure the ceramic uranium oxide pellet will undergo densification, which makes the gap larger, reducing heat transfer capabilities. After additional core exposure and fission, fission product gases build up in the pellet and migrate out of the pellet and begin to concentrate in the gap. Fission product gases have a low thermal conductivity, this tends to reduce the heat transfer capabilities. The fission product gases also to cause the pellet to swell. The pellet swelling reduces the gap between the pellet and the cladding and helps increases the heat transfer capabilities, overcoming the negative effect of the buildup in fission product gases in the gap.

Reference Information:
BT09Sr4 BWR Generic Fundamentals - Core Thermal Limits

10CFR55 RO/SRO Written Exam Content
10 CFR 55.41(b)(14) Principals of heat transfer, thermodynamics and fluid mechanics.

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NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog
293009 Core Thermal Limits (CFR: 41.14)
293009.K1.33 (PELLET-CLAD INTERACTION) Describe the purpose of the pellet to clad gap

Associated objective(s):
Pellet Clad Interaction
Cognitive Enabler
K1.33 Describe the purpose of the pellet to clad gap

75	K/A Importance: 2.8			**Points: 1.00**
R75	Difficulty: 2.00	Level of Knowledge: Fund	Source: BANK	103908

After several years of operation, why is the maximum allowable stress to the Fermi 2 reactor vessel more limited by the inner wall than the outer wall?

A. The inner wall has a smaller surface area than the outer wall.

B. The inner wall experiences more tensile stress than the outer wall.

C. There is a temperature gradient across the reactor pressure vessel wall.

D. The inner wall experiences more neutron-induced embrittlement than the outer wall.

Answer: D

Answer Explanation:

Per BT10Sr4:

The reactor vessel inner wall will receive a higher neutron flux than the outer wall. This will cause a higher amount of embrittlement on the inner vessel wall. The effect of this fast neutron radiation is more stress on the inner wall as compared to the outer wall, which will limit the maximum allowable stress to the reactor vessel over time.

Distractor Explanation:

Distractors are incorrect and plausible because:

A. Incorrect - although this statement is true, it is true for all times in core life and will not cause more stress after several years of operation.
B. Incorrect - although this statement is true, it is true for all times in core life and will not cause more stress after several years of operation.
C. Incorrect - although this statement is true, it is true for all times in core operational life and will not cause more stress after several years of operation.

Reference Information:

BT10Sr4 BWR Generic Fundamentals - Brittle Fracture and Vessel Thermal Stress

10CFR55 RO/SRO Written Exam Content

10 CFR 55.41(b)(14) Principals of heat transfer, thermodynamics and fluid mechanics.

Fermi 2 NRC Exam Usage

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Bank
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Fundamental (Low) Cognitive Level
RO

NUREG-1123-Rev 3 Boiling Water Reactors Knowledge and Abilities Catalog

293010 Brittle Fracture and Vessel Thermal Stress (CFR: 41.14)
293010.K1.05 State the effect of fast neutron irradiation on reactor vessel metals

Associated objective(s):

Brittle Fracture and Vessel Thermal Stress
Cognitive Enabler
K1.05 State the effect of fast neutron irradiation on reactor vessel metals