

**U. S. Nuclear Regulatory Commission
Site-Specific RO Written Examination**

Applicant Information

Name:

Date: 12/13/2016

Facility / Unit: Brunswick Unit 1/2

Region: I II III IV

Reactor Type: W CE BW GE

Start Time:

Finish Time:

Instructions

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

Applicant Certification

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

Applicant's Signature

Results

Examination Value _____ Points

Applicant's Score _____ Points

Applicant's Grade _____ Percent

1. Unit Two is operating at rated power when a control rod begins to drift out from position 24.

Which one of the following identifies the **first** action to be taken by the operator at the controls (OATC)?

- A. Initiate a single rod scram.
- B. Initiate a manual reactor scram.
- C. Select and attempt to arrest the control rod.
- D. Select and fully insert the control rod to position 00.

2. Unit One is in an outage with the condensate system under clearance.
An earthquake results in damage to the CST causing level to slowly lower.

Which one of the following completes the statement below with regards to the effect on the CRD system?

The CRD system will (1) when the CST level reaches approximately (2).

- A. (1) trip
(2) 3 feet
- B. (1) trip
(2) 11 feet
- C. (1) transfer to the backup supply
(2) 3 feet
- D. (1) transfer to the backup supply
(2) 11 feet



3. Unit One is at rated power.

Which one of the following identifies the impact of inadvertently closing the 1A Reactor Recirculation Pump 1-B32-F031A, Pump A Disch Vlv?

The 1A Reactor Recirculation pump speed will lower to approximately:

- A. 20%
- B. 34%
- C. 45.4%
- D. 48%

4. A line break has occurred in the Unit Two drywell with the following sequence of events:

1155	Drywell pressure rises above 1.7 psig
1202	RPV pressure drops below 410 psig
1203	RPV level drops to LL3

Which one of the following completes the statement below?

The **earliest** time that the operator can throttle the 2-E11-F048A, Loop 2A RHR Heat Exchanger Bypass Valve is at:

- A. 1205.
- B. 1206.
- C. 1207.
- D. 1208.



5. RHR Loop 2A is operating in the Shutdown Cooling mode of operation with the following parameters:

RHRSW Pump 2A	Operating
RHRSW Flow	4000 gpm
RHR Pump 2A	Operating
RHR Loop A Flow	6000 gpm

Which one of the following completes the statement below?

The required operator action to **lower** the cooldown rate IAW 2OP-17, *Residual Heat Removal System Operating Procedure*, is to throttle **closed**:

- A. 2-E11-F003A, HX 2A Outlet Vlv.
- B. 2-E11-F017A, Outboard Injection Vlv.
- C. 2-E11-F048A, HX 2A Bypass Vlv.
- D. 2-E11-PDV-F068A, HX 2A SW Disch Vlv.

6. A Group 1 isolation has occurred on Unit One.
HPCI has been placed in the pressure control mode of operation IAW 1OP-19, *High Pressure Coolant Injection System Operating Procedure*.
HPCI flow controller, E41-FIC-R600, is in manual with the output at midscale.

Which one of the following completes the statement below?

If the 1-E41-F008, Bypass To CST Valve, is throttled (1) too far, this may result in HPCI (2).

- A. (1) open
(2) tripping on overspeed
- B. (1) open
(2) operation below 2100 rpm
- C. (1) closed
(2) tripping on overspeed
- D. (1) closed
(2) operation below 2100 rpm



7. Unit Two is operating at rated power.

Due to a circuit malfunction an inadvertent LOCA initiation occurs in the Div II Core Spray logic causing A-03 (2-6), *CORE SPRAY SYSTEM II ACTUATED*, to alarm.

Which one of the following completes both statements below?

Core Spray Pump(s) (1) will start.

(2) will start.

- A. (1) 2B ONLY
(2) All DGs
- B. (1) 2B ONLY
(2) DG2 and DG4 ONLY
- C. (1) 2A and 2B
(2) All DGs
- D. (1) 2A and 2B
(2) DG2 and DG4 ONLY

8. Which one of the following completes the statement below concerning Core Spray Line Break Detection differential pressure instrument?

The (1) leg of this DP instrument senses (2) core plate pressure via the SLC/Core Differential Pressure penetration.

- A. (1) variable
(2) below
- B. (1) variable
(2) above
- C. (1) reference
(2) below
- D. (1) reference
(2) above



9. Which one of the following completes both statements below?

The normal power supply to RPS MG Set 2B is from 480V MCC (1).

The **normal** alternate power supply to RPS B is from 480V Bus (2).

A. (1) 2CA
(2) E7

B. (1) 2CA
(2) E8

C. (1) 2CB
(2) E7

D. (1) 2CB
(2) E8



10. Which one of the following identifies the LPRM detector level that provides input to the Rod Block Monitor system for indication ONLY, and is NOT used for the purpose of generating rod blocks?

- A. Level A
- B. Level B
- C. Level C
- D. Level D



11. Unit One is performing a startup with the reactor just declared critical. While ranging IRM G from range 1, the IRM will not change ranges and remains on Range 1.

Which one of the following completes both statements below?

When IRM G indication **first** exceeds (1) on the 125 scale, annunciator A-05, 2-4, *IRM UPSCALE*, will alarm.

The action required IAW A-05, 2-4, *IRM UPSCALE*, is to (2) .

- A. (1) 70
(2) place the joystick on P603 for the IRM G to Bypass
- B. (1) 70
(2) withdraw the IRM G detector to maintain reading on scale
- C. (1) 117
(2) place the joystick on P603 for the IRM G to Bypass
- D. (1) 117
(2) withdraw the IRM G detector to maintain reading on scale



12. Which one of the following identifies the criteria for when SRM detectors can **first** begin to be withdrawn from the core IAW OGP-02, *Approach To Criticality And Pressurization Of The Reactor*?
- A. When all IRMs are above range 3.
 - B. When SRM counts reach 2×10^5 counts.
 - C. When RTRCT PERMIT light is illuminated.
 - D. When SRM/IRM overlap has been established.

13. Which one of the following identifies the power supply to the APRM channel NUMACs?

- A. All APRM channels receive 120 VAC power from UPS
- B. All APRM channels receive 120 VAC power from both RPS Bus A and RPS Bus B
- C. APRM Channels 1 & 3 receive power from ONLY 120 VAC RPS Bus A
APRM Channels 2 & 4 receive power from ONLY 120 VAC RPS Bus B
- D. APRM Channels 1 & 3 receive power from Division I 24/48 VDC
APRM Channels 2 & 4 receive power from Division II 24/48 VDC

14. Which one of the following completes the statement below?

An APRM must have at least (1) of the assigned LPRMs operable with at least (2) LPRM inputs per axial level operable.

- A. (1) 18
(2) 2
- B. (1) 18
(2) 3
- C. (1) 17
(2) 2
- D. (1) 17
(2) 3

15. Following a loss of feedwater, RCIC automatically initiated and subsequently tripped on low suction pressure.

Current plant status is:

Reactor water level is 150 inches
RCIC flow controller in Manual set at 200 gpm

Subsequently, the following actions are taken:

RCIC suction transferred to Torus
E51-V8, Turbine Trip and Throttle Valve is closed
E51-V8 is re-opened
PF push button on the RCIC flow controller is depressed

Which one of the following identifies the indicated flow on the RCIC flow controller that would be observed for these conditions?

- A. 0 gpm
- B. 200 gpm
- C. 400 gpm
- D. 500 gpm



16. Which one of the following completes both statements below concerning the Automatic Depressurization System (ADS) reactor water level inputs from the Nuclear Boiler System?

The (1) instruments provide LL3 inputs to ADS initiation logic.

The (2) range instruments provide LL1 inputs to ADS logic.

- A. (1) Fuel Zone
 (2) Narrow
- B. (1) Fuel Zone
 (2) Shutdown
- C. (1) Wide range
 (2) Narrow
- D. (1) Wide range
 (2) Shutdown



17. Unit One is operating at power with Core Spray Pump 1B under clearance.
A small break LOCA occurs simultaneously with a Loss of Off-site Power to both units.

DG1 and DG4 fail to start and tie onto their respective E bus.

The following plant conditions exist on Unit One:

A-03 (5-1) <i>Auto Depress Timers Initiated</i>	In alarm
A-03 (6-9) <i>Reactor Low Wtr Level Initiation</i>	In alarm
RPV pressure	600 psig
Drywell pressure	13 psig

Which one of the following completes both statements below?

ADS (1) auto initiate.

After ADS is initiated (either automatically or manually), RPV water level (2) be restored with **BOTH** RHR Loops.

- A. (1) will
(2) will
- B. (1) will
(2) will NOT
- C. (1) will NOT
(2) will
- D. (1) will NOT
(2) will NOT

18. Which one of the following completes the statement below concerning the Fuel Zone instruments, N036 and N037, during a loss of drywell cooling?

The reference leg density will (1) causing the indicated level to read (2) than actual level.

- A. (1) rise
(2) higher
- B. (1) rise
(2) lower
- C. (1) lower
(2) higher
- D. (1) lower
(2) lower

19. Unit One is at 75% power.
The 1A RPS MG set trips.
No operator actions have been taken.

Which one of the following identifies the Main Steam Line Isolation Valve (MSIV) logic lamp status on P601 panel?

- | | <u>Inboard MSIV Logic</u> | | <u>Outboard MSIV Logic</u> | |
|----|---------------------------|----|----------------------------|----|
| | DC | AC | DC | AC |
| A. | | | | |
| B. | | | | |
| C. | | | | |
| D. | | | | |

20. Which one of the following identifies the effect if both Refuel Bridge hoist grapple hooks are not open five seconds **after** placing the Engage/Release switch to Release?
- A. Fuel Hoist Interlock is generated.
 - B. Engage amber light extinguishes.
 - C. Fault lockout is generated.
 - D. Grapple hooks will reclose.



21. Which one of the following identifies the SRV component that will prevent siphoning of water into the SRV discharge piping?
- A. Vacuum breaker
 - B. Check Valve
 - C. T-Quencher
 - D. Sparger



22. Which one of the following identifies the criteria for tripping the main turbine IAW the Unit Two Scram Immediate Actions of OEOP-01-UG, *Users Guide*?
- A. When APRM's indicate downscale trip.
 - B. When steam flow is less than 3 Mlbs/hr.
 - C. When reactor water level is 160 inches and rising.
 - D. When reactor mode switch is placed in SHUTDOWN.



23. Which one of the following completes both statements below concerning the Main Generator Voltage Regulator?

The automatic voltage regulator maintains a constant generator (1) voltage.

While in the automatic voltage regulation mode, the manual voltage regulator setting (2) automatically follow the automatic setpoint.

- A. (1) field
(2) does
- B. (1) field
(2) does NOT
- C. (1) terminal
(2) does
- D. (1) terminal
(2) does NOT

24. Unit One Reactor Feed Pump 1B is operating in automatic DFCS control at 4500 RPM. The DFCS control signal to Reactor Feed Pump 1B woodward governor **immediately** fails downscale.

Which one of the following completes the statement below?

Reactor Feed Pump 1B speed will:

- A. lower to 0 rpm.
- B. lower to 1000 rpm.
- C. lower to 2450 rpm.
- D. remain at 4500 rpm.

25. Which one of the following completes both statements below concerning the reactor feed pump turbine (RFPT) DFCS controls?

During a RFPT startup, transfer to DFCS control is performed when RFPT speed is approximately (1).

DFCS will automatically control the speed of the RFPT up to (2).

- A. (1) 1000 rpm
(2) 5450 rpm
- B. (1) 1000 rpm
(2) 6150 rpm
- C. (1) 2550 rpm
(2) 5450 rpm
- D. (1) 2550 rpm
(2) 6150 rpm



26. Unit One primary containment venting is being performed IAW 1OP-10, *Standby Gas Treatment System Operating System*, with the following plant status:

1-VA-1F-BFV-RB, SBTG DW Suct Damper	Open
1-VA-1D-BFV-RB, Reactor Building SBTG Train 1A Inlet Valve	Closed
1-VA-1H-BFV-RB, Reactor Building SBTG Train 1B Inlet Valve	Closed

Which one of the following completes both statements below concerning the predicted SBTG response if drywell pressure rises to 1.9 psig?

1-VA-1F-BFV-RB (1).

Both 1-VA-1D-BFV-RB and 1-VA-1H-BFV-RB (2).

- A. (1) auto closes
(2) auto open
- B. (1) auto closes
(2) remain closed
- C. (1) remains open
(2) auto open
- D. (1) remains open
(2) remain closed

27. Unit One is operating at rated power.
Unit Two is in MODE 5 performing fuel movements.

Which one of the following completes both statements below IAW
Unit One Tech Spec 3.8.1, AC Sources - Operating, LCO statement?

The Unit Two SAT (1) required to be OPERABLE.

(2) Diesel Generators are required to be OPERABLE.

- A. (1) is
(2) Two
- B. (1) is
(2) Four
- C. (1) is NOT
(2) Two
- D. (1) is NOT
(2) Four

28. Unit One is operating at rated power.

Subsequently, E1 breaker AU9, Feed to 480V Substation E5, trips.

Which one of the following completes the statement below?

120V UPS Distribution Panel 1A is:

- A. de-energized.
- B. energized from MCC 1CB.
- C. energized from the Standby UPS.
- D. energized from 250V DC SWBD A.



29. A reactor shutdown is in progress.
All IRMs on **range 1** reading between 15 and 20.
IRM B detector is failing downscale.

Which one of the following completes both statements below?

IAW A-05 (1-4) *IRM Downscale*, the alarm setpoint is (1) on the 125 scale.

When the IRM downscale alarm is received, a rod block (2) be generated.

- A. (1) 3
(2) will
- B. (1) 3
(2) will NOT
- C. (1) 6.5
(2) will
- D. (1) 6.5
(2) will NOT

30. Unit Two is operating at full power when a loss of DC Distribution Panel 4A occurs.

Which one of the following completes both statements below?

RCIC is (1) for injection from the RTGB.

RCIC (2) isolation logic has lost power.

- A. (1) available
(2) inboard
- B. (1) available
(2) outboard
- C. (1) unavailable
(2) inboard
- D. (1) unavailable
(2) outboard



31. Unit Two has lost off-site power.
DG3 started and tied to its respective E Bus.
Sequence of events:

1200 DG3 ties to E3
1205 DG3 lube oil temperature rises above 190°F
1206 DG3 lube oil pressure drops below 27 psig

Which one of the following identifies when DG3 will trip?

- A. Immediately at 1205.
- B. Immediately at 1206.
- C. 45 seconds after 1205.
- D. 45 seconds after 1206.



32. A Unit Two plant cooldown is being performed with the following plant conditions:

Reactor water level	175 inches, steady
Reactor pressure band	500 - 700 psig
Drywell ref leg temp	175°F

(REFERENCE PROVIDED)

Which one of the following completes both statements below?

The lowering of reactor pressure causes the N004A/B/C (Narrow Range) reactor water level instruments indicated level error to (1).

The reactor water level that would correspond to Low level 4 (LL4) is (2).

- A. (1) increase
(2) -60 inches
- B. (1) increase
(2) -65 inches
- C. (1) decrease
(2) -60 inches
- D. (1) decrease
(2) -65 inches



33. Unit Two is performing a startup IAW OGP-02, *Approach to Criticality and Pressurization of the Reactor*.

IAW OGP-02, which one of the following identifies the radiation monitor(s) that will require the alarm setpoints raised when HWC is placed in service?

- A. D12-RM-K603A,B,C,D, Main Steam Line Rad Monitors
- B. ARM Channel 2-9, U-2 Turbine Bldg Breezeway
- C. D12-RR-4599-1,2,3, Main Stack Rad Monitors
- D. ARM Channel 2-4, Cond Filter-Demin Aisle



34. Which one of the following identifies the power supply to 2D RHR Pump?

- A. E1
- B. E2
- C. E3
- D. E4



35. Unit One is operating at 70% power when the OATC observes indications for a failed jet pump. Subsequently, Recirc Pump 1A trips.

Which one of the following completes both statements below IAW 1AOP-04.0, *Low Core Flow*?

Performance of the jet pump operability surveillance for (1) Loop Operation is required.

If it is determined that a jet pump has failed, the required action is to (2).

- A. (1) Single
(2) reduce reactor power below 25% rated thermal power
- B. (1) Single
(2) commence unit shutdown IAW 0GP-05, Unit Shutdown
- C. (1) Two
(2) reduce reactor power below 25% rated thermal power
- D. (1) Two
(2) commence unit shutdown IAW 0GP-05, Unit Shutdown

36. Unit One is operating at rated power.

The load dispatcher reports degraded grid conditions with the following indications:

Generator frequency	59.7 hertz
230 KV Bus 1A voltage	205 KV
230 KV Bus 1B voltage	205 KV
E1 voltage	3690 volts
E2 voltage	3685 volts

Which one of the following completes both statements below?

The (1) may be damaged with continued operation under these conditions.

IAW 0AOP-22.0, *Grid Instability*, the E-Bus master/slave breakers (2) open.

- A. (1) main turbine blades
(2) will
- B. (1) main turbine blades
(2) will NOT
- C. (1) emergency bus loads
(2) will
- D. (1) emergency bus loads
(2) will NOT

37. Which one of the following completes both statements below?

IAW 0AOP-39.0, *Loss of DC Power*, before 125 VDC battery voltage reaches (1), remove loads as directed by the Unit CRS.

IAW 1EOP-01-SBO, *Station Blackout*, if either division battery chargers can NOT be restored within (2) then load strip the affected battery.

- A. (1) 105 volts
(2) 1 hour
- B. (1) 105 volts
(2) 2 hours
- C. (1) 129 volts
(2) 1 hour
- D. (1) 129 volts
(2) 2 hours

38. Which one of the following identifies the reason an operator is directed to trip the main turbine as an immediate action IAW 0AOP-32.0, Plant Shutdown From Outside Control Room?
- A. To initiate a scram on TSV/TCV closure.
 - B. To prevent reverse power starts of the Diesel Generators.
 - C. The turbine cannot be tripped once the Control Room is evacuated.
 - D. To bring bypass valves into operation until Remote Shutdown Panel control is established.



39. Unit One has entered RSP with the following conditions:

Six control rods are at position 02, all others are fully inserted
B Recirc Pump has tripped

Which one of the following completes both statements below?

The control rods will be inserted by (1) IAW OEOP-01-LEP-02, *Alternate Control Rod Insertion*.

After the control rods are inserted, a CRD flow rate of approximately (2) will be established.

- A. (1) placing the individual scram test switches to the Scram position
(2) 30 gpm
- B. (1) placing the individual scram test switches to the Scram position
(2) 45 gpm
- C. (1) driving rods using RMCS
(2) 30 gpm
- D. (1) driving rods using RMCS
(2) 45 gpm

40. A total loss of Unit One feedwater results in reactor water level lowering to 87 inches.
Drywell pressure is 2.1 psig.
Reactor water level is being restored with RCIC and CRD.

Which one of the following completes both statements below?

RVCP (1) required to be entered.

The expected response of the G31-F001, Inboard RWCU Isolation Valve, and the G31-F004, Outboard RWCU Isolation Valve, is that (2) should be closed.

- A. (1) is
(2) ONLY the G31-F004
- B. (1) is
(2) BOTH
- C. (1) is NOT
(2) ONLY the G31-F004
- D. (1) is NOT
(2) BOTH

41.

CAUTION

There are seven keylock *NORMAL/LOCAL* switches located on Diesel Generator 2 control panel. Six of these are located in a row. The seventh switch is located in the row above the six switches.

Which one of the following completes both statements below concerning the caution above from OASSD-02, *Control Building*?

The six switches in a row must be placed in *LOCAL* (1) placing the seventh switch in *LOCAL*.

The purpose of this sequence is to prevent a loss of DG2 due to a loss of the redundant power supply fuses for the (2) circuitry.

- A. (1) before
(2) output breaker
- B. (1) before
(2) engine run control
- C. (1) after
(2) output breaker
- D. (1) after
(2) engine run control

42. During accident conditions, the source term from the Unit One Reactor Building must be estimated. Three RB HVAC supply fans and three RB HVAC exhaust fans are running.

IAW OPEP-03.6.1, *Release Estimates Based on Stack/Vent Readings*, which one of the following is the calculated release rate?

ATTACHMENT 2
Page 1 of 1
Source Term Calculation From #1 RX Gas (1-CAC-AQH-1264-3)

TIME	METER READING (cpm)	FLOW ¹ (cfm)	EFFICIENCY ⁽²⁾ FACTOR	RELEASE ⁽³⁾ RATE (μCi/sec)
1 minute ago	4.0 E+3	43,200 CFM per exhaust fan	1.275 E-5	

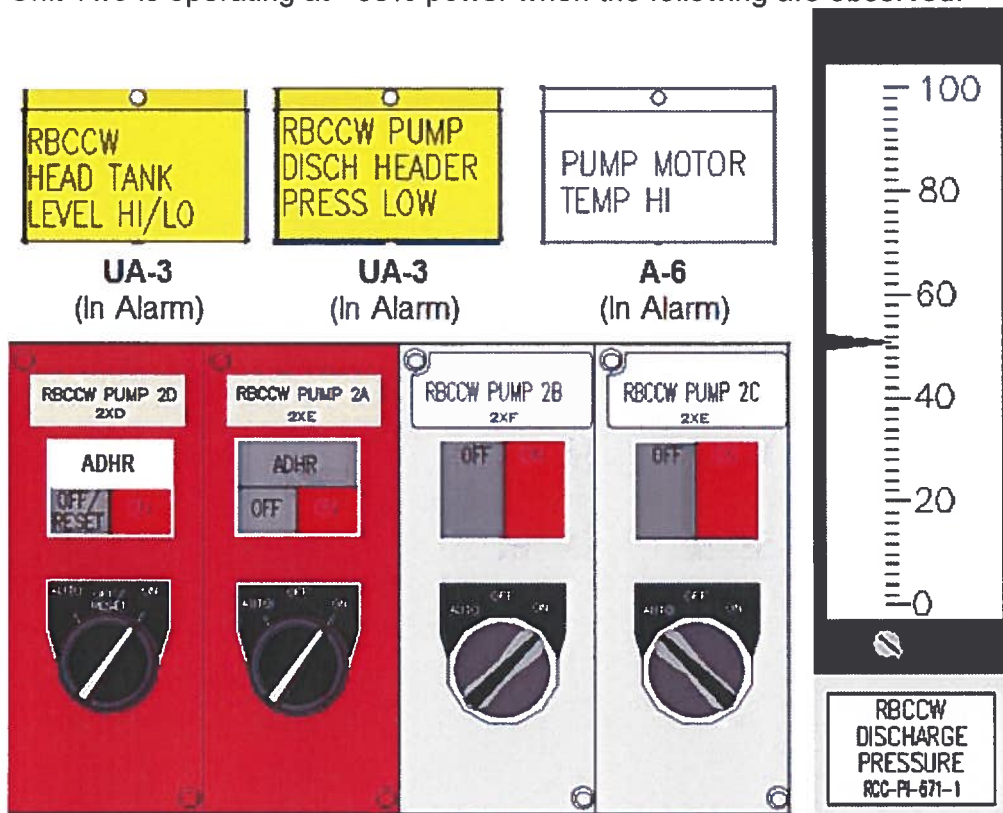
(1) If not available use 43,200 cfm per exhaust fan times the number of fans operating.

(2) The efficiency factors can be obtained from OE&RC-2020 (contact E&RC counting room).

(3) Release Rate = (cpm) x (cfm) x (Efficiency Factor)

- A. 2.2 E+3 μCi/sec.
- B. 6.6 E+3 μCi/sec.
- C. 1.3 E+4 μCi/sec.
- D. 6.6 E+4 μCi/sec.

43. Unit Two is operating at ~65% power when the following are observed:



Which one of the following completes both statements below IAW 0AOP-16.0, *RBCCW System Failure*?

A complete loss of RBCCW (1) occurred.

A reactor scram (2) required.

- A. (1) has
(2) is
- B. (1) has
(2) is NOT
- C. (1) has NOT
(2) is
- D. (1) has NOT
(2) is NOT

44. Unit Two has entered 0AOP-20.0, *Pneumatic (Air/Nitrogen) System Failures*, due to a loss of instrument air pressure with the following annunciator status:

UA-01 (1-1) <i>RB Instr Air Receiver 2A Press Low</i>	Alarm sealed in
UA-01 (1-2) <i>RB Instr Air Receiver 2B Press Low</i>	NOT in Alarm
UA-01 (3-2) <i>Air Compr D Trip</i>	Alarm sealed in
UA-01 (4-4) <i>Inst Air Press Low</i>	Alarm sealed in
UA-01 (5-4) <i>Service Air Press-Low</i>	Alarm sealed in

Which one of the following completes both statements below?

On a loss of instrument air, the RB HVAC Butterfly Isolation Valves will fail (1).

IAW 0AOP-20.0, the reactor (2) required to be scrammed.

- A. (1) as-is
(2) is
- B. (1) as-is
(2) is NOT
- C. (1) open
(2) is
- D. (1) open
(2) is NOT

45. I&C Techs inadvertently cause a low level 3 (LL3) signal.

Unit Two plant conditions are:

Reactor pressure	930 psig
Drywell pressure	1.7 psig, steady
Drywell temp (average)	140°F, slow rise
Drywell leak calculation	Normal

Which one of the following completes the statement below?

All Drywell Cooler Fans are:

- A. tripped, but can be overridden on.
- B. tripped, and cannot be overridden on.
- C. running, but can be tripped at the RTGB.
- D. running, and cannot be tripped at the RTGB.

46. Unit One in MODE 5.
The fuel pool gates are removed.
SDC Loop B is in service.
Fuel pool cooling assist is in operation.

The RHR Loop B pumps tripped and can NOT be restarted.

Which one of the following completes both statements below?
(consider each statement separately)

Fuel pool cooling assist (1).

Fuel pool cooling assist (2) capable of being aligned to the SDC Loop A IAW
1OP-17, *Residual Heat Removal System Operating Procedure*.

- A. (1) remains in service
(2) is
- B. (1) remains in service
(2) is NOT
- C. (1) is lost
(2) is
- D. (1) is lost
(2) is NOT

47. Unit Two is performing refueling operations when the refueling SRO reports that a spent fuel bundle has been dropped.

The following radiation monitoring alarms are received:

UA-03 (3-7) *Area Rad Refuel Floor High*

UA-03 (4-5) *Process Rx Bldg Vent Rad Hi*

Which one of the following identifies the "Immediate Action" that is required IAW 0AOP-05.0, *Radioactive Spills, High Radiation, and Airborne Activity*?

- A. Verify Group 6 isolation.
- B. Evacuate all personnel from the refuel floor.
- C. Place Control Room Emergency Ventilation System in operation.
- D. Isolate Reactor Building Ventilation and place Standby Gas Treatment trains in operation.



48. Unit Two is operating at rated power when high drywell pressure switch C72-PTM-N002A-1 fails high resulting in the annunciation of A-05-(5-6) *Pri Ctmt Press Hi Trip*.

Which one of the following completes the statement below?

RPS high drywell pressure relay C72-K4A will (1).

The RSP (2) be required to be entered.

- A. (1) energize
(2) will
- B. (1) energize
(2) will NOT
- C. (1) de-energize
(2) will
- D. (1) de-energize
(2) will NOT



49. Unit One was operating at power when a turbine trip occurred.
85 control rods fail to insert.
Reactor pressure peaks at 1145 psig.

Which one of the following completes both statements below?

The reactor recirc pumps (1) tripped.

Tripping of the reactor recirc pumps results in a rapid decrease in reactor power due to (2).

- A. (1) must be manually
(2) voiding of the moderator
- B. (1) must be manually
(2) a reduction in reactor water level
- C. (1) have automatically
(2) voiding of the moderator
- D. (1) have automatically
(2) a reduction in reactor water level



50. Unit One failed to scram following a loss of off-site power with the following plant conditions:

Reactor Power	5%
RPV Water Level	-55 inches (N036)
RPV Pressure	850 psig

Which one of the following completes both statements below?



This UA-12 (5-4) alarm is expected to be received when suppression pool water temperature **first** reaches (1).

IAW 10P-17, *Residual Heat Removal System Operating Procedure*, the RHR logic requirements to place torus cooling in service under the current plant conditions will require (2).

- A. (1) 95°F
(2) placing the CS-S17B "Think Switch" to Manual first and then bypassing the 2/3rd core height interlock
- B. (1) 95°F
(2) bypassing the 2/3rd core height interlock first and then placing the CS-S17B "Think Switch" to Manual
- C. (1) 105°F
(2) placing the CS-S17B "Think Switch" to Manual first and then bypassing the 2/3rd core height interlock
- D. (1) 105°F
(2) bypassing the 2/3rd core height interlock first and then placing the CS-S17B "Think Switch" to Manual



51. Unit Two is in MODE 3 following a Station Blackout.
IAW 0EOP-01-SBO-01, *Plant Monitoring*, the AO has reported the following temperatures from the RSDP temperature recorder 2CAC-TR-778:

Point 1	290°F
Point 2	118°F
Point 3	255°F
Point 4	230°F
Point 5	191°F
Point 6	117°F

(REFERENCE PROVIDED)

Which one of the following represents the correct calculated Drywell temperature?

- A. ~205°F
- B. ~249°F
- C. ~258°F
- D. ~267°F



52. Unit Two is performing RVCP with HPCI in pressure control.

Subsequently, A-01 (1-5) *Suppression Chamber Level Hi Hi* is received.

Which one of the following completes both statements below?

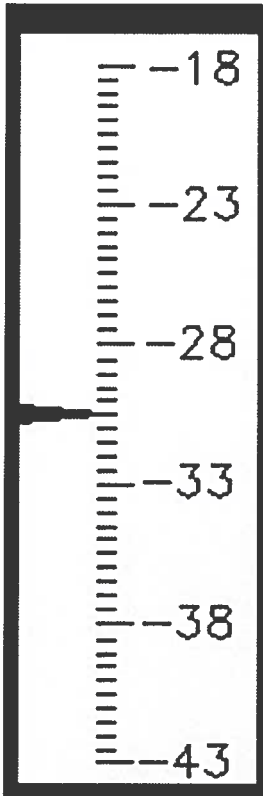
The E41-F004, CST Suction Vlv, will (1).

The E41-F008, Bypass to CST Vlv, will (2).

- A. (1) close
(2) close
- B. (1) close
(2) remain open
- C. (1) remain open
(2) close
- D. (1) remain open
(2) remain open



53.



Unit One is operating at rated power when A-01 (3-7) *Suppression Chamber Lvl Hi/Lo*, is received.

The BOP Operator verifies the alarm using CAC-LI-4177, Supp Pool Level, indicator on Panel XU-51. (indication provided to the left)

Which one of the following identifies the action that is required IAW A-01 (3-7) *Suppression Chamber Lvl Hi/Lo*?

The water level in the Unit One torus must be:

- A. lowered by using Core Spray and routed to Radwaste.
- B. lowered using RHR and routed to Radwaste.
- C. raised by opening the HPCI suction from the CST.
- D. raised by opening the Core Spray suction from the CST.



54. Unit One is executing the ATWS procedure with the following plant conditions:

Reactor power 12%
Reactor pressure 940 psig, controlled by EHC
Reactor water level 170 inches, controlled by feedwater

Which one of the following identifies the reason the ATWS procedure directs deliberately lowering RPV water level to 90 inches?

- A. Reduces reactor power so that it will remain below the APRM downscale setpoint.
- B. Provides heating of the feedwater to reduce potential for high core inlet subcooling.
- C. Reduces challenges to primary containment if MSIVs close.
- D. Promotes more efficient boron mixing in the core region.



55. Which one of the following identifies the reason for performing Emergency Depressurization due to exceeding Maximum Safe Operating Temperatures IAW OOI-37.9, *Secondary Containment Control Procedure Basis Document*?

- A. Prevent an unmonitored release.
- B. Preserve personnel access into the reactor building.
- C. Provide continued operability of equipment required for safe shutdown.
- D. Ensure ODCM site boundary dose limits are not exceeded.



56. Which one of the following completes both statements below?

IAW 0AOP-5.4, *Radiological Releases*, RRCP is entered when the Turbine Building Vent Rad Monitor indication exceeds an (1) EAL.

IAW RRCP, before the radioactivity release rate reaches a (2) Emergency EAL, Emergency Depressurization is required.

- A. (1) Unusual Event
(2) Site Area
- B. (1) Unusual Event
(2) General
- C. (1) Alert
(2) Site Area
- D. (1) Alert
(2) General



57. Following an unisolable RWCU line break in the reactor building the following conditions exist:

South Core Spray Room temperature 155°F
South RHR Room temperature 300°F
UA-12 (2-3) *South Core Spray Room Flood Level Hi*, in alarm
UA-12 (2-4) *South RHR Room Flood Level Hi*, in alarm
UA-12 (1-4) *South RHR Room Flood Level Hi-Hi*, in alarm

(REFERENCE PROVIDED)

Which one of the following completes both statements below?

IAW 0EOP-01-UG, *User's Guide*, (1) equipment required for safe shutdown will fail.

IAW SCCP, Emergency Depressurization (1) required.

- A. (1) ONLY the South RHR room
(2) is
- B. (1) ONLY the South RHR room
(2) is NOT
- C. (1) the South RHR room AND Core Spray room
(2) is
- D. (1) the South RHR room AND Core Spray room
(2) is NOT

58. The RO has attempted to manually scram Unit One with the following actions taken:

All rods are noted to be greater than position 02

Reactor mode switch is placed in shutdown

ARI was initiated.

Both recirculation pumps were tripped.

Reactor power reported at 12%

SLC is injecting

RPV level is 80 inches and stable

Rod insertion attempts are unsuccessful

Which one of the following completes both statements below?

Reactor power (1) expected to be lowering.

Assuming no rod insertion, SLC injection (2).

- A. (1) is
(2) can be secured when all APRMs are downscale
- B. (1) is
(2) must be continued until the reactor is shutdown under all conditions
- C. (1) is NOT
(2) can be secured when all APRMs are downscale
- D. (1) is NOT
(2) must be continued until the reactor is shutdown under all conditions



59. A radioactive release has occurred in the Turbine Building.

Which one of the following completes both statements below?

IAW 0AOP-05.4, *Radiological Releases*, the Unit Two turbine building ventilation must be in the (1) operating mode.

This discharge will be monitored by the (2).

- A. (1) recirc
(2) Main Stack Radiation Monitor
- B. (1) recirc
(2) Wide Range Gaseous Monitor (WRGM)
- C. (1) once through
(2) Main Stack Radiation Monitor
- D. (1) once through
(2) Wide Range Gaseous Monitor (WRGM)

60. Unit One is operating at rated power when the following alarms are received:

UA-01 (4-4) *Instr Air Press-Low*
UA-01 (5-1) *Air Dryer 1A Trouble*

The AO reports that the cause of the alarms is due to filter blockage.

Which one of the following completes both statements below?

The Service Air Dryer malfunction will cause SA-PV-5067, Service Air Dryer Bypass Valve, to open when pressure **first** lowers to (1).

IAW 0AOP-20.0, Pneumatic (Air/Nitrogen) System Failures, the required action is to (2).

- A. (1) 105 psig
(2) place the 1B Service Air Dryer in service
- B. (1) 105 psig
(2) set the service air dryer maximum sweep value to zero
- C. (1) 98 psig
(2) place the 1B Service Air Dryer in service
- D. (1) 98 psig
(2) set the service air dryer maximum sweep value to zero

61. Unit One is in MODE 3 following a seismic event and reactor scram with the following plant conditions:

Reactor level	55 inches
Reactor pressure	500 psig
Drywell pressure	9 psig
Division I PNS header pressure	93 psig
Division II PNS header pressure	98 psig

Which one of the following completes both statements below?

Div I Backup N2 Rack Isol Vlv, RNA-SV-5482 is (1) .

Div II Backup N2 Rack Isol Vlv, RNA-SV-5481 is (2) .

- A. (1) open
 (2) open
- B. (1) open
 (2) closed
- C. (1) closed
 (2) open
- D. (1) closed
 (2) closed



62. Unit One is operating at rated power with the following conditions:

CSW Pump 1A trips
Conventional header pressure lowers to 35 psig

Which one of the following completes both statements below?

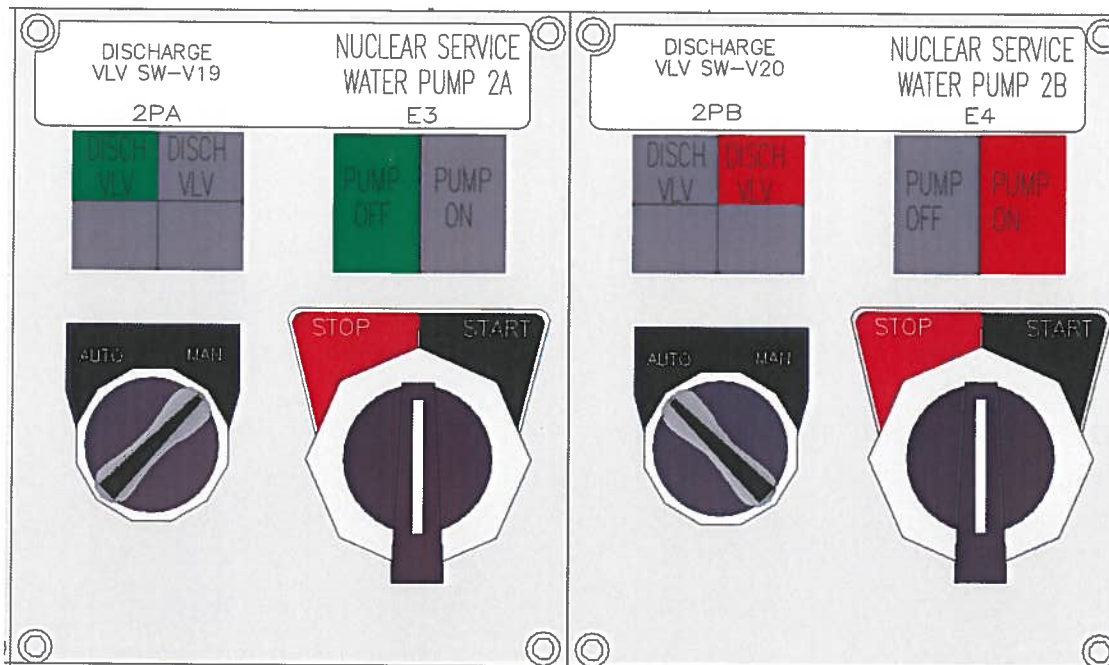
If CSW header pressure remains at this pressure for (1) seconds, the SW-V3, SW To TBCCW HXs Otbd Isol Vlv, and SW-V4, SW To TBCCW HXs Inbd Isol Vlv, will close to a throttled position.

IAW 0AOP-19, *Conventional Service Water System Failure*, the SW-V3 and SW-V4 are reopened (2).

- A. (1) 30
(2) ONLY after a reactor Scram is inserted
- B. (1) 30
(2) if system pressure is restored by starting the standby CSW pump
- C. (1) 70
(2) ONLY after a reactor Scram is inserted
- D. (1) 70
(2) if system pressure is restored by starting the standby CSW pump



63. Unit Two Nuclear Service Water (NSW) pumps are aligned as follows in preparation for equipment realignment:



Subsequently, Off-site power is lost.

Which one of the following completes the statement below?

 (1) NSW pump(s) will auto start (2) associated E Bus is re-energized.

- A. (1) 2A and 2B
 (2) immediately when their
- B. (1) 2A and 2B
 (2) five seconds after their
- C. (1) 2B ONLY
 (2) immediately when its
- D. (1) 2B ONLY
 (2) five seconds after its

64. Which one of the following identifies the potential consequence of failing to place backup nitrogen in service by placing RNA keylock switches in LOCAL IAW 0ASSD-02, *Control Building*?

RNA keylock switch noun names:

2-RNA-CS-001, Override Switch For Valve RNA-SV-5482

2-RNA-CS-002, Override Switch For Valve RNA-SV-5253

- A. Misoperation of RCIC.
- B. Loss of drywell cooling.
- C. Inability to operate SRVs.
- D. Spurious operation of MSIVs.



65. A grid disturbance occurs with the following Unit One plant parameters:

Generator Load	980 MWe
Generator Reactive Load	160 MVARs, out
Generator Gas Pressure	50 psig

(REFERENCE PROVIDED)

Which one of the following identifies both available options that will place the Unit within the Estimated Capability Curve?

- A. Raise gas pressure to 58 psig or lower power to 940 MWe.
- B. Raise gas pressure to 58 psig or raise reactive load to 240 MVARs.
- C. Raise gas pressure to 58 psig or lower reactive load to 70 MVARs.
- D. Lower power to 940 MWe or raise reactive load to 240 MVARs.



66. Which one of the following completes both statements below IAW AD-OP-ALL-1000, *Conduct of Operations*?

With the Unit operating at rated, steady state power, steam flow / feed flow (1) a key parameter that the OATC must monitor to assure a constant awareness of its value and trend.

An end to end control panel walk down shall be performed every (2) and documented in the Narrative Logbook.

- A. (1) is NOT
(2) one hour
- B. (1) is NOT
(2) two hours
- C. (1) is
(2) one hour
- D. (1) is
(2) two hours



67. Which one of the following completes the statement below?

1OP-10, *Standby Gas Treatment System Operating Procedure*, prohibits venting the drywell and the suppression pool chamber simultaneously with the reactor at power because this would cause the:

- A. unnecessary cycling of reactor building to torus vacuum breakers.
- B. unnecessary cycling of torus to drywell vacuum breaker.
- C. SBGT Train water seal to blow out of the trough.
- D. pressure suppression function to be bypassed.



68. A core reload is in progress during a refueling outage. The initial loading of fuel bundles around each SRM centered 4-bundle cell was completed with all four SRMs fully inserted and reading 50 cps.

It is now approximately half way through the core loading sequence and SRMs read 80 cps.

Which one of the following completes the statement below IAW OFH-11, *Refueling*?

Fuel movement must be suspended when any SRM reading **first** rises to _____ upon insertion of the **next** fuel bundle.

- A. 100 cps
- B. 160 cps
- C. 250 cps
- D. 400 cps



69. Unit Two is conducting a routine power reduction for rod pattern improvement. The Reactivity Management Plan contains actions for the RO to insert a group of four rods from position 24 to position 12.

Which one of the following completes the statement below IAW AD-OP-ALL-0203, *Reactivity Management*?

The movement of these rods should be:

- A. single notched for the entire movement.
- B. continuously inserted to the final intended position.
- C. continuously inserted to settle four notches prior to reaching the intended position and then single notched into the final intended position.
- D. continuously inserted to settle one notch prior to reaching the intended position and then single notched into the final intended position.

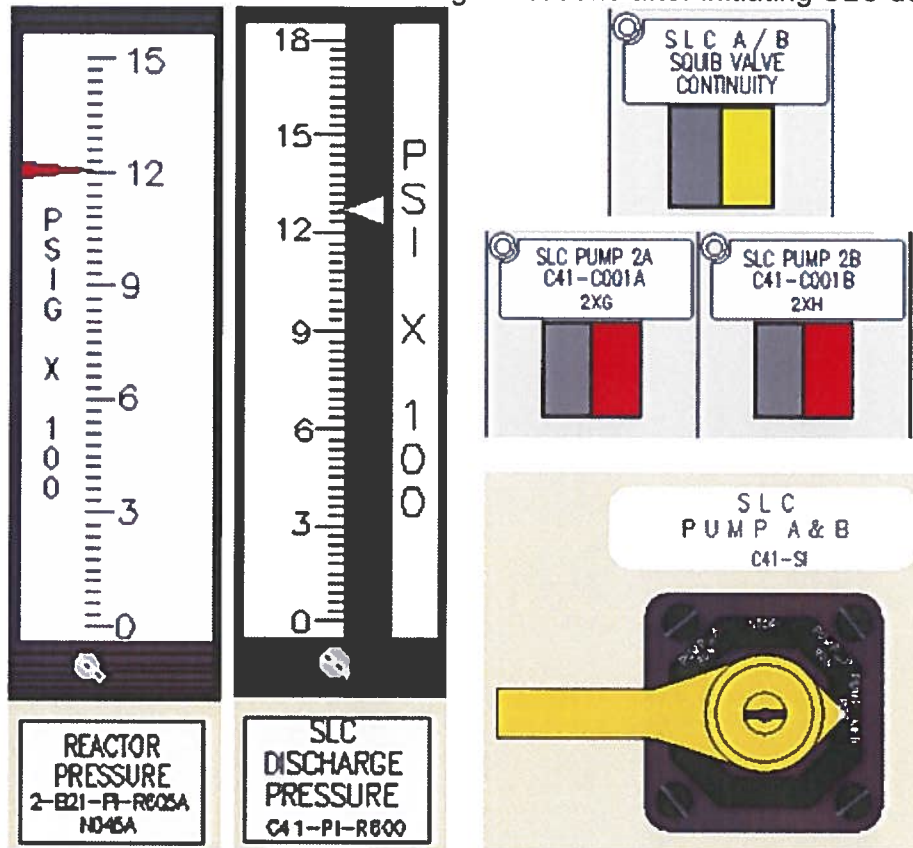


70. Which one of the following identifies the Unit Two "Scram Immediate Operator Action" that utilizes a different criteria for performance than on Unit One?

- A. Tripping of the main turbine.
- B. Tripping one of the running feed pumps.
- C. Master level controller setpoint setdown.
- D. Placing the reactor mode switch to Shutdown.



71. The OATC observes the following indications after initiating SLC during an ATWS.



Which one of the following completes both statements below?

Squib valve (1) has failed to fire.

IAW 20P-05, *Standby Liquid System Operating Procedure*, the OATC is required to (2).

- A. (1) A
(2) place the CS-S1, SLC Pump A & B, in the PUMP B RUN position
- B. (1) A
(2) leave the CS-S1, SLC Pump A & B, in the PUMP A/B RUN position
- C. (1) B
(2) place the CS-S1, SLC Pump A & B, in the PUMP A RUN position
- D. (1) B
(2) leave the CS-S1, SLC Pump A & B, in the PUMP A/B RUN position

72. Two operators are required to enter a room that is posted as a Locked High Radiation Area (LHRA) to hang a clearance for **scheduled** work.

Which one of the following completes both statements below?

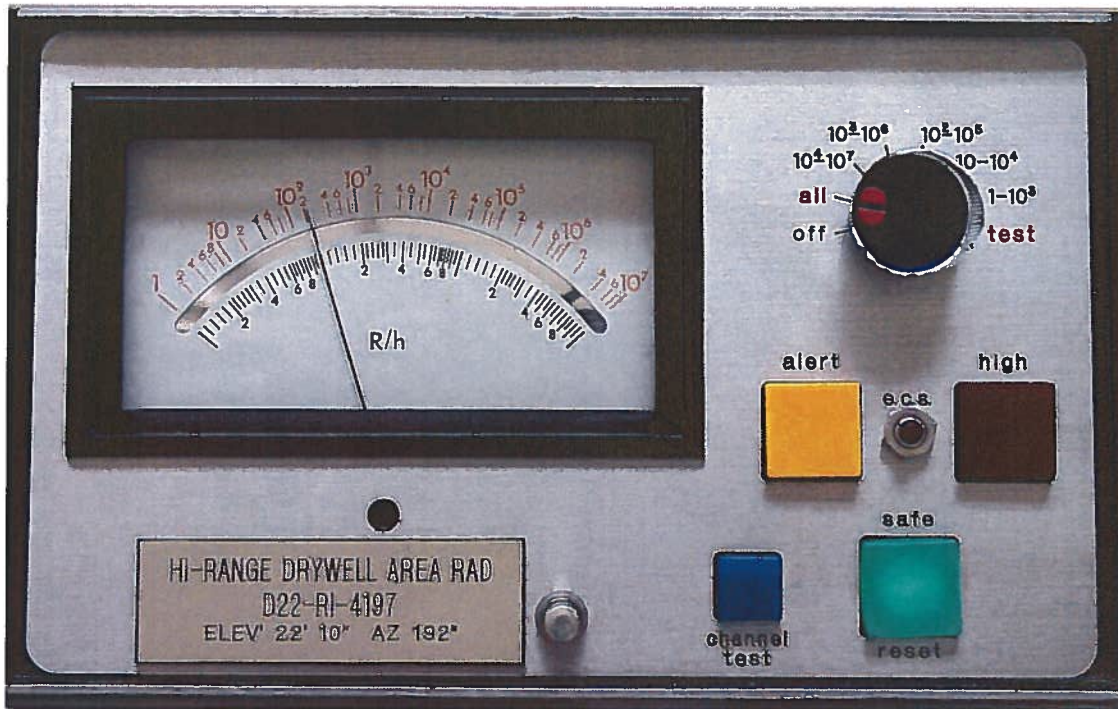
The radiation level at which a LHRA posting is required is (1) in one hour at 30 centimeters from the radiation source.

The LHRA key is obtained from (2) .

- A. (1) >100 mrem
 (2) the Shift Manager
- B. (1) >100 mrem
 (2) a RP Technician
- C. (1) >1000 mrem
 (2) the Shift Manager
- D. (1) >1000 mrem
 (2) a RP Technician



73.



Which one of the following identifies the DW radiation value indicated above?

- A. ~ 10 R/hr
- B. ~ 20 R/hr
- C. ~ 100 R/hr
- D. ~ 200 R/hr

74. A transient has occurred on Unit Two with the following plant conditions:

RPV pressure	1000 psig
Drywell ref leg area temp	197°F
Rx Bldg 50' temp	135°F
Wide Range Level	170 inches (N026A/B)
Shutdown Range Level	160 inches (N027A/B)

(REFERENCE PROVIDED)

Which one of the following completes both statements below concerning the level instruments that can be used to determine reactor water level IAW EOP Caution 1?

Wide Range Level instruments N026A/B (1) be used.

Shutdown Range Level instruments N027A/B (2) be used.

- A. (1) can
(2) can
- B. (1) can
(2) can NOT
- C. (1) can NOT
(2) can
- D. (1) can NOT
(2) can NOT



75. A fire has been reported and confirmed in the turbine building breezeway.
A fire hose is being used to control/suppress the fire.

Which one of the following completes both statements below IAW OPFP-013, *General Fire Plan*?

The RO is required to sound the fire alarm and announce the location of the fire (1).

A call for offsite assistance to the Brunswick County 911 Center (2) required.

- A. (1) ONLY once
(2) is
- B. (1) ONLY once
(2) is NOT
- C. (1) three times
(2) is
- D. (1) three times
(2) is NOT



RO Written Exam Reference Index

1. 0EOP-01-NL, EOP/SAMG Numerical Limits and Values, Attachment 3, Containment Parameters, Secondary Containment Area Temperature Limits, Table 3-B
2. 0EOP-01-SBO-01, Attachment 4, Drywell Temperature Calculation Using RSDP Recorder Inputs
3. 0EOP-01-UG, User's Guide, Attachments 19 (RPV Saturation Limit), 22 Shutdown Range Level Instrument (N027A, B) Caution), and 31 (RPV Level Caution, pages 1 & 2)
4. 0EOP-01-UG, User's Guide, Attachments 26, Unit 2 RPV Level at LL4
5. 1OP-27, Attachment 2, Estimated Capability Curves

ATTACHMENT 3
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Containment Parameters

Secondary Containment Area Temperature Limits

Table 3-B

PLANT AREA	PLANT LOCATION DESCRIPTION	MAX NORM OPERATING VALUE (°F)	MAX SAFE OPERATING VALUE (°F)	AUTO GROUP ISOLATION
N CORE SPRAY	N CORE SPRAY ROOM	120	175	N/A
S CORE SPRAY	S CORE SPRAY ROOM	120	175	N/A
RWCU	PMP ROOM A PMP ROOM B HX ROOM	140	225	3
N RHR	N RHR EQUIP ROOM	175	295	N/A
S RHR	S RHR EQUIP ROOM RCIC EQUIP ROOM	175 165	295 295	N/A 5
HPCI	HPCI EQUIP ROOM	165	165	4
STEAM TUNNEL	RCIC STM TUNNEL HPCI STM TUNNEL	190 190	295 295	5 4
20 FT	20 FT NORTH 20 FT SOUTH	140 140	200 200	N/A N/A
50 FT	50 FT NW 50 FT SE	140 140	200 200	N/A N/A
REACTOR BLDG	MULTIPLE AREAS ANNUN. A-02 5-7	ALARM SETPOINT	N/A	3, 4, AND/OR 5
REACTOR BLDG	MSIV PIT ANNUN. A-06 6-7	ALARM SETPOINT	N/A	1

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ATTACHMENT 4

Page 1 of 1

Drywell Temperature Calculation Using RSDP Recorder Inputs

Values obtained from Recorder CAC-TR-778

Above 70' Elevation

PT 1 _____ x 0.141 = _____ °F

Between 28' and 45' Elevation

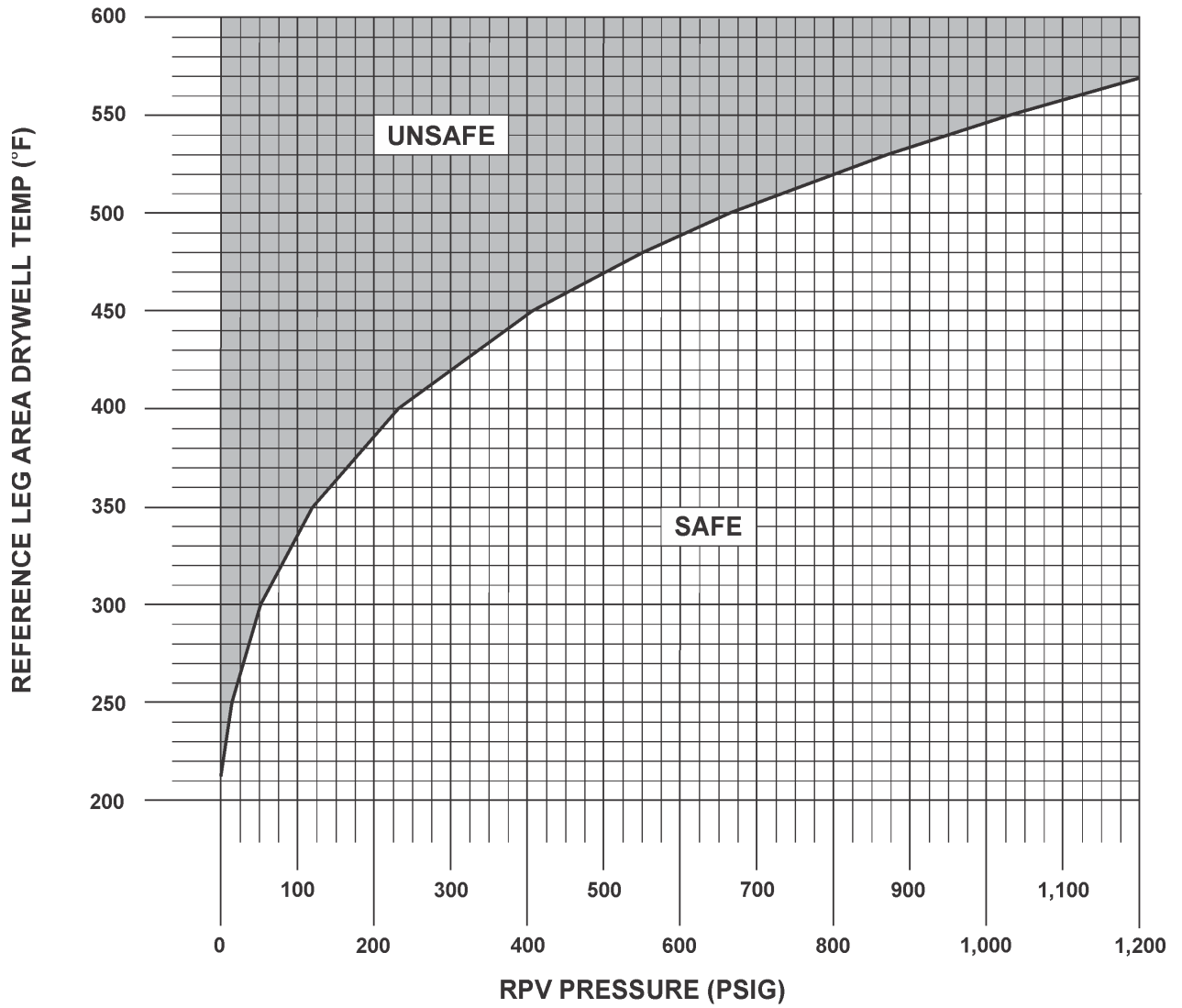
PT 3 _____ x 0.404 = _____ °F

Between 10' and 23' Elevation

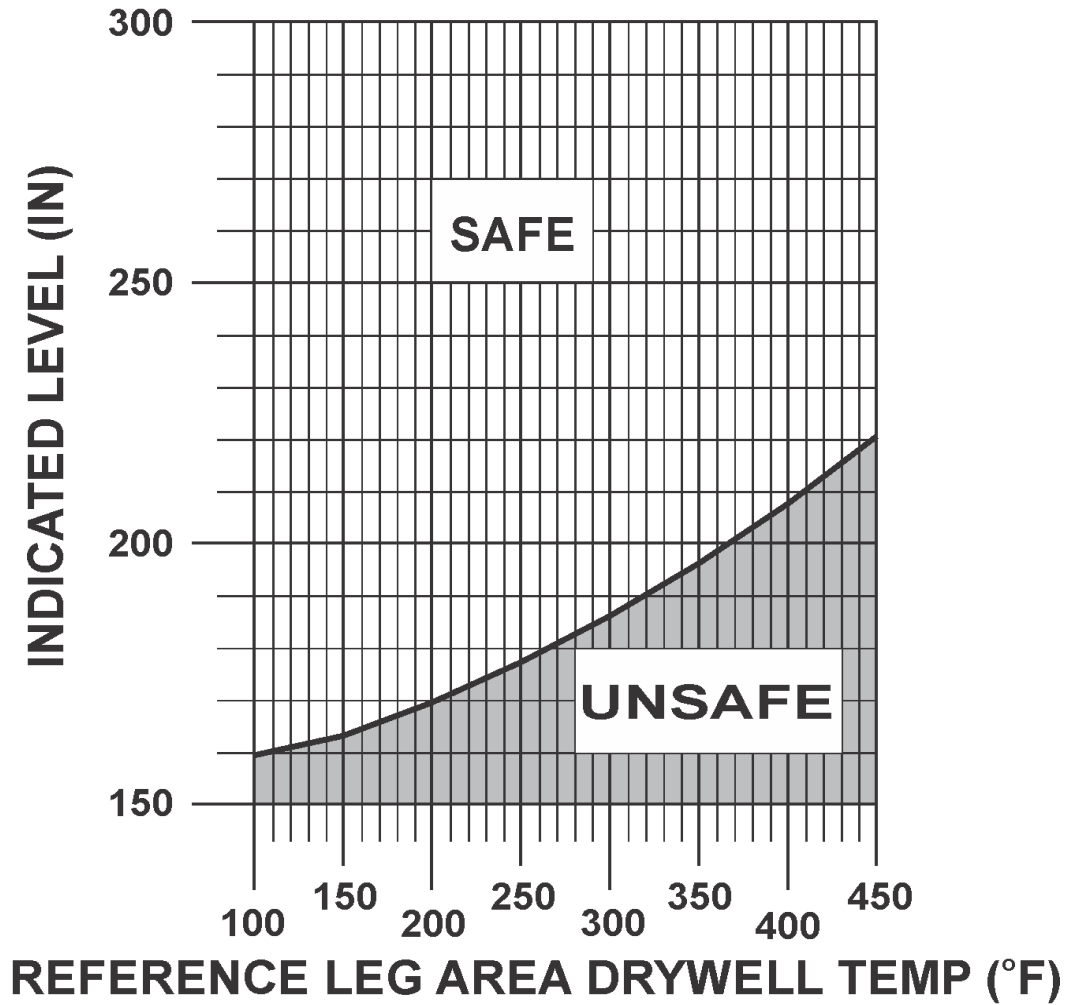
PT 4 _____ x 0.455 = _____ °F

Average Drywell Temperature _____ °F
 (Sum of 3 Regional Weighted Areas)

<< RPV Saturation Limit >>



<< Shutdown Range Level
Instrument (N027A, B) Caution >>



<< RPV Level Caution >>

Caution 1

A RPV level instrument may be used to determine RPV level only when the conditions for use specified below are satisfied for that instrument.

NOTE

- Reference leg area drywell temperature is determined using Attachment 18, Level Instrument Reference Leg Area Drywell Temperature Calculations, ERFIS or Instructional Aid based on Attachment 18.
- If the temperature near any instrument run is in the UNSAFE region of the Attachment 19, RPV Saturation Limit, the instrument may be unreliable due to boiling in the run.
- Immediate reference leg boiling is not expected to occur for short duration excursions into the unsafe region due to heating of the drywell. The thermal time constant associated with the mass of metal and water in the reference leg will prohibit immediate boiling of the reference leg. Reference leg boiling is an obvious phenomenon. Large scale oscillations of all water level instruments associated with the reference leg that is boiling will occur. This occurrence will be obvious and readily observable by the operator. Additionally, if the operator is not certain whether boiling has occurred, he can refer to plant history as provided on water level recorders or ERFIS. Reference leg boiling is indicated by level oscillations without corresponding pressure oscillations.

Instrument	Conditions for Use
Narrow Range Level Instruments C32-LI-R606A, B, C (N004A, B, C) C32-LPR-R608 (N004A, B) Indicating Range 150-210 Inches Cold Reference Leg	Unit 1 Only: The indicated level is in the SAFE region of Attachment 20. Unit 2 Only: The indicated level is in the SAFE region of Attachment 21.
Shutdown Range Level Instruments B21-LI-R605A, B (N027A, B) Indicating Range 150-550 Inches Cold Reference Leg	The indicated level is in the SAFE region of Attachment 22. To determine RPV level at the Main Steam Line Flood Level (MSL), see Attachment 30. Attachment 30 has two curves: The upper curve is for reference leg area drywell temperature equal to or greater than 200°F. The lower curve is for reference leg area drywell temperature less than 200°F.

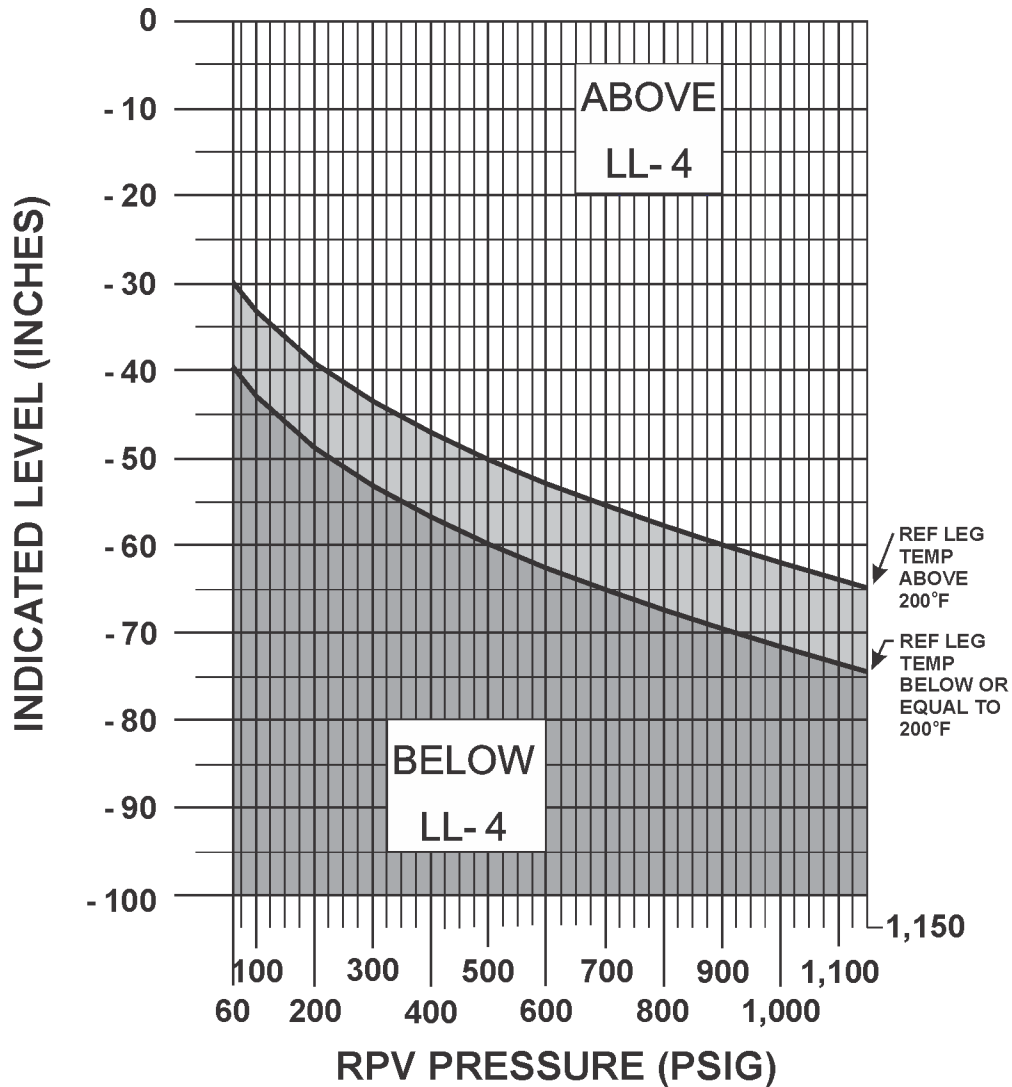
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<< RPV Level Caution >>

Caution 1 (Continued)

Instrument	Conditions for Use
<p>Wide Range Level Instruments B21-LI-R604A, B (N026A, B) C32-PR-R609 (N026B) Indicating Range 0-210 Inches Cold Reference Leg</p>	<ul style="list-style-type: none"> • Temperature on the Reactor Building 50' below 140°F (B21-XY-5948A A2-4, B21-XY-5948B A2-4, ERFIS Computer Point B21TA102, <u>OR</u> B21TA103) <p style="text-align: center;"><u>AND</u></p> <ul style="list-style-type: none"> • <u>IF</u> the reference leg area drywell temperature is in the UNSAFE region of Attachment 19, RPV Saturation Limit, <u>THEN</u> the indicated level is greater than 20 inches <p style="text-align: center;"><u>OR</u></p> <ul style="list-style-type: none"> • <u>IF</u> the reference leg area drywell temperature is in the SAFE region of Attachment 19, RPV Saturation Limit, <u>THEN</u> the indicated level is greater than 10 inches.

<< Unit 2 RPV Level at LL 4
(Minimum Steam Cooling RPV Level) >>

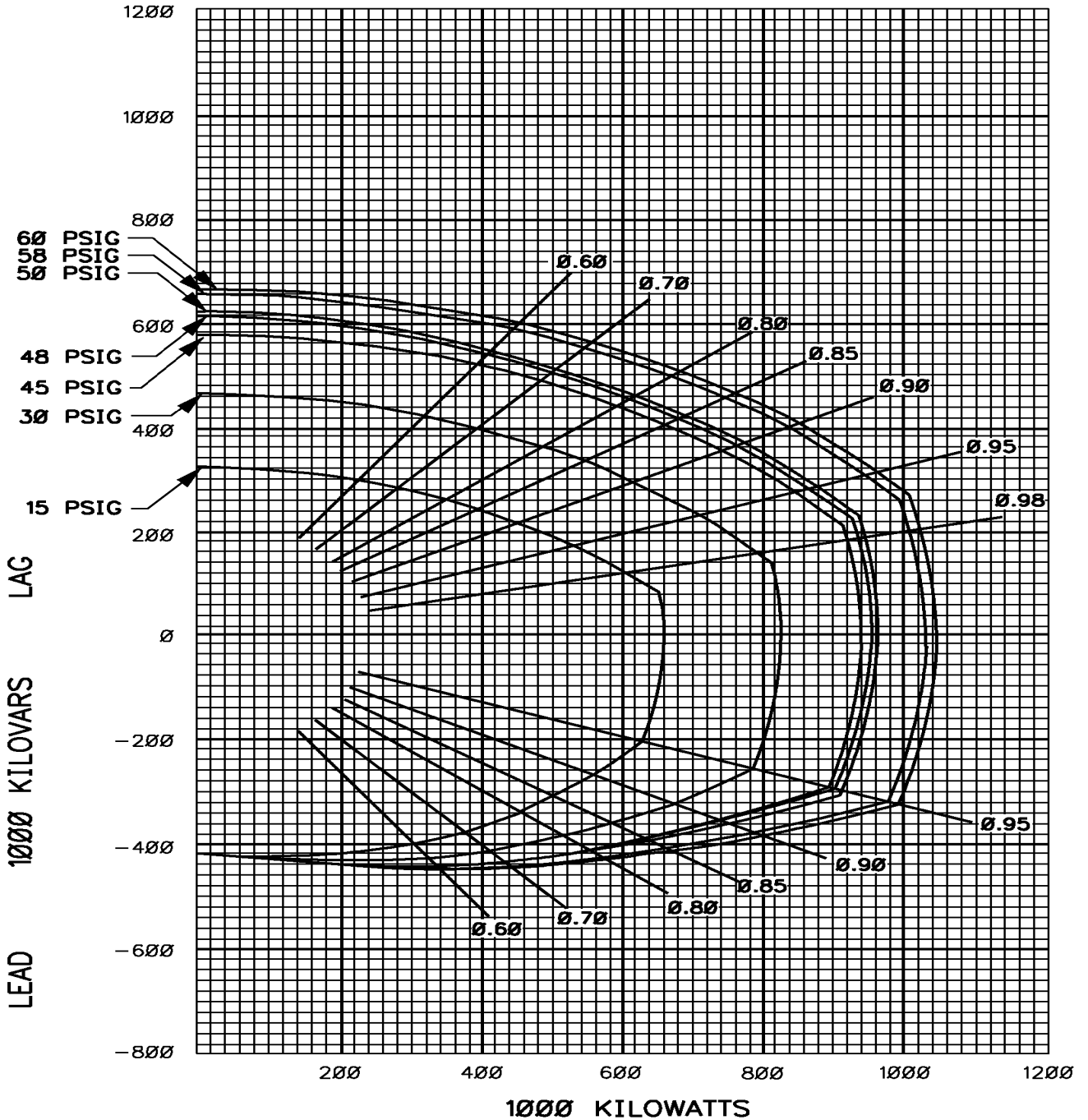


When RPV pressure is less than 60 psig, use indicated level. LL-4 is -27.5 inches.

<< Estimated Capability Curves >>

GENERATOR REACTIVE CAPABILITY CURVE

ATB 4 POLE 1039000 KVA 1800 RPM 24000 VOLTS 0.964PF
0.53 SCR, 60 PSIG HYDROGEN PRESSURE, 500 VOLTS EXCITATION



U. S. Nuclear Regulatory Commission Site-Specific SRO Written Examination	
Applicant Information	
Name: Answer Key	
Date: 12/13/2016	Facility / Unit: Brunswick Unit 1/2
Region: I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/>	Reactor Type: W <input type="checkbox"/> CE <input type="checkbox"/> BW <input type="checkbox"/> GE <input type="checkbox"/>
Start Time:	Finish Time:
Instructions	
<p>Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. To pass the examination you must achieve a final grade of at least 80 percent overall, with 70 percent or better on the SRO-only items if given in conjunction with the RO exam; SRO-only exams given alone require a final grade of 80 percent to pass. You have 8 hours to complete the combined examination, and 3 hours if you are only taking the SRO portion.</p>	
Applicant Certification	
<p>All work done on this examination is my own. I have neither given nor received aid.</p> <p style="text-align: right; margin-right: 100px;">_____</p> <p style="text-align: right; margin-right: 100px;">Applicant's Signature</p>	
Results	
RO/SRO-Only/Total Examination Values Points	_____ / _____ / _____
Applicant's Score Points	_____ / _____ / _____
Applicant's Grade Percent	_____ / _____ / _____

1. 201003 1

Unit Two is operating at rated power when a control rod begins to drift out from position 24.

Which one of the following identifies the **first** action to be taken by the operator at the controls (OATC)?

- A. Initiate a single rod scram.
- B. Initiate a manual reactor scram.
- C. Select and attempt to arrest the control rod.
- D. Select and fully insert the control rod to position 00.

Answer: C

K/A:

201003 Control Rod and Drive Mechanism

G2.4.49 Ability to perform without reference to procedures those actions that require immediate operation of system components and controls. (CFR: 41.10 / 43.2 / 45.6)

RO/SRO Rating: 4.6/4.4

Tier 2 / Group 2

K/A Match: This meets the K/A because the question is testing the operator action required to control a drifting control rod
(Chief Examiner agreed that operation of the RMCS for a rod drift would meet this K/A)

Pedigree: New

Objective: LOI-CLS-LP-07. Obj. 11b

Describe the possible cause(s) and required operator actions for the following alarms:
A-5 3-2. Control Rod Drift

Reference: None

Cog Level: Fundamental

Explanation: This abnormal positive reactivity addition requires response from the APP before entering the AOP. The APP requires that the operator attempt to arrest the drift at the intended position first, if it cannot be arrested but responds to RMCS to insert to 00, if it does not respond to RMCS to perform a single rod scram. If more than 1 rod drifts then a manual scram is required.

Distractor Analysis:

Choice A: Plausible because if the rod does not move then this is the appropriate action.

Choice B: Plausible because if more than 1 rod is drifting then this would be correct

Choice C: Correct Answer, see explanation.

Choice D: Plausible because this is the correct action if the rod is drifting in or the rod continues to drift after attempting to arrest.

SRO Basis: N/A

ROD DRIFT

AUTO ACTIONS

1. RWM withdraw or insert errors possibly causing rod block if reactor power is below the low power setpoint.
2. The reactor power will respond to the drifting rod depending upon the direction of the rod drift and rod worth, and could result in a reactor Scram if the plant is at low power operation.

CAUSE

1. Rod in uneven position due to:
 - a. Leaking Scram valve.
 - b. High cooling water pressure.
 - c. Failure of directional control valves.
 - d. Slow to settle due to fuel bundle channel bow.
2. Malfunction in alarm circuit.

OBSERVATIONS

1. "Rod Drift" indication on the full core display.
2. RWM error indications and Rod Block if reactor power is below the low power setpoint.
3. A change in neutron monitoring system meter readings as a result of the drifting rod with possible high flux alarms.
4. If drifting rod is selected, the four-rod group display will indicate an odd control rod position, a blank window, or a changing control rod position in the direction of the drift.
5. High control rod cooling water pressure and/or flow.
6. If control rod drifts to the full in position, a green backlight on the full core display will illuminate with no position readout on RTGB.
7. ROD OUT BLOCK alarm A-05 (2-2) and no withdraw permissive light.
8. Greater than normal settle times causing an odd or no-position to be present when the RMCS timer times out.

ACTIONS

1. Determine if the affected control rod(s) is drifting or if the rod(s) has scrambled using full core display, RPIS, and RWM.
2. Select the drifting rod and determine direction of drift.
 - a. **Attempt to arrest the drift and latch rod** by performing the following:
 - 1) Apply appropriate insert or withdrawal signals to the rod using RMCS.
 - 2) If RWM is causing rod blocks, then bypass RWM if directed by Unit CRS.

ACTIONS (Continued)

3. If the rod continues to DRIFT OUT, then perform the following:

CAUTION

A control rod collett piston stuck in the withdraw (unlatched) position will allow the rod to drift full out due to its own weight when insert pressure is removed either by the RMCS or by closing Valve C12-101.

- a. Notify Reactor Engineer.
 - b. Monitor core parameters, main steam line radiation monitors, and off-gas activity.
 - c. If rod responds to an RMCS insert signal, then fully insert the rod to position 00.
 - d. If rod fails to latch at position 00, then reapply insert signal to drive the rod full in.
 - e. If rod fails to respond to RMCS, then initiate a single control rod scram.
 - f. Refer to CAOP-03.0.
 - g. Refer to Technical Specifications 3.1.3.
4. If rod continues to DRIFT IN, then perform the following:
- a. Apply an RMCS insert signal and fully insert rod to position 00.

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3.0 AUTOMATIC ACTIONS

1. Possible rod block or select block from a failed reed switch or a loss of power
2. CRD pumps trip after a 3 second delay on low suction pressure

4.0 OPERATOR ACTIONS

NOTE
The following should be considered for establishment as critical parameters during performance of this procedure: <input type="checkbox"/>
<ul style="list-style-type: none"> • Reactor power • Control rod position • Thermal limits

4.1 Immediate Actions

1. Stop any power changes in progress

NOTE
Detected control rod motion without a withdraw or insert command will cause annunciator A-05 3-2, Rod Drift, to alarm. IF the annunciator alarms AND NO blue scram light(s) are lit on the full core display, the conservative assumption is that rod(s) are drifting <input type="checkbox"/>

2. **IF** more than one control rod is drifting, **THEN** insert a manual scram **AND** enter 1EOP-01-RSP(2EOP-01-RSP), Reactor Scram Procedure

2. 201001 1

Unit One is in an outage with the condensate system under clearance.
An earthquake results in damage to the CST causing level to slowly lower.

Which one of the following completes the statement below with regards to the effect on the CRD system?

The CRD system will ____ (1) ____ when the CST level reaches approximately ____ (2) ____

- A. (1) trip
(2) 3 feet
- B. (1) trip
(2) 11 feet
- C. (1) transfer to the backup supply
(2) 3 feet
- D. (1) transfer to the backup supply
(2) 11 feet

Answer: B

K/A:

201001 Control Rod Drive Hydraulic System

K6 Knowledge of the effect that a loss or malfunction of the following will have on the CONTROL ROD DRIVE HYDRAULIC System: (CFR: 41.7 / 45.7)

02 Condensate storage tanks

RO/SRO Rating: 3.0/3.1

Tier 2 / Group 2

K/A Match: This meets the K/A because the student has determine the effect of the loss of the CST on the CRD system.

Pedigree: New

Objective: LOI-CLS-LP-008, Obj. 8

Given plant conditions, predict the effect that a loss or malfunction of the following will have on the CRDH System: b. Condensate Storage Tank

Reference: None

Cog Level: High

Explanation: Under normal system operations the CRD system suction is from the condensate system. The alternate supply is from the CST, which will transfer automatically. With the condensate system under clearance these valves would be isolated. The standpipe for the CRD suction is at ~11 feet. The auto transfer for the suction for ECCS is at ~3 feet.

Distractor Analysis:

Choice A: Plausible because the pumps will lose NPSH and trip but the suction is at 11 feet not 3 feet.

Choice B: Correct Answer, see explanation.

Choice C: Plausible because an auto transfer to the CST would occur but in this case an auto transfer to the condensate system is not possible. 3 feet is the suction height for the ECCS system.

Choice D: Plausible because an auto transfer to the CST would occur but in this case an auto transfer to the condensate system is not possible. The second part is correct.

SRO Basis: N/A

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3.0 PRECAUTIONS AND LIMITATIONS

1. This procedure is Reactivity Management related per AD-OP-ALL-0203, Reactivity Management. Those portions of this procedure that move control rods in MODES 1 or 2 are considered a Direct Reactivity manipulation and Reactivity Evolution Category R2 (Reactivity Manipulation, R2).
2. CST level is maintained greater than 11 feet to prevent CRD pumps from losing suction.

3. 202002 1

Unit One is at rated power.

Which one of the following identifies the impact of inadvertently closing the 1A Reactor Recirculation Pump 1-B32-F031A, Pump A Disch Vlv?

The 1A Reactor Recirculation pump speed will lower to approximately:

- A. 20%
- B. 34%
- C. 45.4%
- D. 48%

Answer: B

K/A:

202002 Recirculation Flow Control System

K6 Knowledge of the effect that a loss or malfunction of the following will have on the RECIRCULATION FLOW CONTROL SYSTEM: (CFR: 41.7 / 45.7)

03 Recirculation system

RO/SRO Rating: 2.8/2.8

Tier 2 / Group 2

K/A Match: This meets the K/A because the student has to determine the effect of closing the discharge valve (which causes a loss of recirc) will have on the recirc flow control system.

Pedigree: new

Objective: LOI-CLS-LP-002.1, Obj. 17

Explain the operation of the following VFD limiters and controls: a. Limiter #1 b. Limiter #2

Reference: None

Cog Level: Fundamental

Explanation: Closing of the discharge valve will cause the pump to runback to limiter #1 (34%).

Distractor Analysis:

Choice A: Plausible because this is the minimum speed setting.

Choice B: Correct Answer, see explanation.

Choice C: Plausible because this is limiter #2 setting for Unit One

Choice D: Plausible because this is limiter #2 setting for Unit Two

SRO Basis: N/A

4. RFCS VFD Runback #1 Logic (Figure 02-18D and 02-18E)

The logic for VFD A Runback #1 is shown on Figure 02-18D; the logic for VFD B Runback #1 shown on Figure 02-18E is functionally identical to that for VFD A. The initiating conditions for Runback #1 are:

- Recirculation Pump A Discharge Valve B32-F031A Limit Switch LS-2 opens (equivalent to Discharge Valve Not Full Open);
- Total Feedwater Flow as sensed by DFCS is less than 16.4% for 15 seconds or more.

Unit 1 Specific VFD Parameters

Parameter	Value	Function
1170	98.9% (1661.5 rpm)	VFD Over Speed Trip (Over Speed Alarm at 93.95% or 1578.4 rpm)
2080	92.5% (1554.0 rpm)	Maximum running motor speed (based upon achieving 104.5% Core Flow)
2120	45.4% (762.7 rpm)	Runback #2 Active Maximum Motor Speed
4250	50.8% (853.0 rpm)	Manual Runback Motor Speed Low Limit

Unit 2 Specific VFD Parameters

Parameter	Value	Function
1170	103.7% (1742.2 rpm)	VFD Over Speed Trip (Over Speed Alarm at 98.5% or 1655.1 rpm)
2080	97.9% (1644.7 rpm)	Maximum running motor speed (based upon achieving 104.5% Core Flow)
2120	48% (806.4 rpm)	Runback #2 Active Maximum Motor Speed
4250	53.6% (900.5 rpm)	Manual Runback Motor Speed Low Limit

VFD Parameters Common to Both Units

Parameter	Value	Function
2090	20% (336 rpm)	Minimum Running Motor Speed
2100	34% (571.2 rpm)	Runback #1 Active Maximum Motor Speed

4. 203000 1

A line break has occurred in the Unit Two drywell with the following sequence of events:

1155 Drywell pressure rises above 1.7 psig
1202 RPV pressure drops below 410 psig
1203 RPV level drops to LL3

Which one of the following completes the statement below?

The **earliest** time that the operator can throttle the 2-E11-F048A, Loop 2A RHR Heat Exchanger Bypass Valve is at:

- A. 1205.
- B. 1206.
- C. 1207.
- D. 1208.

Answer: A

K/A:

203000 RHR / LPCI: Injection Mode

A4 Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)

04 Heat exchanger cooling flow

RO/SRO Rating: 3.6/3.6

Tier 2 / Group 1

K/A Match: This meets the K/A because the student has to determine when the HX cooling flow can be operated.

Pedigree: Bank

Objective: LOI-CLS-LP-017, Obj. 09

Given an RHR pump or valve, list the interlocks, permissives and/or automatic actions associated with the RHR pump or valve, including setpoints.

Reference: None

Cog Level: High

Explanation: The heat exchanger bypass valve has a 3 minute timer that starts on a LOCA signal. Drywell pressure greater than 1.7# and reactor pressure is less than 410# is the first LOCA signal. The injection valve has a 5 minute interlock initiated by the same conditions. Another LOCA signal is introduced when reactor water level less than LL3 which provides the plausibility of the distractors.

Distractor Analysis:

Choice A: Correct Answer, see explanation.

Choice B: Plausible because this is 3 minutes from the LL3 LOCA signal.

Choice C: Plausible because this is 5 minutes from the low pressure setpoint which is time limit interlock for the injection valve.

Choice D: Plausible because this is 5 minutes from the LL3 LOCA signal.

SRO Basis: N/A

After an initiation signal is received the following actions will occur:

- all four RHR pumps will start 10 seconds after power is available to the E-buses.
- Recirculation pumps are tripped via LL#2
- All valves not needed for LPCI injection automatically isolate and are interlocked shut as previously described.
- Heat exchanger bypass valve F048A/B opens and cannot be throttled for 3 minutes after an initiation signal is received. This ensures a discharge path for the RHR pumps.
- Permissives sent to ADS as RHR pump pressure is sensed > 100 psig. Both pumps in either loop are required to satisfy the ADS permissive, or one core spray loop.
- Minimum flow valve opens if injection flow in loop is < 1000 gpm decreasing after a 10 sec time delay. It automatically shuts as injection valves open and injection flow raises to > 3000 gpm increasing.
- Reactor pressure decreases through the break and/or with actuation of ADS.
- As reactor pressure decreases to 410 psig, the LPCI injection valves F015A(B) auto open. The outboard injection valve F017A(B) can be throttled 5 minutes after the RPV pressure is below 410 psig.
- As pressure reaches 310 psig, recirculation pump discharge and discharge bypass valves shut and are interlocked shut in the attempt to re-flood the core.
- As pressure reaches 200 psig, the RHR system injects into both recirculation system loops by lifting the check valves and overcoming reactor pressure.

5. 205000 1

RHR Loop 2A is operating in the Shutdown Cooling mode of operation with the following parameters:

RHRSW Pump 2A	Operating
RHRSW Flow	4000 gpm
RHR Pump 2A	Operating
RHR Loop A Flow	6000 gpm

Which one of the following completes the statement below?

The required operator action to **lower** the cooldown rate IAW 2OP-17, *Residual Heat Removal System Operating Procedure*, is to throttle **closed**:

- A. 2-E11-F003A, HX 2A Outlet Vlv.
- B. 2-E11-F017A, Outboard Injection Vlv.
- C. 2-E11-F048A, HX 2A Bypass Vlv.
- D. 2-E11-PDV-F068A, HX 2A SW Disch Vlv.

Answer: D

K/A:

205000 Shutdown Cooling System (RHR Shutdown Cooling Mode)

K5 Knowledge of the operational implications of the following concepts as they apply to SHUTDOWN COOLING SYSTEM (RHR SHUTDOWN COOLING MODE): (CFR: 41.5 / 45.3)

03 Heat removal mechanisms

RO/SRO Rating: 2.8/3.1

Tier 2 / Group 1

K/A Match: This meets the K/A because the student has to know which valve would need to be operated to control the heat removal for SDC.

Pedigree: New

Objective: LOI-CLS-LP-017, Obj. 15

Describe how the reactor cool down rate is controlled when the RHR system is in the Shutdown Cooling mode

Reference: None

Cog Level: High

Explanation: The procedure allows throttling closed the F003, F017 or F068 or throttling open the F048. Throttling open the F048 will bypass some of the RHR flow around the heat exchanger thereby lowering cooldown rate. RHR flow is limited to greater than 6000 gpm, so closing the F017 or F003 is not an option.

Distractor Analysis:

Choice A: Plausible because if the valve was throttled closed this would lower cooldown, but flow must be greater than 6000 gpm.,

Choice B: Plausible because if the valve was throttled closed this would lower cooldown, but flow must be greater than 6000 gpm.,

Choice C: Plausible because if the valve was throttled open this would be correct.

Choice D: Correct Answer, see explanation

SRO Basis: N/A

5. **IF less cooling is desired, THEN perform the following**, in order of preference:.....

CAUTION

When E11-F003A(B) [Hx 2A(2B) Outlet Vlv] is CLOSED, RHR Heat Exchanger 2A(2B) inlet temperature, located on E41-TR-R605 (HPCI Turb Brg Oil Temp Recorder), Point 1(2), is **NOT** a valid indication of reactor coolant temperature.

- a. **Throttle close E11-F003A(B) [Hx 2A(2B) Outlet Vlv] not lower than 6000 gpm**, as necessary.....
- b. **Reduce RHR SW loop flow by performing the following as necessary:**
- **Throttle closed E11-PDV-F068A(B) [Hx 2A(2B) SW Disch Vlv] to reduce RHR SW flow rate**.....
 - **IF both RHR SW loop pumps are running, THEN secure one pump per 2OP-43, Service Water System Operating Procedure**.....
- c. **Bypass a portion of RHR loop flow around the HX as follows:**
- (1) **Station an operator at E11-F048A(B) [Hx 2A(2B) Bypass Vlv] to monitor for severe vibration/cavitation during throttling evolutions**.....
 - (2) **Adjust E11-F003A(B) [Hx 2A(2B) Outlet Vlv] as required to achieve 6500 gpm RHR loop flow**.....
 - (3) **Throttle close E11-F017A(B) (Outboard Injection Vlv) as required to achieve 6000 gpm RHR loop flow**.....
 - (4) **Throttle open E11-F048A(B) [Hx 2A(2B) Bypass Vlv] as necessary**.....

6. 206000 1

A Group 1 isolation has occurred on Unit One.

HPCI has been placed in the pressure control mode of operation IAW 1OP-19, *High Pressure Coolant Injection System Operating Procedure*.

HPCI flow controller, E41-FIC-R600, is in manual with the output at midscale.

Which one of the following completes the statement below?

If the 1-E41-F008, Bypass To CST Valve, is throttled ____ (1) ____ too far, this may result in HPCI ____ (2) ____.

- A. (1) open
(2) tripping on overspeed
- B. (1) open
(2) operation below 2100 rpm
- C. (1) closed
(2) tripping on overspeed
- D. (1) closed
(2) operation below 2100 rpm

Answer: B

K/A:

206000 High Pressure Coolant Injection System

K1 Knowledge of the physical connections and/or cause-effect relationships between HIGH PRESSURE COOLANT INJECTION SYSTEM and the following:
(CFR: 41.2 to 41.9 / 45.7 to 45.8)

10 Condensate storage and transfer system

RO/SRO Rating: 2.8/3.1

Tier 2 / Group 1

K/A Match: This meets the K/A because this is testing the cause-effect relationship between HPCI and the flowpath to the CST.

Pedigree: Bank

Objective: LOI-CLS-LP-019. Obj. 8

Describe the methods available for controlling RPV pressure and/or RPV cooldown when operating the HPCI System in the Pressure Control mode. (LOCT)

Reference: None

Cog Level: high

Explanation: Opening F008 will increase flow, causing turbine speed control to lower turbine speed to maintain desired flow. Opening valve too far can result in RPM below 2100 (OP-19, Section 8.2). Closing F008 will cause turbine speed to increase, but the governor limits turbine speed to a maximum value (4100 RPM) below the overspeed trip.

Distractor Analysis:

Choice A: Plausible because opened is correct and an overspeed condition may be thought correct if the flowpath is considered incorrectly.

Choice B: Correct Answer, see explanation.

Choice C: Plausible because throttling closed will increase the speed of the turbine.

Choice D: Plausible because may be thought correct if the flowpath is considered incorrectly.

SRO Basis: N/A

From OP-19:

CAUTION

Throttling *E41-F008* open may cause turbine speed reduction to less than 2100 rpm, if opened too far.

From the SD:

Operation of the HPCI Turbine below the minimum rated speed of 2100 rpm may result in a failure of the auxiliary oil pump from repeated startup cycles. A loss of the auxiliary oil pump will prevent starting of the HPCI Turbine.

7. 209001 1

Unit Two is operating at rated power.

Due to a circuit malfunction an inadvertent LOCA initiation occurs in the Div II Core Spray logic causing A-03 (2-6), *CORE SPRAY SYSTEM II ACTUATED*, to alarm.

Which one of the following completes both statements below?

Core Spray Pump(s) (1) will start.

 (2) will start.

- A. (1) 2B ONLY
 (2) All DGs
- B. (1) 2B ONLY
 (2) DG2 and DG4 ONLY
- C. (1) 2A and 2B
 (2) All DGs
- D. (1) 2A and 2B
 (2) DG2 and DG4 ONLY

Answer: A

K/A:

209001 Low Pressure Core Spray System

K3 Knowledge of the effect that a loss or malfunction of the LOW PRESSURE CORE SPRAY SYSTEM will have on following: (CFR: 41.7 / 45.4)

03 Emergency generators

RO/SRO Rating: 2.9/3.0

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the knowledge of a malfunction of the CS logic has on the EDG.

Pedigree: New

Objective: LOI-CLS-LP-018, Obj. 14

List three systems, other than the Core Spray System, which are initiated or isolated by the Core Spray System logic.

Reference: None

Cog Level: High

Explanation: For CS the logic will only start that divisions pump (RHR would start the other divisions pump) for the CS logic to the DGs either divisions signal will start all DGs.

Distractor Analysis:

Choice A: Correct Answer, see explanation.

Choice B: Plausible because the first part is correct and since it is divisional for the pump starts the student may think that it would start only the Div II DGs. There are signals that would start divisional DGs.

Choice C: Plausible because the student may think the CS logic is similar to the RHR logic for pump starts and the second part is correct.

Choice D: Plausible because the student may think the CS logic is similar to the RHR logic for pump starts and since it is a Div II logic the student may think that it would start only the Div II DGs. There are signals that would start divisional DGs.

SRO Basis: N/A

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CORE SPRAY SYS II ACTUATED

AUTO ACTIONS

1. If E bus was not deenergized, Core Spray Pump 2B starts 15 seconds after receipt of initiation signal
2. If E bus was deenergized, Core Spray pump 2B starts 15 seconds after diesel generator ties onto E bus
3. If open, Full Flow Test Byp Vlv, E21-F015B, closes
4. If closed, Outboard Injection Vlv, E21-F004B, opens
5. When reactor pressure drops to 410 psig, Inboard Injection Vlv, E21-F005B, opens
6. When loop flow is greater than 1500 gpm, Min Flow Bypass Vlv, E21-F031B, closes
7. Div II Non-Intcpt RNA, RNA-SV-5261, and Div I Non-Intcpt RNA, RNA-SV-5262, close
8. Div II Backup N2 Rack Isol Vlv, RNA-SV-5461, and Div I Backup N2 Rack Isol Vlv, RNA-SV-5462, open
9. Fans for Drywell Coolers B and C trip
10. All diesel generators start
11. Nuclear Service Water To Vital Header Valve, SW-V117, opens
12. RBCCW HX Service Water Inlet Valve, SW-V103, closes

CAUSE

1. Reactor low level three (45 inches)
2. High drywell pressure (1.7 psig) in conjunction with low reactor pressure (410 psig)
3. Circuit malfunction

8. 211000 1

Which one of the following completes the statement below concerning Core Spray Line Break Detection differential pressure instrument?

The ____ (1) ____ leg of this DP instrument senses ____ (2) ____ core plate pressure via the SLC/Core Differential Pressure penetration.

- A. (1) variable
(2) below
- B. (1) variable
(2) above
- C. (1) reference
(2) below
- D. (1) reference
(2) above

Answer: D

K/A:

211000 Standby Liquid Control System

K1 Knowledge of the physical connections and/or cause-effect relationships between STANDBY LIQUID CONTROL SYSTEM and the following: (CFR: 41.2 to 41.9 / 45.7 to 45.8)

01 Core spray line break detection

RO/SRO Rating: 3.0/3.3

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the physical connection of SBLC and CS line break detection.

Pedigree: Last used on 10-1 NRC Exam

Objective: CLS-LP-18, Obj. 10

Explain the principle of operation of the CS Line Break Detection Instrumentation

Reference: None

Cog Level: fundamental

Explanation: This system is comprised of a differential pressure detector which provides Control Room annunciation on detected high DP. The high pressure reference leg of this instrument is exposed to above core plate pressure via the SLC/Core Differential Pressure penetration. The low pressure of this instrument is normally exposed to above core pressure via the Core Spray injection line. This results in the instrument normally measuring core DP (not including core plate DP).

Distractor Analysis:

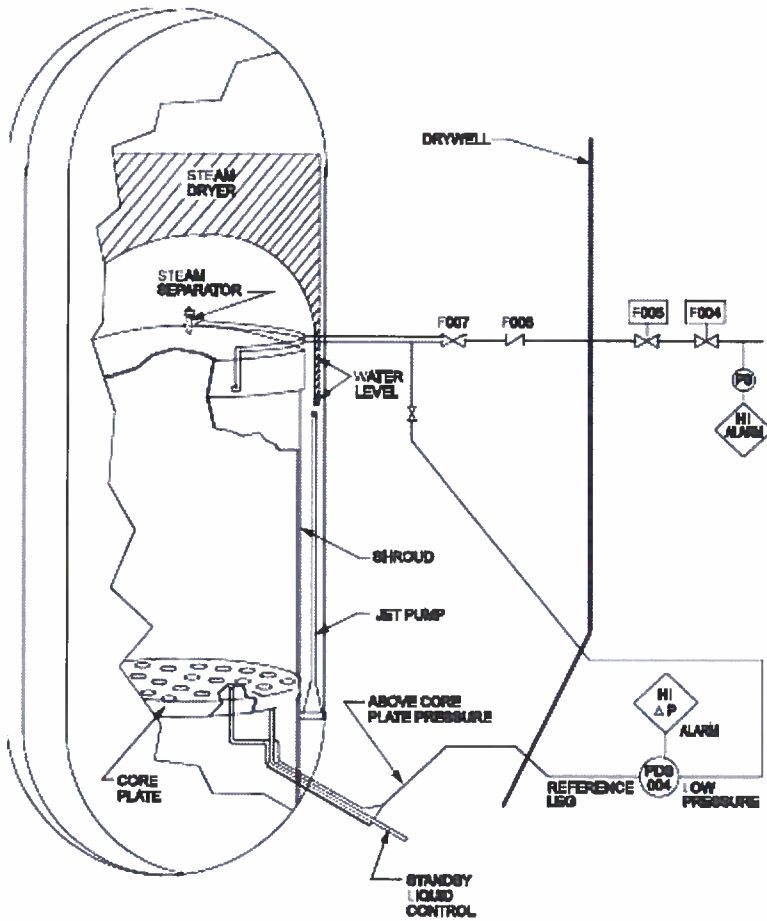
Choice A: Plausible because the examinee may confuse the reference and variable legs and SLC does discharge below the core plate

Choice B: Plausible because the examinee may confuse the reference and variable legs

Choice C: Plausible because it is the reference leg and SLC does discharge below the core plate.

Choice D: Correct Answer, see explanation

SRO Basis: N/A



This system is comprised of a differential pressure detector which provides Control Room annunciation on detected high ΔP . The high pressure reference leg of this instrument is exposed to above core plate pressure via the SLC/Core Differential Pressure penetration. The low pressure of this instrument is normally exposed to above core pressure via the Core Spray injection line. This results in the instrument normally measuring core ΔP (not including core plate ΔP).

A break in the Core Spray injection line between the reactor vessel penetration and the core shroud would expose the low pressure side of the instrument to the lower pressure of the region outside the shroud. This would be sensed as an increased differential pressure and Control Room annunciator would alert the Operator. Although other indications would be available, this alarm would also indicate a break in the line between the E21-F006B(A) check valve and the reactor vessel penetration.

The Core Spray pipe break detection instruments are located on the Reactor Building 20' elevation.

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9. 212000 1

Which one of the following completes both statements below?

The normal power supply to RPS MG Set 2B is from 480V MCC (1) .

The **normal** alternate power supply to RPS B is from 480V Bus (2) .

- A. (1) 2CA
 (2) E7
- B. (1) 2CA
 (2) E8
- C. (1) 2CB
 (2) E7
- D. (1) 2CB
 (2) E8

Answer: C

K/A:

212000 Reactor Protection System

K2 Knowledge of electrical power supplies to the following: (CFR: 41.7)

01 RPS motor-generator sets

RO/SRO Rating: 3.2/3.3

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the power supply to the RPS MG Set

Pedigree: New

Objective: CLS-LP-03, Obj 18b

State the power supplies for the following: RPS MG Set B

Reference: None

Cog Level: Fundamental

Explanation: Power for the Unit 2B Motor Generator Sets is tapped off two phases of the normal 480 VAC MCC 2CB power supply for the motor through a stepdown transformer (480V to 120V) from E8 (the 2A MG Set is powered from 2CA). Normal alternate power to the RPS Bus is provided from E7 with Alternate alternate power to the RPS Bus provided from E8. In the event that either RPS M-G Set fails to operate, the alternate power sources must be manually selected.

Distractor Analysis:

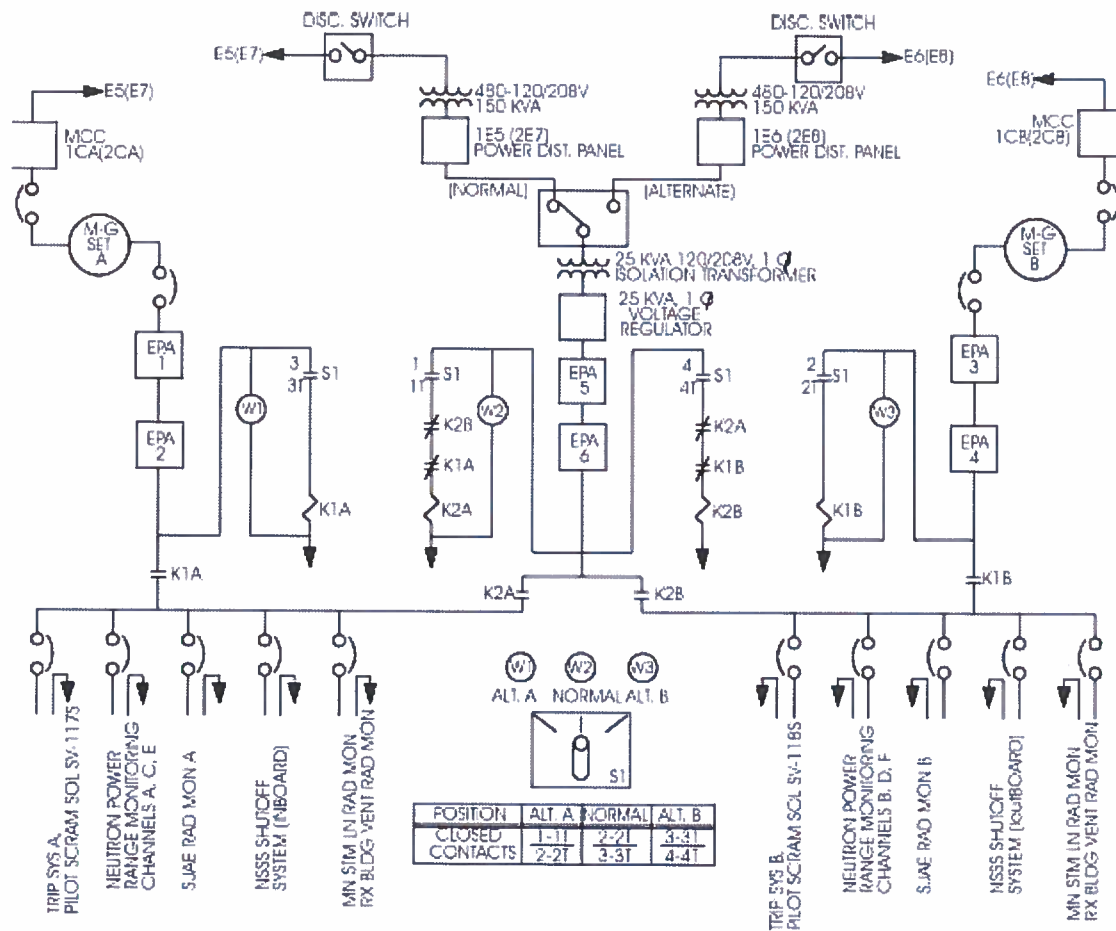
Choice A: Plausible because 2CA supplies RPS MG Set A and E7 is the normal alternate power supply.

Choice B: Plausible because 2CA supplies RPS MG Set A and E8 is the alternate alternate power supply.

Choice C: Correct Answer, see explanation.

Choice D: Plausible because 2CB is the RPS MG Set B power supply and E8 is the alternate alternate power supply.

SRO Basis: N/A



10. 215002 1

Which one of the following identifies the LPRM detector level that provides input to the Rod Block Monitor system for indication ONLY, and is NOT used for the purpose of generating rod blocks?

- A. Level A
- B. Level B
- C. Level C
- D. Level D

Answer: A

K/A:

215002 Rod Block Monitor System

K1 Knowledge of the physical connections and/or cause-effect relationships between ROD BLOCK MONITOR SYSTEM and the following: (CFR: 41.2 to 41.9 / 45.7 to 45.8)

02 LPRM

RO/SRO Rating: 3.2/3.1

Tier 2 / Group 2

K/A Match: This meets the K/A because it is testing the connection between RBM and LPRMs

Pedigree: Bank

Objective: LOI-CLS-LP-09.6, Obj 5a

List the PRNMS system signals/conditions that will cause the following actions: APRM / RBM Rod Blocks

Reference: None

Cog Level: Fundamental

Explanation: The level A inputs are sent to RBM-A for processing/output to the LPRM Display Meters on the 4-Rod Display. Level A is for indication only

RBM-A Receives

all four level C inputs
lower left and upper right level B inputs
upper left and lower right level D inputs

RBM-B Receives

all four level C inputs
upper left and lower right level B inputs
lower left and upper right level D inputs

Distractor Analysis:

Choice A: Correct Answer, see explanation.

Choice B: Plausible because LPRMs have a B level that input to the RBMs Rod Blocks.

Choice C: Plausible because LPRMs have a C level that input to the RBMs Rod Blocks.

Choice D: Plausible because LPRMs have a D level that input to the RBMs Rod Blocks.

SRO Basis: N/A

The "A" level LPRM detectors are not used for RBM input processing, while both RBM channels use all "C" level detectors. This gives an accurate representation of actual power around the control rod. The "B" and "D" detectors are distributed evenly between the two RBM channels. An example of LPRM input to a both RBM channels with a four-string rod selected is two "B" level LPRMs, four "C" level LPRMs, and two "D" level LPRMs for each channel.

The RBM circuitry undergoes a nulling and filtering sequence when a rod is selected and therefore a delay of at least 2.5 seconds must be allowed between selection and rod movement. A Rod Inhibit signal is

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11. 215003 1

Unit One is performing a startup with the reactor just declared critical. While ranging IRM G from range 1, the IRM will not change ranges and remains on Range 1.

Which one of the following completes both statements below?

When IRM G indication **first** exceeds ____ (1) ____ on the 125 scale, annunciator A-05, 2-4, *IRM UPSCALE*, will alarm.

The action required IAW A-05, 2-4, *IRM UPSCALE*, is to ____ (2) ____.

- A. (1) 70
(2) place the joystick on P603 for the IRM G to Bypass
- B. (1) 70
(2) withdraw the IRM G detector to maintain reading on scale
- C. (1) 117
(2) place the joystick on P603 for the IRM G to Bypass
- D. (1) 117
(2) withdraw the IRM G detector to maintain reading on scale

Answer: A

K/A:

215003 Intermediate Range Monitor System

A2 Ability to (a) predict the impacts of the following on the INTERMEDIATE RANGE MONITOR (IRM) SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: (CFR: 41.5 / 45.6)

06 Faulty range switch

RO/SRO Rating: 3.0/3.2

Tier 2 / Group 1

K/A Match: THIS QUESTION WAS PRE-SUBMITTED FOR APPROVAL.

This meets the K/A because it is testing what will happen with a faulty range switch and the action required.

Pedigree: New

Objective: LOI-CLS-LP-009.1, Obj. 3a

List the SRM/IRM system signals/conditions that will cause the following actions and the conditions under which each is bypassed: Rod Blocks (LOCT)

LOI-CLS-LP-009.1, Obj. 14a

Given plant conditions and one of the following events, use plant procedures to determine the actions required to control and/or mitigate the consequences of the event: SRM/IRM Upscale alarm (LOCT)

Reference: None

Cog Level: High

Explanation: With the reactor critical the indication will continue to rise. The Upscale alarm will come in at 70 on the 0-125 scale. The Upscale Hi/Inop alarm comes in at 117 on the 0-125 scale. IAW with the APP the action to take is to bypass the IRM. In the case of the SRMs an action to take could be to withdraw the SRM to maintain on scale readings.

Distractor Analysis:

Choice A: Correct Answer, see explanation.

Choice B: Plausible because the first part is correct and the second part could be correct if this was an SRM.

Choice C: Plausible because 117 is an alarm setpoint for the IRMs and the second part is correct.

Choice D: Plausible because 117 is an alarm setpoint for the IRMs and the second part could be correct if this was an SRM.

SRO Basis: N/A

IRM UPSCALE

AUTO ACTIONS

1. Rod withdrawal block (bypassed when Reactor Mode Switch in RUN)

CAUSE

1. IRM channel indicates greater than or equal to 70 on 0-125 scale
2. Improper ranging of IRM channels during reactor startup or shutdown
3. IRM detector failure
4. During refuel outages, IRM spiking due to noise generation from work activities in drywell, such as welding
5. Circuit malfunction

OBSERVATIONS

1. IRM channel indicating greater than or equal to 70 on 0-125 scale
2. IRM channel upscale (UPSC ALARM) amber indicating light on
3. ROD OUT BLOCK (A-05 2-2) alarms
4. Rod withdrawal permissive indicating light off

ACTIONS

1. If in progress, stop withdrawal of control rods.
2. Monitor IRM indications to determine affected channel(s).

CAUTION

IRM range switches should be repositioned carefully in order to prevent a reactor scram.

3. Reposition affected IRM range switch to next higher range.
4. If a sudden rise in indicated reactor power occurred on more than one IRM channel, verify correct rod withdrawal sequence is being used and insert in-sequence control rods as necessary to turn power rise.
5. If IRM detector failure or circuit malfunction is suspected, perform the following:
 - a. Refer to Technical Specification 3.3.1.1 and TRM 3.3 for IRM channel operability requirements.
 - b. Notify Unit CRS.
 - c. Bypass affected channel using IRM bypass switch.
 - d. Ensure a WR is prepared.

12. 215004 1

Which one of the following identifies the criteria for when SRM detectors can **first** begin to be withdrawn from the core IAW OGP-02, *Approach To Criticality And Pressurization Of The Reactor*?

- A. When all IRMs are above range 3.
- B. When SRM counts reach 2×10^5 counts.
- C. When RTRCT PERMIT light is illuminated.
- D. When SRM/IRM overlap has been established.

Answer: D

K/A:

215004 Source Range Monitor System

K5 Knowledge of the operational implications of the following concepts as they apply to SOURCE RANGE MONITOR (SRM) SYSTEM: (CFR: 41.5 / 45.3)

03 Changing detector position

RO/SRO Rating: 2.8/2.8

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing when SRMs can change detector positions.

Pedigree: New

Objective: LOI-CLS-LP-009-A, Obj 3b

List the SRM/IRM system signals/conditions that will cause the following actions and the conditions under which each is bypassed: Retract Permissive (SRM) only (LOCT)

Reference: None

Cog Level: Fundamental

Explanation: When SRM/IRM overlap has been established then SRM can be withdrawn to maintain an indicated SRM count rate between 100 cps and 200,000 cps.

Distractor Analysis:

Choice A: Plausible because this is the logic setpoint at which the SRM can be fully withdrawn

Choice B: Plausible because this is the point at which the SRM must be fully withdrawn.

Choice C: Plausible because this is an indication that is used during the withdrawal of the SRMs

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

NOTE

- SRM/IRM overlap is required to be demonstrated for all operable IRM channels prior to withdrawing SRMs from the fully inserted position. SRM/IRM overlap exists when IRM channels show an increase to at least twice their pre-startup levels and indicate at least 10% of scale (i.e., 12.5 on the digital readout 0-125 scale) before the first SRM channel reaches 5×10^5 cps (Technical Specifications, SR 3.3.1.1.6).....
- If desired, the level of the highest reading IRM (pre-startup) may be doubled and that value used as overlap criteria for all IRMs. This method will allow the operator to compare IRM channel response to a single value which is at least twice the pre-startup levels of the individual IRMs.....

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6.2 Pulling Rods To Achieve Criticality (continued)

NOTE

- With IRM channels below Range 3, the SRM channels will initiate a rod withdrawal block when either of the following conditions exists:
 - ◊ SRM channel indicates greater than 2×10^5 cps
 - ◊ SRM channel indicates less than 10^2 cps with its detector **NOT** full in
- SRM detectors are withdrawn two at a time so that the reactor flux level conditions are being monitored by channels that are **NOT** being affected by detector movement.....

32. **WHEN** SRM/IRM overlap has been confirmed,
THEN withdraw SRM detectors as required to maintain an
indicated SRM count rate between 10^2 cps and 2×10^5 cps.....

CAUTION

Repositioning IRM range switches is performed by one operator, using one hand, on one trip system at a time {8.1.6}.....

33. As reactor power rises, reposition the IRM range switches to maintain IRM indication on recorders between 15 and 50 on the 0-125 scale.
34. **WHEN** all OPERABLE IRM channels are above Range 3 **AND** prior to reaching Range 7,
THEN fully withdraw all SRM detectors

13. 215005 1

Which one of the following identifies the power supply to the APRM channel NUMACs?

- A. All APRM channels receive 120 VAC power from UPS
- B. All APRM channels receive 120 VAC power from both RPS Bus A and RPS Bus B
- C. APRM Channels 1 & 3 receive power from ONLY 120 VAC RPS Bus A
APRM Channels 2 & 4 receive power from ONLY 120 VAC RPS Bus B
- D. APRM Channels 1 & 3 receive power from Division I 24/48 VDC
APRM Channels 2 & 4 receive power from Division II 24/48 VDC

Answer: B

K/A:

215005 Average Power Range Monitor/Local Power Range Monitor

K2 Knowledge of electrical power supplies to the following: (CFR: 41.7)

02 APRM channels

RO/SRO Rating: 2.6/2.8

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the power supply to the NUMACs.

Pedigree: Modified from 2015 NRC Exam

Objective: LOI-CLS-LP-09.6, Objective 7a

Describe the operational relationships between the PRNMS and the following:
Reactor Protection System

Reference: None

Cog Level: Fundamental

Explanation: Each APRM channel NUMAC is equipped with a dual power supply arrangement with one supply from RPS Bus A and the other supply from RPS Bus B. All four APRM channels maintain power on loss of either supply as long as the other supply is available

Distractor Analysis:

Choice A: Plausible because UPS supplies power to the APRM ODA and recorder

Choice B: Correct Answer, see explanation.

Choice C: Plausible because this is the power supply arrangement for the voters.

Choice D: Plausible because other ranges of nuclear instrumentation (SRM/IRM) receive their power from here.

SRO Basis: N/A

2015 Exam Question:

Which one of the following is the power supply to APRM Channel 4 NUMAC on P608?

- A. 120 VAC RPS
- B. 120 VAC UPS
- C. 24/48 VDC Div I
- D. 24/48 VDC Div II

2.8.8 PRNMS Power Supplies

The Power Range Neutron monitoring System uses one Quadruple Voltage Power Supply (QLVPS) chassis and four Dual Low Voltage Power Supplies (DLVPS), one for each bay of the PRNMS panel, to provide redundant power to the NUMAC instruments. These LVPS convert 120 VAC to low voltage DC. See Figure 09.6-14.

Each APRM instrument receives power from two power supplies, LVPS 1 and LVPS 4. LVPS 1 is fed from RPS Bus A while LVPS 4 is fed from RPS Bus B. Therefore, a loss of an RPS Bus will not affect operation of the APRM NUMACS. Each RBM instrument also

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4.3.1 Reactor Protection System

APRM channels provide signals to open contacts in the scram trip logic of the RPS System under various conditions discussed previously.

The RPS System provides power to each of the four APRM instruments, which in turn provide power to all subsystems driven from the APRM instruments or NUMAC. Both RPS busses, A and B, provide power to each APRM instrument, as well as, each RBM. Therefore, a loss of one RPS bus will not affect operation of the PRNMS.

The reactor mode switch provides input to each APRM instrument to determine when to enforce the fixed or flow biased scram trip and rod block settings. OPRM circuitry is enabled only when power/flow conditions are met and the mode switch in RUN.

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14. 215005 2

Which one of the following completes the statement below?

An APRM must have at least ____ (1) ____ of the assigned LPRMs operable with at least ____ (2) ____ LPRM inputs per axial level operable.

- A. (1) 18
(2) 2
- B. (1) 18
(2) 3
- C. (1) 17
(2) 2
- D. (1) 17
(2) 3

Answer: D

K/A:

215005 Average Power Range Monitor/Local Power Range Monitor

K5 Knowledge of the operational implications of the following concepts as they apply to AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM: (CFR: 41.5 / 45.3)

04 LPRM detector location and core symmetry

RO/SRO Rating: 2.9/3.2

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the knowledge of the LPRM inputs per axial level that are required and the minimum number of inputs for core symmetry that are required.

Pedigree: New

Objective: LOI-CLS-LP-09.6, Obj. 13b

Given plant conditions, predict the effect of a single or multiple LPRM failure on the following:
APRM

Reference: None

Cog Level: Fundamental

Explanation: An APRM channel must have a minimum of 3 LPRM inputs per level and a total of 17 LPRM inputs to be operable

Distractor Analysis:

Choice A: Plausible because an OPRM requires 18 LPRMs with at least 2 LPRM inputs to each cell.

Choice B: Plausible because an OPRM requires 18 LPRMs and 3 per level is correct for APRMS.

Choice C: Plausible because 17 is correct for APRMs and OPRMs require at least 2 LPRM inputs to each cell.

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

4.2.1 LPRM

LPRM System failure, depending on the extent or failure type, can cause the loss of LPRM functions including the loss of indication, incorrect operation of rod block or scram protection. Generally, the following symptoms are exhibited for LPRM failure for the affected LPRM:

- Indicates upscale, accompanied by an upscale alarm.
- Indicates downscale, accompanied by a downscale alarm.
- Indicator reads erratically.

The results of an LPRM failure may lead to an APRM or OPRM becoming inoperable. An APRM channel must have a minimum of 3 LPRM inputs per level and a total of 17 LPRM inputs to be operable.

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An OPRM cell must have a minimum of 2 LPRM inputs to each cell and a total of 18 cells to be operable.

15. 217000 1

Following a loss of feedwater, RCIC automatically initiated and subsequently tripped on low suction pressure.

Current plant status is:

Reactor water level is 150 inches

RCIC flow controller in Manual set at 200 gpm

Subsequently, the following actions are taken:

RCIC suction transferred to Torus

E51-V8, Turbine Trip and Throttle Valve is closed

E51-V8 is re-opened

PF push button on the RCIC flow controller is depressed

Which one of the following identifies the indicated flow on the RCIC flow controller that would be observed for these conditions?

A. 0 gpm

B. 200 gpm

C. 400 gpm

D. 500 gpm

Answer: ~~C~~ **A**

K/A:

217000 Reactor Core Isolation Cooling System

A1 Ability to predict and/or monitor changes in parameters associated with operating the REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) controls including: (CFR: 41.5 / 45.5)

01 RCIC flow

RO/SRO Rating: 3.7/3.7

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the prediction of what RCIC flow will be when operating the RCIC system.

Pedigree: New

Objective: CLS-LP-016-A, Obj.16c

Describe how the following evolutions are performed during operation of the RCIC System:
Adjusting RCIC flow in the Reactor Level Control mode.

Reference: None

Cog Level: high

changed per exam feedback

Explanation: The RCIC Turbine is provided with a solenoid operated remote electrical tripping device, which when actuated (in this case by low suction pressure), will close the Turbine Trip and Throttle Valve, E51-V8. Resetting of the remote electrical tripping device may be accomplished from the RTGB. The RCIC system is restarted after auto initiation and turbine trip by fully closing the V-8, and re-opening the V-8. Located on the controller face is a PF (programmable function) pushbutton which when depressed an automatic transfer from manual to automatic at a predetermined setpoint of 400 GPM will result. This button (PF) has no function if the controller is already in automatic.

Distractor Analysis:

- Choice A: This is plausible because this answer would be correct for these actions following a high RPV water level trip of RCIC
- Choice B: Plausible because this would be correct if the operator did not depress the PF pushbutton.
- Choice C: Correct Answer, see explanation.
- Choice D: Plausible because the PF push button would raise RCIC flow to rated (400 gpm) and not maximum per procedure (500 gpm). Achieving 500 gpm would require the flow control setpoint to be manually raised.

SRO Basis: N/A

From SD-16:

Also located on the controller face is a PF (programmable function) pushbutton. When depressed an automatic transfer from MANUAL to AUTOMATIC at a predetermined setpoint of 400 GPM will result. NOTE: This button (PF) has no function if the controller is already in AUTOMATIC.

For various internal processing failures, the controller is designed to hold the last output and automatically switch to MANUAL giving the operator manual control capability. Barring operator intervention, this failure could result in rising or lowering RCIC flow and would be indicated by the red FAIL lamp on the controller face. Failure display code can then be checked using the side panel keypad. A down scale failure of the controller is possible and would result in turbine operation at well below the normal minimum speed of 2000 rpm. An upscale failure is highly unlikely but would result in turbine speed at or above the maximum running speed of 4600 rpm. Failures associated with the dynamic response are also highly unlikely but would produce either excessively sluggish responses or dynamic instability (full scale oscillations) when in the Automatic mode. Programmable settings internal to the controller are maintained during a loss of 24 Vdc power supply by a lithium battery. If this battery voltage drops to a pre-determined low value, the yellow ALARM light will flash. If the input signals are not within the limits of -6.3% to 106.3% or if the input or output signals are not intact, the Yellow ALARM light will come on solid.

<< RCIC Instructional Aid for EOPs >>

RESTARTING RCIC AFTER AUTO INITIATION AND TURBINE TRIP

(2OP-16 Section 8.7)

1. **ENSURE THE E51-V8 (VALVE POSITION) AND E51-V8 (MOTOR OPERATOR) ARE CLOSED.**
2. **PLACE RCIC FLOW CONTROL IN MANUAL (M) AND ADJUST OUTPUT TO 0%.**.....
3. **JOG OPEN E51-V8 UNTIL THE TURBINE SPEED IS CONTROLLED BY THE GOVERNOR.**.....
4. **FULLY OPEN E51-V8.**
5. **SLOWLY RAISE TURBINE SPEED UNTIL FLOW RATE OF AT LEAST 120 GPM.**
6. **ENSURE E51-F019 IS CLOSED WITH FLOW GREATER THAN 80 GPM.**.....
7. **WHEN SYSTEM CONDITIONS ARE STABLE, THEN ADJUST SETPOINT, AND TRANSFER RCIC FLOW CONTROL TO AUTO (A).**
8. **SLOWLY ADJUST FLOW RATE USING RCIC FLOW CONTROL IN AUTO (A).**.....
9. **ENSURE THE FOLLOWING:**
 - BAROMETRIC CNDSR VACUUM PUMP HAS STARTED
 - SBGT STARTED (2OP-10).....
 - SGT-V8 AND SGT-V9 ARE OPEN.....

16. 218000 1

Which one of the following completes both statements below concerning the Automatic Depressurization System (ADS) reactor water level inputs from the Nuclear Boiler System?

The ____ (1) ____ instruments provide LL3 inputs to ADS initiation logic.

The ____ (2) ____ range instruments provide LL1 inputs to ADS logic.

- A. (1) Fuel Zone
(2) Narrow
- B. (1) Fuel Zone
(2) Shutdown
- C. (1) Wide range
(2) Narrow
- D. (1) Wide range
(2) Shutdown

Answer: C

K/A:

217000 Automatic Depressurization System

K1 Knowledge of the physical connections and/or cause-effect relationships between AUTOMATIC DEPRESSURIZATION SYSTEM and the following: (CFR: 41.2 to 41.9 / 45.7 to 45.8)

03 Nuclear boiler instrument system

RO/SRO Rating: 3.7/3.8

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the connection between ADS and level indicators.

Pedigree: New

Objective: LOI-CLS-LP-0001.2, Obj 4a

List the systems which receive input from the Vessel Instrumentation system for the following:
Level signal

Reference: None

Cog Level: Fundamental

Explanation: B21-LT-N031(Wide Range) provide LL3 initiation from N031A and C for Logic B and from N031B and D for Logic A.
B21-LT-N042 (Narrow Range) provide LL1 confirmatory from N042A for Logic B and from N042B for Logic A.

Distractor Analysis:

Choice A: Plausible because the fuel zone instruments covers LL3 (45 inches) and the second part is correct.

Choice B: Plausible because fuel zone instruments covers LL3 (45 inches) and the shutdown range covers the LL1 setpoint (166 inches).

Choice C: Correct Answer, see explanation.

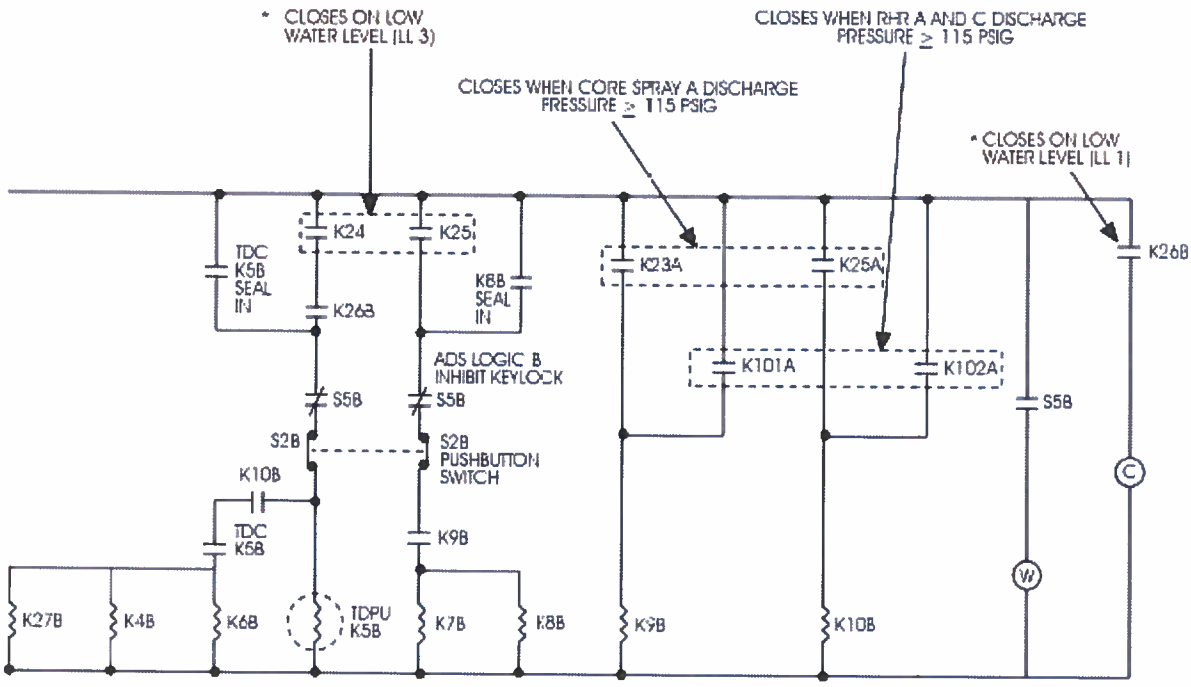
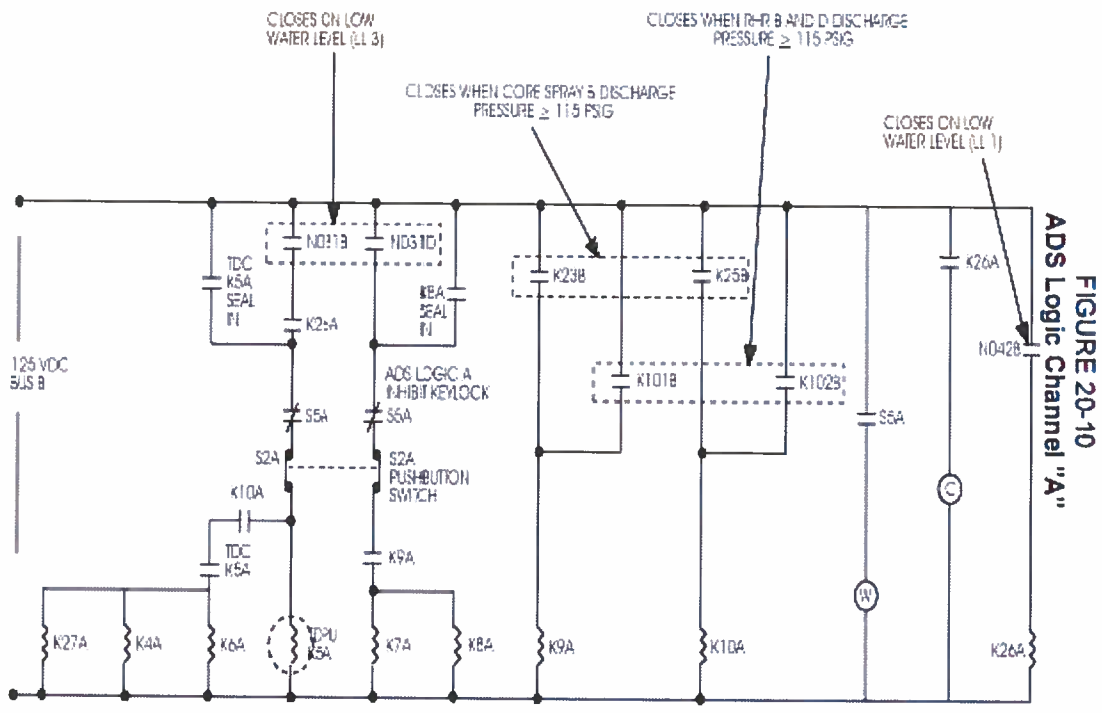
Choice D: Plausible because the wide range is correct and the shutdown range covers the LL1 setpoint (166 inches).

SRO Basis: N/A

4.1.2 Automatic Operation

The ADS logic automatically opens the ADS valves in the event the HPCI System fails to maintain reactor level during a LOCA. The seven ADS valves open automatically when all the following conditions are met on either of two logic channels (A or B) associated with ADS:

- Reactor low water level (LL3 from B21-LTS-N031A and C or B and D).
- Reactor confirmatory low water level (LL1 from B21-LTS-N042A or B).
- Operation of both pumps of an RHR loop or one Core Spray pump as indicated by a pump discharge pressure of 115 psig (either E11-PS-N016A AND C or B AND D or E11-PS-N020A AND C or B AND D for RHR or either E21-PS-N008A AND E11-PS-N009A or E21-PS-N008B AND E21-PS-N009B for CS).
- A time delay of 83 seconds has elapsed (timer B21-TDPU-K5A or B).
- AUTO/INHIBIT switches in AUTO for either or both logic channels A and B.



17. 218000 2

Unit One is operating at power with Core Spray Pump 1B under clearance.
A small break LOCA occurs simultaneously with a Loss of Off-site Power to both units.

DG1 and DG4 fail to start and tie onto their respective E bus.

The following plant conditions exist on Unit One:

A-03 (5-1) <i>Auto Depress Timers Initiated</i>	In alarm
A-03 (6-9) <i>Reactor Low Wtr Level Initiation</i>	In alarm
RPV pressure	600 psig
Drywell pressure	13 psig

Which one of the following completes both statements below?

ADS (1) auto initiate.

After ADS is initiated (either automatically or manually), RPV water level (2) be restored with **BOTH** RHR Loops.

- A. (1) will
 (2) will
- B. (1) will
 (2) will NOT
- C. (1) will NOT
 (2) will
- D. (1) will NOT
 (2) will NOT

Answer: D

K/A:

218000 Automatic Depressurization System

K3 Knowledge of the effect that a loss or malfunction of the AUTOMATIC DEPRESSURIZATION SYSTEM will have on following: (CFR: 41.7 / 45.4)

01 Restoration of reactor water level after a break that does not depressurize the reactor when required

RO/SRO Rating: 4.4/4.4

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the knowledge of the effect of the malfunction on auto initiation of ADS and how level will be restored.

Pedigree: Last used on 10-1 NRC exam

Objective: CLS-LP-20 Obj. 16b

Given plant conditions, predict how the following will be affected by a loss or malfunction of ADS/SRVs: Reactor water level

Reference: None

Cog Level: high

Explanation: With the loss of offsite power and 1B CS pump under clearance this would leave only one pump available in each RHR loop. Therefore ADS logic is lost. Level will continue to lower until the ADS valves are manually opened (emergency depressurization) at which time the running low pressure pumps will be able to add water. Injection would be from the A Loop of RHR as the B Loop injection valves do not have power.

Distractor Analysis:

Choice A: Plausible because ADS does have initiation conditions except that the logic will not have the appropriate pumps lined up for injection. B Loop of RHR does not have power to the injection valves

Choice B: Plausible because ADS does have initiation conditions except that the logic will not have the appropriate pumps lined up for injection. B Loop of RHR does not have power to the injection valves

Choice C: Plausible because ADS will not auto initiate but the B Loop of RHR does not have power to the injection valves. B Loop of RHR does not have power to the injection valves

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

SD-20

4.1.2 Automatic Operation

The ADS logic automatically opens the ADS valves in the event the HPCI System fails to maintain reactor level during a LOCA. The seven ADS valves open automatically when all the following conditions are met on either of two logic channels (A or B) associated with ADS:

- Reactor confirmatory low water level (LL1 from B21-LTS-N042A or B).
- Operation of both pumps of an RHR loop or one Core Spray pump as indicated by a pump discharge pressure of 115 psig (either E11-PS-N016A AND C or B AND D or E11-PS-N020A AND C or B AND D for RHR or either E21-PS-N008A AND E11-PS-N009A or E21-PS-N008B AND E21-PS-N009B for CS).
- A time delay of 83 seconds has elapsed (timer B21-TDPU-K5A or B).
- AUTO/INHIBIT switches in AUTO for either or both logic channels A and B. Reactor low water level (LL3 from B21-LTS-N031A and C or B and D).

18. 223001 1

Which one of the following completes the statement below concerning the Fuel Zone instruments, N036 and N037, during a loss of drywell cooling?

The reference leg density will _____ (1) _____ causing the indicated level to read _____ (2) _____ than actual level.

- A. (1) rise
(2) higher
- B. (1) rise
(2) lower
- C. (1) lower
(2) higher
- D. (1) lower
(2) lower

Answer: C

K/A:

223001 Primary Containment System and Auxiliaries

K3 Knowledge of the effect that a loss or malfunction of the PRIMARY CONTAINMENT SYSTEM AND AUXILIARIES will have on following: (CFR: 41.7 / 45.4)

09 Nuclear boiler instrumentation

RO/SRO Rating: 2.8/3.1

Tier 2 / Group 2

K/A Match: This meets the K/A because it is testing the knowledge of a loss of DW cooling has on instrumentation.

Pedigree: Bank

Objective: LOI-CLS-LP-001.2, Obj. 05c

Explain the effect that the following will have on reactor vessel level and/or pressure indications: High containment (primary and secondary) temperatures.

Reference: None

Cog Level: High

Explanation: The reference leg length is longer than the variable leg length, therefore secondary temp increasing makes the instrument read higher than actual level.

Distractor Analysis:

Choice A: Plausible because density is a function of temperature and the temperature is rising. The second part is correct.

Choice B: Plausible because density is a function of temperature and the temperature is rising. The second part is plausible because if the first part is seen as right then this would be correct.

Choice C: Correct Answer, see explanation.

Choice D: Plausible because the first part is correct and the second part is the opposite of the answer.

SRO Basis: N/A

19. 223002 1
 Unit One is at 75% power.
 The 1A RPS MG set trips.
 No operator actions have been taken.

Which one of the following identifies the Main Steam Line Isolation Valve (MSIV) logic lamp status on P601 panel?

	<u>Inboard MSIV Logic</u>		<u>Outboard MSIV Logic</u>	
	DC	AC	DC	AC
A.				
B.				
C.				
D.				

Answer: C

K/A:

223002 Primary Containment Isolation System/Nuclear Steam Supply Shut-Off

A1 Ability to predict and/or monitor changes in parameters associated with operating the PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF controls including: (CFR: 41.5 / 45.5)

01 System indicating lights and alarms

RO/SRO Rating: 3.5/3.5

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the ability to predict the light status on a loss of a power supply

Pedigree: New

Objective: LOI-CLS-LP-012, Objective 12

Given plant conditions, determine how the following will affect PCIS:
 c. Loss of RPS

Reference: None

Cog Level: High

Explanation: See Notes Section. RPS A provides power to PCIS Logic A. PCIS Logic A is Inboard AC and Outboard DC indicating lights on P601.

Distractor Analysis:

Choice A: Plausible because first part is correct. Outboard light is DC.

Choice B: Plausible because second part is correct. Inboard light is AC.

Choice C: Correct Answer, see explanation.

Choice D: Plausible because the lights are just reversed. This would be true for Loss of RPS B.

SRO Basis: N/A

4.3.10 AC Distribution

RPS MG sets supply power to the following PCIS related components:

RPS Bus A

PCIS Trip System A logic

PCIS Trip Channels A1 and A2 logic

Inboard isolation logic for valves:

Inboard reactor water sample valve

Main Steam Line drains

Shutdown cooling suction

RWCU

Inboard RHR Sample valves

Drywell floor and equipment drains

CAC/CAMS/PASS for LL1 and High Drywell pressure

Valve operating power:

Inboard reactor water sample valve

Inboard RHR Sample valves

Drywell floor and equipment drains

Inboard "AC" MSIV solenoids

Reactor Building Vent Exh Rad Monitor N010A

Main Steam Line Rad Monitors A and C (alarm function only)

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P601 panel. These lights are arranged above the MSIV control switches as follows:

TABLE 25-3, MSIV ISOLATION SIGNAL STATUS

Light	INBD DC	INBD AC	OUTBD DC	OUTBD AC
Solenoid Power	125 VDC "A"	RPS "A"	125 VDC "B"	RPS "B"
PCIS Logic	B	A	A	B

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20. 234000 1

Which one of the following identifies the effect if both Refuel Bridge hoist grapple hooks are not open five seconds **after** placing the Engage/Release switch to Release?

- A. Fuel Hoist Interlock is generated.
- B. Engage amber light extinguishes.
- C. Fault lockout is generated.
- D. Grapple hooks will reclose.

Answer: D

K/A:

234000 Fuel Handling

A3 Ability to monitor automatic operations of the FUEL HANDLING EQUIPMENT including:
(CFR: 41.7 / 45.7)

01 Crane/refuel bridge movement

RO/SRO Rating: 2.6/3.1

Tier 2 / Group 2

K/A Match: This meets the K/A because it is testing the ability to monitor the crane grapple hooks auto re-close feature.

Pedigree: New

Objective: LOI-CLS-LP-58.1, Obj 13

Describe the operation of the grapple if the ENGAGE/RELEASE Switch is positioned to RELEASE and both grapple hooks are not open within 5 seconds when the main hoist is loaded.

Reference: None

Cog Level: Fundamental

Explanation: If the grapple does not indicate released (open) within 5 seconds, the solenoid is de-energized and the grapple hooks re-close. The switch must then be taken to the ENGAGE position to reset the logic prior to making another attempt to release the grapple.

Distractor Analysis:

Choice A: Plausible because a Fuel Hoist Interlock is generated for a number of reasons.

Choice B: Plausible because this is an indication of operation of the grapple hooks.

Choice C: Plausible because a fault lockout is generated for a number of reasons.

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

21. 239002 1

Which one of the following identifies the SRV component that will prevent siphoning of water into the SRV discharge piping?

- A. Vacuum breaker
- B. Check Valve
- C. T-Quencher
- D. Sparger

Answer: A

K/A:

239002 Safety Relief Valves

K4 Knowledge of RELIEF/SAFETY VALVES design feature(s) and/or interlocks which provide for the following: (CFR: 41.7)

03 Prevents siphoning of water into SRV discharge piping and limits loads on subsequent actuation of SRV's

RO/SRO Rating: 3.1/3.3

Tier 2 / Group 1

K/A Match: THIS QUESTION WAS PRE-SUBMITTED FOR APPROVAL.

This meets the K/A because it is testing the knowledge of the design feature that prevents siphoning of water.

Pedigree: New

Objective: LOI-CLS-LP-020, Obj. 7d

State the purpose of the following: SRV tailpipe vacuum breakers

Reference: None

Cog Level: Fundamental

Explanation: Following operation of the valve, a vacuum is created in the SRV tailpipe as the steam condenses. Water in the line above the suppression pool water level would cause excessive pressure at the SRVs discharge when and if the valve reopened. For this reason, a vacuum relief valve is provided on each SRV tailpipe to prevent drawing water up into the line due to this steam condensation following SRV operation.

Distractor Analysis:

Choice A: Correct Answer, see explanation.

Choice B: Plausible because this is a component that is typically used to provide an anti-siphon break.

Choice C: Plausible because this is a component on the SRV that the steam discharges through and has holes in the pipe which could be thought of an anti-siphon type break.

Choice D: Plausible because this is a component on the SRV that the steam discharges through and has holes throughout the pipe which could be thought of an anti-siphon type break. (The supplemental fuel pool cooling sparger has this design to prevent siphoning of water)

SRO Basis: N/A

22. 241000 1

Which one of the following identifies the criteria for tripping the main turbine IAW the Unit Two Scram Immediate Actions of 0EOP-01-UG, *Users Guide*?

- A. When APRM's indicate downscale trip.
- B. When steam flow is less than 3 Mlbs/hr.
- C. When reactor water level is 160 inches and rising.
- D. When reactor mode switch is placed in SHUTDOWN.

Answer: A

K/A:

241000 Reactor/Turbine Pressure Regulating System

A4 Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)

14 Turbine trip

RO/SRO Rating: 3.8/3.7

Tier 2 / Group 2

K/A Match: This meets the K/A because it is testing the ability of tripping the turbine from the control room.

Pedigree: New

Objective: LOI-CLS-LP-300-C, Obj. 2
List the immediate operator actions for a reactor scram.

Reference: None

Cog Level: Fundamental

Explanation: The main turbine is tripped after reactor power is below 2% which is indicated by APRM downscale trip lights illuminated.

Distractor Analysis:

Choice A: Correct Answer, see explanation.

Choice B: Plausible because this is a criteria for placing the mode switch to shutdown which is an immediate operator action.

Choice C: Plausible because this is a criteria for a reactor feed pump which is an immediate operator action.

Choice D: Plausible because this is an immediate operator action that is performed on the scram.

SRO Basis: N/A

Unit 2 Scram Immediate Actions (0EOP-01-UG)

SCRAM IMMEDIATE ACTIONS

1. Ensure SCRAM valves OPEN by manual SCRAM or ARI initiation.
2. **WHEN** steam flow less than 3×10^6 lb/hr,
THEN place reactor mode switch in SHUTDOWN.
3. **IF** reactor power below 2% (APRM downscale trip),
THEN trip main turbine.
4. Ensure master RPV level controller setpoint at +170 inches.
5. **IF:**
 - Two reactor feed pumps running**AND**
 - RPV level above +160 inches**AND**
 - RPV level rising.**THEN** trip one.

23. 245000 1

Which one of the following completes both statements below concerning the Main Generator Voltage Regulator?

The automatic voltage regulator maintains a constant generator ____ (1) ____ voltage.

While in the automatic voltage regulation mode, the manual voltage regulator setting ____ (2) ____ automatically follow the automatic setpoint.

- A. (1) field
(2) does
- B. (1) field
(2) does NOT
- C. (1) terminal
(2) does
- D. (1) terminal
(2) does NOT

Answer: D

K/A:

245000 Main Turbine Generator and Auxiliary Systems

K4 Knowledge of MAIN TURBINE GENERATOR AND AUXILIARY SYSTEMS design feature(s) and/or interlocks which provide for the following: (CFR: 41.7)

07 Generator voltage regulation

RO/SRO Rating: 2.5/2.6

Tier 2 / Group 2

K/A Match: This meets the K/A because this is testing the design of the auto regulator as to what it controls and whether the manual regulator automatically follows the auto regulator.

Pedigree: Bank

Objective: LOI-CLS-LP-027.0, Obj 7c

Given a simplified diagram of the Main Generator Voltage Regulator, explain how:

- a. the MANUAL regulator controls Generator output voltage
- b. the AUTOMATIC regulator controls Generator output voltage
- c. to transfer from one Voltage Regulator to the other

Reference: None

Cog Level: Fundamental

Explanation: The AVR controls terminal voltage while the manual regulator controls field voltage. The manual voltage regulator does not track the setpoint of the AVR, this must be manually adjusted in the control room.

Distractor Analysis:

Choice A: Plausible because the MVR controls field voltage and the DG manual voltage regulator does track the auto regulator setpoint.

Choice B: Plausible because the MVR controls field voltage and the second part is correct.

Choice C: Plausible because the first part is correct and the DG manual voltage regulator does track the auto regulator setpoint.

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

2.15 Excitation Control (Refer to Figure 27-12)

The Silicon Controlled Rectifier (SCR) bridge circuit is used as a variable DC voltage source to control the exciter field current as required by the AC or DC regulator. The source of the control signal for the SCRs is determined by the Regulator Mode Selector Switch (43CS) located on Panel XU-1. When Manual is selected, the DC regulator maintains a constant generator field voltage that is determined by the Manual Volts Adjust Rheostat. When the Automatic regulator is selected, the AC regulator maintains a constant generator terminal voltage.

2.17.8 Generator Voltage Regulator Differential Voltmeter

This is a standard voltmeter that measures the magnitude and polarity of the difference between the DC regulator output signal and the AC regulator output signal. When shifting control from the DC voltage regulator to the AC regulator or back, it is important to ensure that the signals are the same. As an example, if the meter reads to the clockwise of zero, then the manual regulator output is less than the automatic regulator. If the meter reads counter clockwise of zero, then the manual signal is larger than the automatic signal. The meter indicates 0-10 volts in both directions.

Failure to have the regulator control signals matched when shifting regulator modes may result in transients on the generator output. The severity of the transient would be determined by the direction and magnitude of the mismatch.

24. 259001 1

Unit One Reactor Feed Pump 1B is operating in automatic DFCS control at 4500 RPM. The DFCS control signal to Reactor Feed Pump 1B woodward governor **immediately** fails downscale.

Which one of the following completes the statement below?

Reactor Feed Pump 1B speed will:

- A. lower to 0 rpm.
- B. lower to 1000 rpm.
- C. lower to 2450 rpm.
- D. remain at 4500 rpm.

Answer: D

K/A:

259001 Reactor Feedwater System

A1 Ability to predict and/or monitor changes in parameters associated with operating the REACTOR FEEDWATER SYSTEM controls including: (CFR: 41.5 / 45.5)

04 RFP turbine speed: Turbine-Driven-Only

RO/SRO Rating: 2.8/2.7

Tier 2 / Group 2

K/A Match: This meets the K/A because it is testing the ability to predict the response in parameters.

Pedigree: New

Objective: LOI-CLS-LP-032.2, Obj. 13d

Given plant conditions and one of the following events, use plant procedures to determine the actions required to control and/or mitigate the consequences of the event:
Loss of signal interface between controllers and processor.

Reference: None

Cog Level: High

Explanation: If RFPT A(B) *MAN/DFCS* selector switch is in *DFCS*, and *DFCS* control signal subsequently drops below 2450 rpm, or increases to greater than 5450 rpm, then Woodward 5009 digital controls will automatically assume RFPT speed control and maintain current pump speed.

Distractor Analysis:

Choice A: Plausible if the student believes that a loss of input signal will cause the controller to use 0 as the input for the speed of the pump. (i.e. HPCI/RCIC controllers will fail to zero)

Choice B: Plausible because an idled RFP is maintained at 1000 rpm.

Choice C: Plausible because 2450 is the low end of the controller function.

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

NOTE: If RFPT A(B) *MAN/DFCS* selector switch is in *DFCS*, and *DFCS* control signal subsequently drops below 2450 rpm, or increases to greater than 5450 rpm, then Woodward 5009 digital controls will automatically assume RFPT speed control and maintain current pump speed. In this condition, the RFPT will only respond to *LOWER/RAISE* speed control switch commands until *MAN/DFCS* selector switch is placed in *MAN*, *DFCS CTRL RESET* pushbutton is depressed, and *MAN/DFCS* selector switch returned to *DFCS*.

- 3.13 Plant management has recommended one RFPT be idled at 1000 rpm with the discharge valve closed, during conditions with one RFPT in service.

25. 259002 1

Which one of the following completes both statements below concerning the reactor feed pump turbine (RFPT) DFCS controls?

During a RFPT startup, transfer to DFCS control is performed when RFPT speed is approximately ____ (1) ____.

DFCS will automatically control the speed of the RFPT up to ____ (2) ____.

- A. (1) 1000 rpm
(2) 5450 rpm
- B. (1) 1000 rpm
(2) 6150 rpm
- C. (1) 2550 rpm
(2) 5450 rpm
- D. (1) 2550 rpm
(2) 6150 rpm

Answer: C

K/A:

259002 Reactor Water Level Control System

A3 Ability to monitor automatic operations of the REACTOR WATER LEVEL CONTROL SYSTEM including: (CFR: 41.7 / 45.7)

01 Runout flow control

RO/SRO Rating: 3.0/3.0

Tier 2 / Group 1

K/A Match: This meets the K/A because this is testing the upper limit of the auto (DFCS) controls which in essence prevent pump runout of the reactor feed pumps.

Pedigree: new

Objective: LOI-CLS-LP-032.2, Obj. 5d

Describe the operation of the DFCS in the following operating modes:
Master Level Control Mode (auto and manual)

Reference: None

Cog Level: Fundamental

Explanation: DFCS will be placed into service with the manual output set at 2550 RPM. The DFCS system will control the RFPT speed from 2450 - 5450 RPMs

Distractor Analysis:

Choice A: Plausible because 1000 RPM is the idle speed of the RFPT and the second part is correct.

Choice B: Plausible because 1000 RPM is the idle speed of the RFPT and 6150 is the overspeed setpoint of the woodward controls.

Choice C: Correct Answer, see explanation.

Choice D: Plausible because the first part is correct and 6150 is the overspeed setpoint of the woodward controls.

SRO Basis: N/A

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6.1.5 Reactor Feed Pump Startup from Idle Speed to Injection at Low Pressure Conditions (continued)

NOTE

When using RFPT A(B) Lower/Raise speed control switch, reactor feed pump turbine speed will change at a rate of 50 rpm per second. If switch is held in LOWER or RAISE for greater than 3 seconds, the rate of change will rise to 375 rpm per second.

- 6. **Maintain RFPT A(B) discharge pressure at least 100 psig greater than reactor pressure by adjusting RFPT A(B) Lower/Raise speed control switch until RFPT speed is approximately 2550 rpm.**

END R.M. LEVEL R3 REACTIVITY EVOLUTION

- 7. **Direct** Radwaste Operator to monitor effluent conductivity for each in service CDD.
- 8. **WHEN** RFPT A(B) speed is approximately 2550 rpm, **THEN raise** C32-SIC-R601A(B) [RFPT A(B) Sp Ctl] output to match DFCS Stpt and Speed Stpt on Panel P603 to within 100 rpm.

NOTE

- **When RFPT A(B) Man/DFCS control switch is placed in DFCS, C32-SIC-R601A(B) [RFPT A(B) Sp Ctl] will control RFPT speed.**
- When RFPT A(B) Man/DFCS control switch is placed in DFCS, and DFCS is in control, the RFPT A(B) DFCS Ctrl light will be ON.
- **If RFPT A(B) Man/DFCS selector switch is in DFCS and DFCS control signal subsequently drops to less than 2450 rpm or rises to greater than 5450 rpm, Woodward 5009 digital controls will automatically assume RFPT speed control and maintain current pump speed. In this condition, the RFPT will only respond to Lower/Raise speed control switch commands until the Man/DFCS selector switch is placed in MAN, DFCS Ctrl Reset pushbutton is depressed, and the Man/DFCS selector switch returned to DFCS.**

- 9. **Confirm** the following RFPT A(B) speed signals on Panel P603 agree within 100 rpm:
 - DFCS Stpt (speed demand from DFCS)
 - Speed Stpt (speed demand from 5009 control)
 - Act Spd (actual RFPT speed)
- 10. **Place Man/DFCS control switch in DFCS.**

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3.0 PRECAUTIONS AND LIMITATIONS (continued)

5. Any of the following conditions will automatically trip a reactor feed pump turbine:

- RFPT Woodward 5009 overspeed greater than or equal to 6150 rpm.....

26. 261000 1

Unit One primary containment venting is being performed IAW 1OP-10, *Standby Gas Treatment System Operating System*, with the following plant status:

1-VA-1F-BFV-RB, SBTG DW Suct Damper	Open
1-VA-1D-BFV-RB, Reactor Building SBTG Train 1A Inlet Valve	Closed
1-VA-1H-BFV-RB, Reactor Building SBTG Train 1B Inlet Valve	Closed

Which one of the following completes both statements below concerning the predicted SBTG response if drywell pressure rises to 1.9 psig?

1-VA-1F-BFV-RB ____ (1) ____.

Both 1-VA-1D-BFV-RB and 1-VA-1H-BFV-RB ____ (2) ____.

- A. (1) auto closes
(2) auto open
- B. (1) auto closes
(2) remain closed
- C. (1) remains open
(2) auto open
- D. (1) remains open
(2) remain closed

Answer: A

K/A:

261000 Standby Gas Treatment System

A4 Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)

02 Suction valves

RO/SRO Rating: 3.1/3.1

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the ability to monitor SBTG suction valves.

Pedigree: Last used on 2014 NRC Exam

Objective: LOI-CLS-LP-004.1, Obj 5

List the signals and setpoints that will cause a Secondary Containment isolation

Reference: None

Cog Level: High

Explanation: The filter train fans will automatically start on High Drywell Pressure. The following actions occur: 1) SBTG Reactor Building suction dampers (1D-BFV-RB and 1H-BFV-RB) open, 2) SBTG DW Suct Damper (F-BFV-RB) closes. The SBTG Train A/B Suction & Discharge Valves on U1 do not auto open. These valves on U2 do auto open, so there could be a misconception on these valves (inlet vs. suction dampers).

Distractor Analysis:

Choice A: Correct Answer, see explanation

Choice B: Plausible because 1F does auto close and SBGT Train 1A/B Suction Valves (1C & 1E) on Unit One only do not auto open

Choice C: Incorrect since SBGT will auto realign from primary containment to the Reactor Building on system initiation

Choice D: Incorrect since SBGT will auto realign from primary containment to the Reactor Building on system initiation and SBGT Train 1A/B Suction Valves (1C & 1E) on Unit One only do not auto open

SRO Basis: N/A

2.1.6 Fan

A 100% capacity, heavy-duty, industrial type Fan and motor assembly is provided in each SBGT filter train. Each Fan will produce the required 2700 - 3300 scfm flow through its associated filter train.

Each Fan is driven by a direct-drive AC motor which is energized from a redundant and separate emergency power supply. The Unit 1 A and B Fans are powered from 480 VAC MCCs 1XE and 1XF respectively and Unit 2 A and B Fans from 2XE and 2XF.

The filter train fans may be operated manually from controls located at RTGB XU-51.

The filter train fans will automatically start if any of the following Secondary Containment isolation conditions exist: (Figure 10-2)

1. Low Reactor Water Level, LL #2
2. High Drywell Pressure
3. Reactor Building Ventilation Radiation (Figure 10-3)

3.2.6 Automatic

1. Upon receipt of an automatic initiation signal both trains of SBGT will start.

Unit 1 ONLY

The dampers associated with Unit 1 SBGT System will receive automatic open signals when an initiation signal is received EXCEPT for the train inlet and outlet dampers, (BFVs-1B, 1C, 1E, and 1G). Should these normally open dampers be manually closed locally via their CLOSE/OPEN pushbuttons, they will NOT automatically reopen and the associated SBGT will not automatically start.

27. 262001 1

Unit One is operating at rated power.

Unit Two is in MODE 5 performing fuel movements.

Which one of the following completes both statements below IAW

Unit One Tech Spec 3.8.1, AC Sources - Operating, LCO statement?

The Unit Two SAT (1) required to be OPERABLE.

 (2) Diesel Generators are required to be OPERABLE.

- A. (1) is
 (2) Two
- B. (1) is
 (2) Four
- C. (1) is NOT
 (2) Two
- D. (1) is NOT
 (2) Four

Answer: B

K/A:

262001 A.C. Electrical Distribution

G2.2.40 Ability to apply Technical Specifications for a system. (CFR: 41.10 / 43.2 / 43.5 / 45.3)

RO/SRO Rating: 3.4/4.7

Tier 2 / Group 1

K/A Match: This meets the K/A because this is testing the items above the line for TS 3.8.1.

Pedigree: New

Objective: LOI-CLS-LP-050, Obj. 16

Given plant conditions, determine whether given plant conditions meet minimum Technical Specifications requirements associated with the 230 KV Electrical Distribution system.

Reference: None

Cog Level: Fundamental

Explanation: Unit One Tech Specs require with Unit One in Mode 1, both SAT's and both UAT's and all four DGs are required to be operable. This would change if Unit One was not in Mode 1, 2, or 3. Unit Two Tech Specs do not require the SAT, it only requires one offsite circuit.

Distractor Analysis:

Choice A: Plausible because the first part is correct and there are only two Unit One DGs but all four are required for the LCO to be met.

Choice B: Correct Answer, see explanation.

Choice C: Plausible because this is the Unit 2 SAT and asking if it is required for Unit 1 TS (it is not required for the Unit Two TS) and whether only the 2 Unit One DGs are required or all four of the DGs.

Choice D: Plausible because this is the Unit 2 SAT and asking if it is required for Unit 1 TS (it is not required for the Unit Two TS) and the second part is correct.

SRO Basis: N/A

AC Sources—Operating
3.8.1

3.8 ELECTRICAL POWER SYSTEMS

3.8.1 AC Sources—Operating

LCO 3.8.1 The following AC electrical power sources shall be OPERABLE:

- a. Two Unit 1 qualified circuits between the offsite transmission network and the onsite Class 1E AC Electrical Power Distribution System;
- b. Four diesel generators (DGs); and
- c. Two Unit 2 qualified circuits between the offsite transmission network and the onsite Class 1E AC Electrical Power Distribution System.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

-----NOTE-----
LCO 3.0.4.b is not applicable to DGs.

28. 262002 1

Unit One is operating at rated power.

Subsequently, E1 breaker AU9, Feed to 480V Substation E5, trips.

Which one of the following completes the statement below?

120V UPS Distribution Panel 1A is:

- A. de-energized.
- B. energized from MCC 1CB.
- C. energized from the Standby UPS.
- D. energized from 250V DC SWBD A.

Answer: D

K/A:

262002 Uninterruptable Power Supply (A.C. /D.C.)

A3 Ability to monitor automatic operations of the UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) including: (CFR: 41.7 / 45.7)

01 Transfer from preferred to alternate source

RO/SRO Rating: 2.8/3.1

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the ability to monitor the transfer to the alternate power source.

Pedigree: New

Objective: LOI-CLS-LP-052, Obj. 5

Given plant conditions, determine the lineup of the primary UPS, the Standby UPS, and their reserve sources.

Reference: None

Cog Level: High

Explanation: The UPS system is normally aligned such the primary inverter is powering UPS loads. The standby inverter is energized but bypassed with the Manual Bypass switch in Bypass Test. The static transfer switch of the Primary inverter (and also the Standby inverter) is receiving an input from the alternate (hard) source. If the primary power source is lost (in this case the loss of E5 which powers MCC CA) the alternate power source from the 250V batteries will keep the loads energized with no need for the inverter to swap to the hard source.

Distractor Analysis:

Choice A: Plausible because the normal power source is lost.

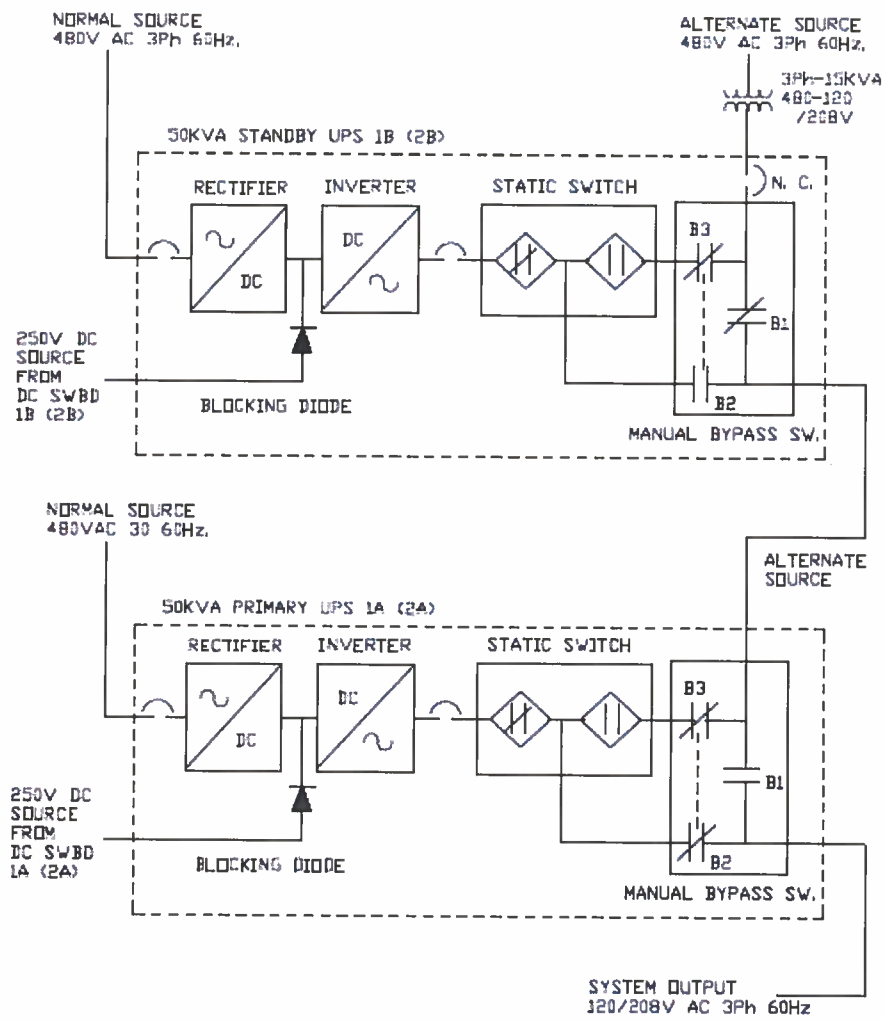
Choice B: Plausible because this is the hard source for the Distribution Panel.

Choice C: Plausible because this is an available power source for the Distribution Panel.

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

FIGURE 52-7
Basic Vital UPS System



29. 215003 2

A reactor shutdown is in progress.

All IRMs on **range 1** reading between 15 and 20.

IRM B detector is failing downscale.

Which one of the following completes both statements below?

IAW A-05 (1-4) *IRM Downscale*, the alarm setpoint is (1) on the 125 scale.

When the IRM downscale alarm is received, a rod block (2) be generated.

- A. (1) 3
 (2) will
- B. (1) 3
 (2) will NOT
- C. (1) 6.5
 (2) will
- D. (1) 6.5
 (2) will NOT

Answer: D

K/A:

215003 Intermediate Range Monitor (IRM) System

K6 Knowledge of the effect that a loss or malfunction of the following will have on the INTERMEDIATE RANGE MONITOR (IRM) SYSTEM : (CFR: 41.7 / 45.7)

04 Detectors

RO/SRO Rating: 3.0/3.0

Tier 2 / Group 1

K/A Match: This meets the K/A because this is testing a failure/malfunction of a detector effect on the IRM system (whether it generates a rod block)

Pedigree: New

Objective: LOI-CLS-LP-009-A, Obj. 3a

List the SRM/IRM system signals/conditions that will cause the following actions and the conditions under which each is bypassed: Rod Blocks

Reference: None

Cog Level: High

Explanation: The downscale setpoint for the IRMs is 6.5 on the 125 scale. The rod block is bypassed under these conditions because the IRMs are all on Range 1.

Distractor Analysis:

- Choice A: Plausible because 3 is the downscale tech spec setpoint for SRMs and if the IRMs were not all on range 1 a rod block would be generated.
- Choice B: Plausible because 3 is the downscale tech spec setpoint for SRMs and the second part is correct.
- Choice C: Plausible because the first part is correct and if the IRMs were not all on range 1 a rod block would be generated.
- Choice D: Correct Answer, see explanation.

SRO Basis: N/A

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IRM DOWNSCALE

AUTO ACTIONS

1. Rod withdrawal block (bypassed when IRM range switch for the affected channel is on Range 1 or when the reactor mode switch is in RUN).
2. Computer printout.

CAUSE

1. IRM channel(s) indicating less than or equal to 6.5 on the 0-125 scale when its range switch is not on Range 1.
2. Improper ranging of IRM channels during reactor startup or shutdown.
3. IRM detector not fully inserted.
4. IRM detector failure.
5. Circuit malfunction.

OBSERVATIONS

1. IRM channel indicating less than or equal to 6.5 on the 0-125 scale.
2. IRM downscale (DN5C) white indicating light is on.
3. ROD OUT BLOCK (A-05 2-2) alarm, if affected IRM channel is not on Range 1.
4. If the affected IRM channel(s) is not on Range 1, the rod withdrawal permissive indicating light will be off.

30. 263000 1

Unit Two is operating at full power when a loss of DC Distribution Panel 4A occurs.

Which one of the following completes both statements below?

RCIC is ____ (1) ____ for injection from the RTGB.

RCIC ____ (2) ____ isolation logic has lost power.

- A. (1) available
(2) inboard
- B. (1) available
(2) outboard
- C. (1) unavailable
(2) inboard
- D. (1) unavailable
(2) outboard

Answer: A

K/A:

263000 D.C. Electrical Distribution

G2.2.37 Ability to determine operability and/or availability of safety related equipment.

(CFR: 41.7 / 43.5 / 45.12)

RO/SRO Rating: 3.6/4.6

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the operability of RCIC/ADS.

Pedigree: New

Objective: LOI-CLS-LP-051, Obj. 7

Given plant conditions, determine the effect that a loss of DC power will have on the following:

d. Reactor Core Isolation Cooling.

e. Automatic Depressurization System.

Reference: None

Cog Level: High

Explanation: RCIC will not shutdown on reactor water level and the inboard isolation logic is powered from Division II 125 VDC panels 4B for Unit 2.

Distractor Analysis:

Choice A: Correct Answer, see explanation

Choice B: Plausible because the first part is correct and a loss of 4B would cause the outboard logic to be lost.

Choice C: Plausible because a loss of 4B would cause RCIC to be unavailable for injection and the second part is correct.

Choice D: Plausible because this would be correct for a loss of 4B.

SRO Basis: N/A

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ATTACHMENT 6

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<< Plant Effects from Loss of DC Distribution Panel 3B(4B) >>

RCIC:

Will **NOT** auto initiate, outboard isolation logic **INOPERABLE** (E51-F008, -F029, and -F066 will **NOT** auto close), RCIC turbine will **NOT** trip except on overspeed, RCIC flow controller and EGM **INOPERABLE** (no flow control or indication), E51-F045 will **NOT** auto close on high water level, E51-F004, -F054, and -F026 fail closed. RCIC isolation is required in accordance with APP 1(2)-A-03 1-4.

<< Plant Effects from Loss of DC Distribution Panel 3A(4A) >>

RCIC:

Will **NOT** shutdown on reactor high water level, inboard isolation logic **INOPERABLE** (E51-F007, -F031, and -F062 will **NOT** auto close). Valves E51-F005 and -F025 fail closed.

31. 264000 1

Unit Two has lost off-site power.
DG3 started and tied to its respective E Bus.
Sequence of events:

1200 DG3 ties to E3
1205 DG3 lube oil temperature rises above 190°F
1206 DG3 lube oil pressure drops below 27 psig

Which one of the following identifies when DG3 will trip?

- A. Immediately at 1205.
- B. Immediately at 1206.
- C. 45 seconds after 1205.
- D. 45 seconds after 1206.

Answer: B

K/A:

264000 Emergency Generators (Diesel/Jet)

K6 Knowledge of the effect that a loss or malfunction of the following will have on the EMERGENCY GENERATORS (DIESEL/JET): (CFR: 41.7 / 45.7)

03 Lube oil pumps

RO/SRO Rating: 3.5/3.7

Tier 2 / Group 1

K/A Match: This meets the K/A because it is testing the effect of a loss of lube oil on the EDG.

Pedigree: Bank

Objective: LOI-CLS-LP-039, Obj. 4a

Given plant conditions, determine if EDGs will trip: After an auto start (LOCT)

Reference: None

Cog Level: High

Explanation: Hi lube oil temperature bypassed by auto start signal (LOOP and LOCA). Low lube oil pressure trip never bypassed. On a start of the DG the low lube oil trip is bypassed for 45 seconds.

Distractor Analysis:

Choice A: Plausible because hi lube oil temperature is a trip, but it is bypassed on the LOOP.

Choice B: Correct Answer, see explanation.

Choice C: Plausible because there is a 45 second time delay associated with the lube oil trip on an initial start of the EDG.

Choice D: Plausible because there is a 45 second time delay associated with the lube oil trip on an initial start of the EDG.

SRO Basis: N/A

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3.3.3 Automatic Stop Control (Figure 39-14)

Under conditions where continued Diesel Generator operation may cause damage to the Diesel itself automatic shutdowns are provided. The shutdown signals will vary dependent upon whether the engine has been started manually or automatically.

When operating due to receipt of an automatic start signal the following trips and lockout are provided:

- Low lube oil pressure 27 psig
- Overspeed 575 (561 to 589) rpm

When operating as a result of an initiation from a normal non-emergency start the following trips and lockouts are enforced in addition to those listed above:

- High lube oil temperature 190°F
- High jacket water temperature 200°F
- Jacket Water Low pressure 12 psig

The low lube oil pressure, and low jacket water pressure shutdowns are blocked for the first forty-five second on initiation of an engine start sequence (auto or manual). This permits the conditions to be established which will prevent these shutdowns during engine operation

32. 216000 1

A Unit Two plant cooldown is being performed with the following plant conditions:

Reactor water level	175 inches, steady
Reactor pressure band	500 - 700 psig
Drywell ref leg temp	175°F

(REFERENCE PROVIDED)

Which one of the following completes both statements below?

The lowering of reactor pressure causes the N004A/B/C (Narrow Range) reactor water level instruments indicated level error to ____ (1) ____.

The reactor water level that would correspond to Low level 4 (LL4) is ____ (2) ____.

- A. (1) increase
(2) -60 inches
- B. (1) increase
(2) -65 inches
- C. (1) decrease
(2) -60 inches
- D. (1) decrease
(2) -65 inches

Answer: A

K/A:

216000 Nuclear Boiler Instrumentation

A2 Ability to (a) predict the impacts of the following on the NUCLEAR BOILER INSTRUMENTATION; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: (CFR: 41.5 / 45.6)

11 Heatup or cooldown of the reactor vessel

RO/SRO Rating: 3.2/3.3

Tier 2 / Group 2

K/A Match: THIS QUESTION WAS PRE-SUBMITTED FOR APPROVAL.

The first part of the question deals with predicting the effect of a cooldown on indicated level error while the second part has the student has to determine based on the lowering pressure what LL4 value would be which is the value that emergency depressurization would be required. They must utilize the lower end of the pressure band to determine LL4. If LL4 cannot be maintained then ED is required.

Pedigree: New

Objective: LOI-CLS-LP-001.2, Objective 5a

Explain the effect that the following will have on reactor vessel level and/or pressure indications:
Plant heatup/cooldown

Reference: 0EOP-01-UG, Attachment 26

Cog Level: High

Explanation: The indicated level error is sensitive to changes in the saturation density of the bulk water as a function of system pressure. The amount of the indicated level error is also a function of the difference in the actual water level and the variable leg instrument tap elevation. As the saturation density increases (pressure decreases) the indicated level error will increase for the narrow and wide range instruments and decrease for the fuel zone and shutdown range instruments due to calibration criteria.

From OI-37.11, TAF, LL4, and LL5 values should be determined based on the reference leg area temperature and RPV pressure compensation curves, using RPV pressure at the low end of the established RPV pressure control band. Based on the low end of the band of 500 psig and < 200°F in the drywell the LL4 value would be -60 inches.

Distractor Analysis:

Choice A: Correct Answer, see explanation

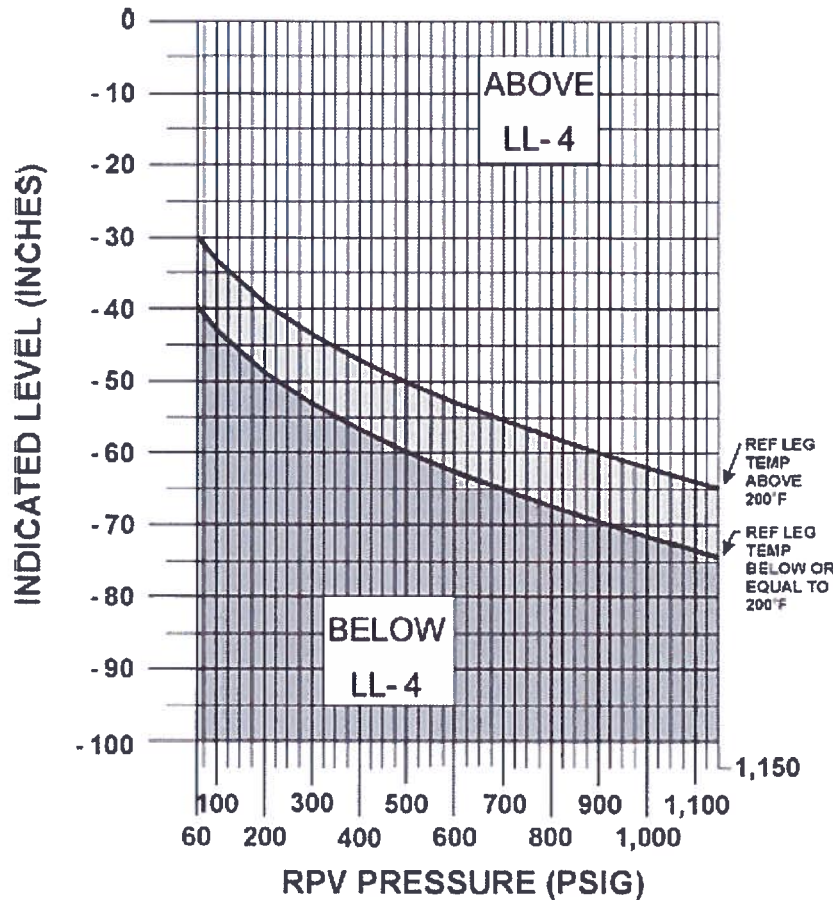
Choice B: Plausible because the first part is correct and the second part would be correct for 700 psig.

Choice C: Plausible because this would be correct for the fuel zone or shutdown range instruments and the second part is correct.

Choice D: Plausible because this would be correct for the fuel zone or shutdown range instruments and the second part would be correct for 700 psig.

SRO Basis: N/A

<< Unit 2 RPV Level at LL 4
(Minimum Steam Cooling RPV Level) >>



When RPV pressure is less than 60 psig, use indicated level. LL-4 is -27.5 inches.

4.1.2 System Pressure (Heat-up and Cool-down)

The indicated level error is sensitive to changes in the saturation density of the bulk water as a function of system pressure. The amount of the indicated level error is also a function of the difference in the actual water level and the variable leg instrument tap elevation. As the saturation density increases (pressure decreases) the indicated level error will increase for the narrow and wide range instruments and decrease for the fuel zone and shutdown range instruments due to calibration criteria. As actual water level decreases, the amount of error will decrease because less vessel water level is acting on the instrument.

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5.3.3 1(2)EOP-01-RVCP, Reactor Vessel Control Procedure

1. Level Leg

- a. The CRS directs an initial RPV level band of +166 to +206 inches. The reactor operator actually maintains a RPV level band of +170 to +200 inches to provide additional margin to the reactor scram and turbine trip set points. The CRS may direct a widened band based on plant conditions and other controlling procedures associated with the transient.
- b. If RPV level is above TAF, injection flow should be controlled so as to control the cooldown rate below 100°F/hr.
- c. If RPV level is below TAF, RPV level should be rapidly restored to above TAF, and then injection flow reduced so as to control the cooldown rate below 100°F/hr.
- d. TAF, LL4, and LL5 values should be determined based on the reference leg area temperature and RPV pressure compensation curves, using RPV pressure at the low end of the established RPV pressure control band.

33. 272000 1

Unit Two is performing a startup IAW 0GP-02, *Approach to Criticality and Pressurization of the Reactor*.

IAW 0GP-02, which one of the following identifies the radiation monitor(s) that will require the alarm setpoints raised when HWC is placed in service?

- A. D12-RM-K603A,B,C,D, Main Steam Line Rad Monitors
- B. ARM Channel 2-9, U-2 Turbine Bldg Breezeway
- C. D12-RR-4599-1,2,3, Main Stack Rad Monitors
- D. ARM Channel 2-4, Cond Filter-Demin Aisle

Answer: A

K/A:

272000 Radiation Monitoring System

K5 Knowledge of the operational implications of the following concepts as they apply to RADIATION MONITORING SYSTEM: (CFR: 41.7 / 45.4)

01 Hydrogen injection operation's effect on process radiation indications

RO/SRO Rating: 3.2/3.5

Tier 2 / Group 2

K/A Match: THIS QUESTION WAS PRE-SUBMITTED FOR APPROVAL.

This meets the K/A because this is testing the operational implication as to which rad monitor, if asked as the operational effect on the individual rad monitor this would provide no discriminatory value.

Pedigree: New

Objective: LOI-CLS-LP-059, Obj. 8

Explain why Chemistry must be notified when starting and securing the HWC System.

Reference: None

Cog Level: Fundamental

Explanation: The excess Hydrogen injected into the reactor coolant creates the driving force to shift the Nitrogen-16 distribution ratio, resulting in a larger fraction of the Nitrogen-16 forming volatile Ammonia and a smaller fraction forming Nitrites and Nitrates. This additional volatile Ammonia is then carried over in the reactor steam resulting in higher background radiation levels. Any increase in Hydrogen injection rates will result in a proportional increase in background radiation levels and vise-versa.

0GP-02 has a step for ensuring that the rad monitors are adjusted based on this background rad level increase.

Distractor Analysis:

Choice A: Correct Answer, see explanation.

Choice B: Plausible because when HWC is placed in service the rad levels will increase minimally and HWC H2 is injected in the reactor feed pumps.

Choice C: Plausible because sufficient decay time is available for N-16 such that radiation levels wouldn't raise that much in this area.

Choice D: Plausible because when HWC is placed in service the rad levels will increase minimally and this is downstream of the HWC O2 injection point.

SRO Basis: N/A

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3.0 PRECAUTIONS AND LIMITATIONS (continued)

- 15. B21-F032A and B21-F032B (Feedwater Supply Line Isolation Valves), are stop-check valves. These valves are designed to prevent leakage from the reactor into the feedwater system. These valves are not designed to positively close against condensate system pressure. As such, with the reactor depressurized and the condensate system in service, these valves may leak by, causing reactor water level to rise.....

- 16. The Main Steam Line Radiation Monitor (MSLRM) High-High Radiation setpoint is adjusted assuming HWC is in service. If HWC is removed from service for an extended period of time (greater than one week), 1(2)OP-59, Hydrogen Water Chemistry System Operating Procedure requires BESS determine if a MSLRM High-High Radiation setpoint adjustment is required.....

- 17. The HWC System will normally be placed in service immediately after establishing the following conditions:
 - At least one Condensate Booster Pump feeding the reactor with minimum flow valve closed.....

 - At least one SJAЕ operating at greater than or equal to half-load

34. 226001 1

Which one of the following identifies the power supply to 2D RHR Pump?

- A. E1
- B. E2
- C. E3
- D. E4

Answer: B

K/A:

226001 RHR/LPCI: Containment Spray System Mode

K2 Knowledge of electrical power supplies to the following: (CFR: 41.7)

03 Pumps

RO/SRO Rating: 2.9/2.9

Tier 2 / Group 2

K/A Match: This meets the K/A because this is testing the power supply to RHR pumps which are the pumps for the containment sprays.

Pedigree: Modified from the 2012 NRC Exam (changed to the D RHR Pump)

Objective: LOI-CLS-LP-017-A Obj. 17a

List the normal and emergency power sources for the following: RHR Pumps.

Reference: None

Cog Level: Fundamental

Explanation: 2D RHR pump is a Div II pump with a power supply from E2.

Distractor Analysis:

Choice A: Plausible because E1 is a Unit One bus that supplies power to Unit One and Unit Two loads. RHR Pumps 1C and 2C are supplied from this bus.

Choice B: Correct Answer, see explanation

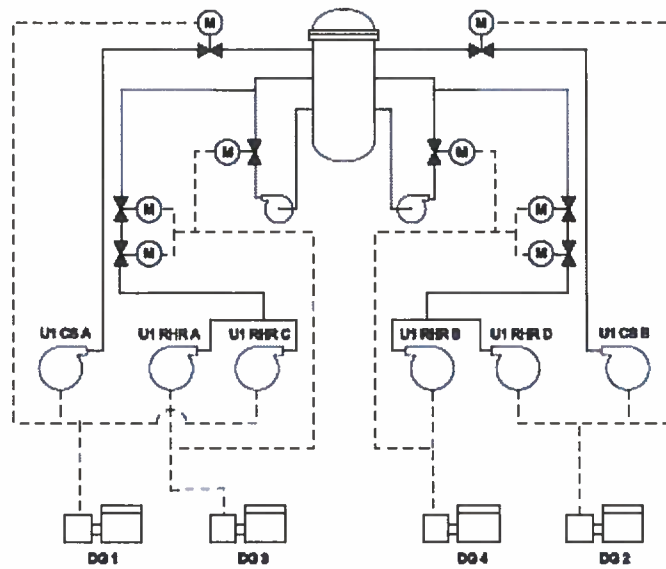
Choice C: Plausible because E3 is a Unit Two bus that supplies power to Unit One and Unit Two loads. RHR Pumps 1A and 2A are supplied from this bus.

Choice D: Plausible because E4 is a Unit Two bus that supplies power to Unit One and Unit Two loads. RHR Pumps 1B and 2B are supplied from this bus

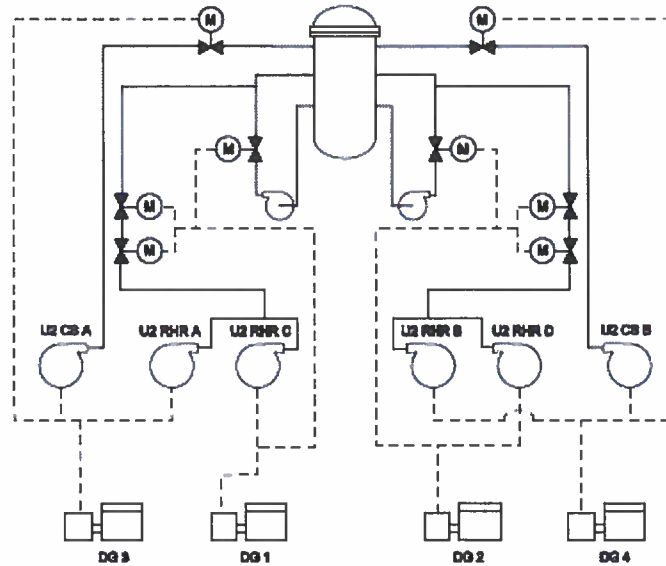
SRO Basis: N/A

FIGURE 17-2B
 Low Pressure Injection Systems and Power

UNIT 1 LOW PRESSURE ECCS



UNIT 2 LOW PRESSURE ECCS



NOTE: INJECTION FLOW PATH AND POWER SUPPLIES SHOWN.
 LOGIC & OTHER FLOW PATHS NOT SHOWN.

35. 295001 1

Unit One is operating at 70% power when the OATC observes indications for a failed jet pump. Subsequently, Recirc Pump 1A trips.

Which one of the following completes both statements below IAW 1AOP-04.0, *Low Core Flow*?

Performance of the jet pump operability surveillance for ____ (1) ____ Loop Operation is required.

If it is determined that a jet pump has failed, the required action is to ____ (2) ____.

- A. (1) Single
(2) reduce reactor power below 25% rated thermal power
- B. (1) Single
(2) commence unit shutdown IAW 0GP-05, Unit Shutdown
- C. (1) Two
(2) reduce reactor power below 25% rated thermal power
- D. (1) Two
(2) commence unit shutdown IAW 0GP-05, Unit Shutdown

Answer: B

K/A:

295001 Partial or Complete Loss of Forced Core Flow Circulation
G2.2.12 Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)

RO/SRO Rating: 3.7/4.1

Tier 1 / Group 1

K/A Match: This meets the K/A because this is testing knowledge of which surv. is required and the action if it has failed the surv.

Pedigree: New

Objective: LOI-CLS-LP-302-C, Obj 4
Given plant conditions and AOP-04.0, determine the required supplementary actions.

Reference: None

Cog Level: High

Explanation: The indications given are for a failed jet pump which IAW the AOP require the surveillance performed for determination of a failed jet pump. Unlike the selection of the power to flow map the PT only looks at the recirc pumps for determination of single loop or two loop operation. The power to flow maps for single loop are not used until the APRM setpoint adjustments are made.

Distractor Analysis:

Choice A: Plausible because single loop is correct and 25% is the requirement for when the PT is required to be performed.

Choice B: Correct Answer, see explanation.

Choice C: Plausible because APRM setpoint adjustments have not been made which is a determination of how to use the power to flow maps and 25% is the requirement for when the PT is required to be performed.

Choice D: Plausible because APRM setpoint adjustments have not been made which is a determination of how to use the power to flow maps and the second part is correct.

SRO Basis: N/A

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4.2 Supplementary Actions (continued)

NOTE
<p>Jet pump failure is indicated by the following: <input type="checkbox"/></p> <ul style="list-style-type: none"> • Reduction in generator megawatt output on GEN-WMR-760 (Net Unit Megawatts) • Reduction in core thermal power • Rise in indicated total core flow on B21-R613 (Core Δ Pressure/Core Flow) recorder • Reduction in core plate differential pressure on B21-R613 (Core Δ Pressure/Core Flow) recorder • Rise in recirculation loop flow in the loop with a failed jet pump on B32-R614 (Recirculation Flow) recorder

CAUTION
<p>Under conditions of jet pump failure, indicated core flow on Process Computer Point U2CPWTCF and B21-R613 (Core Δ Pressure/Core Flow) recorder, will NOT be accurate. Accurate core flow is available from Process Computer Point U2NSSWDP (Core Plate Differential Pressure) or Attachment 1, Estimated Total Core Flow vs. Core Support Plate Delta P for B2C22. Until Step 23.b(1), the operating point on the Power-to-Flow Map will NOT be accurate. Indicated total core flow on B21-R613 (Core Δ Pressure/Core Flow) recorder will continue to be inaccurate until the failed jet pump is repaired. <input type="checkbox"/></p>

23. **IF jet pump failure is suspected, THEN perform the following:**
- a. **IF reactor power is greater than or equal to 25%, THEN ensure the following:**
- **OPT-13.1, Reactor Recirculation Jet Pump Operability,** is performed for two loop operation
 - OR**
 - **OPT-13.4, Reactor Recirculation Jet Pump Operability for Single Loop Operation,** is performed for single loop operation

b. **IF any jet pump is determined to be INOPERABLE, THEN perform the following:**

- (1) **Ensure** the input to the Power-to-Flow Map has been changed from WTCF to core plate differential pressure
- (2) **Notify** the Duty Reactor Engineer the input to the Power-to-Flow Map has been changed from WTCF to core plate differential pressure
- (3) **Commence unit shutdown in accordance with OGP-05, Unit Shutdown,** in compliance with Technical Specification 3.4.2

36. 295003 1

Unit One is operating at rated power.

The load dispatcher reports degraded grid conditions with the following indications:

Generator frequency	59.7 hertz
230 KV Bus 1A voltage	205 KV
230 KV Bus 1B voltage	205 KV
E1 voltage	3690 volts
E2 voltage	3685 volts

Which one of the following completes both statements below?

The ____ (1) ____ may be damaged with continued operation under these conditions.

IAW 0AOP-22.0, *Grid Instability*, the E-Bus master/slave breakers ____ (2) ____ open.

- A. (1) main turbine blades
(2) will
- B. (1) main turbine blades
(2) will NOT
- C. (1) emergency bus loads
(2) will
- D. (1) emergency bus loads
(2) will NOT

Answer: C

K/A:

295003 Partial or Complete Loss of A.C. Power

AK1 Knowledge of the operational implications of the following concepts as they apply to PARTIAL OR COMPLETE LOSS OF A.C. POWER: (CFR: 41.8 to 41.10)

03 Under voltage/degraded voltage effects on electrical loads

RO/SRO Rating: 2.9/3.2

Tier 1 / Group 1

K/A Match: THIS QUESTION WAS PRE-SUBMITTED FOR APPROVAL.

This meets the K/A because this is testing the degraded voltage conditions.

Pedigree: Last used on the 10-2 NRC Exam

Objective: LOI-CLS-LP-302-G, Obj. 4b

Given plant conditions and any of the following AOPs, determine the required supplemental actions: AOP-22.0, Grid Instability

Reference: None

Cog Level: High

Explanation: There are frequency based criteria in AOP-22.0 (Caution directly preceding step 3.2.1) for tripping the turbine to prevent resonance vibration of low pressure blades due to off frequency operation. Time limits include, 5 minute ranges and 1 minute ranges. At this current frequency, the Main Turbine can be operated indefinitely, which will not cause turbine damage. Sustained low voltage provides for higher running currents which will damage running ESF motors. Per the automatic actions section of AOP-22.0, the degraded voltage relays will actuate when emergency bus voltage has dropped below 3700 VAC for 10 seconds. This trips the Master/Slave breakers (BOP bus supply to E Buses) and the DGs start and load.

Distractor Analysis:

- Choice A: Plausible because turbine blade damage can occur due to off frequency operation and the second part is correct.
- Choice B: Plausible because turbine blade damage can occur due to off frequency operation and the second part is plausible because the frequency is within range.
- Choice C: Correct Answer, see explanation
- Choice D: Plausible because damage to E Bus loads is correct and the second part is plausible because the frequency is within range.

SRO Basis: N/A

ASYMMETRICAL SHORT CIRCUIT CURRENT OF ZOOBA RIVIS.

2.4 Protective Relaying

Protective relaying is designed to isolate any faulted component or portion of the electrical system, while maintaining continuity of power to the unfaulted portion of the system. The most commonly used protective devices include:

1. Undervoltage (27 Device) Relays. Undervoltage relays actuate on a low voltage condition, and usually are time delayed to account for momentary transient conditions, such as fault clearing and bus transfers. The degraded grid voltage relays are provided with a substantially longer time delay to prevent actuation due to motor starting transients. Undervoltage relays provide a variety of protective functions including supply breaker trips and closure permissives, large motor breaker trips and closure permissives, and automatic starting of the Emergency Diesel Generators.

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4.2 Abnormal Operation

4.2.1 Abnormal Frequency Conditions

When system frequency reaches 59.8 hertz, Annunciator, UA-06, window 1-2, "GEN BUS UNDER FREQ RELAY" is activated. Operators are directed to respond per AOP-22.0, Generator Abnormal Frequency Conditions. This is done to stabilize loads on the system. One of the most probable causes of an under frequency condition would be the loss of another large generating unit, or units, when the on-line reserve capacity is inadequate for current system loads. Rapid response and close coordination with the load dispatcher are required to ensure system stability.

Abnormal frequency operation can develop resonant frequencies that may induce vibrations in the low pressure turbine blades. The vibration can cause turbine blades to fatigue and possibly fail during operation. The effect increases proportionally in relation to the magnitude of the frequency difference, and the length of time at the abnormal frequency.

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3.0 AUTOMATIC ACTIONS

1. IF emergency bus voltage has lowered to less than 3700 volts (approximately equal to BOP bus voltage) for greater than 10 seconds, THEN the master/slave breakers to the E bus open and associated diesel generator starts and loads. □

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4.2 Supplementary Actions

NOTE

A sudden rise in system frequency may be observed due to additional generation or load shedding. Automatic load shedding (10% of system load) occurs at each of the following frequencies: 59.3, 59.0, and 58.5 Hz.

CAUTION

The maximum allowable time at a given frequency is as follows:

- Below 58.1 Hz, operation is prohibited
- Between 58.1-58.5 Hz, operation for 1 minute is allowed
- Between 58.6-59.3 Hz, operation for 5 minutes is allowed
- Between 59.4-60.6 Hz, operation is allowed indefinitely
- Between 60.7-61.4 Hz, operation for 5 minutes is allowed
- Between 61.5-61.9 Hz, operation for 1 minute is allowed
- Above 61.9 Hz, operation is prohibited

CAUTION

- Off-frequency operation can stimulate resonance vibration in low pressure blades.
- A total loss of off-site power (LOOP) should be anticipated if the turbine is tripped.
- With grid voltage or frequency unstable or grid vulnerability identified, diesel generators should **NOT** be paralleled with any E bus connected to the grid since severe load swings may occur and possibly overload the diesel generators.

1. **IF** the maximum allowable time at a given frequency is exceeded, **THEN** perform the following:
 - a. **IF** reactor power is greater than or equal to 26%, **THEN** insert a manual scram.
 - b. **Trip the main turbine.**
 - c. **IF** the unit was scrammed, **THEN** enter 1EOP-01-RSP(2EOP-01-RSP), Reactor Scram Procedure.

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4.2 Supplementary Actions (continued)

10. **IF** system frequency is high,
THEN:
 - a. **Establish communication with the Load Dispatcher**.....
 - b. **Continue unit generation as directed by the Unit CRS AND coordinate with the Load Dispatcher**.....
 - c. **IF** tripping the turbine becomes imminent,
THEN rapidly reduce power in an attempt to lower frequency to less than 60.7 Hz prior to tripping the main turbine.....

11. **IF** notified by the Load Dispatcher system voltage is unable
OR will be unable to support a LOCA,
OR abnormal frequency conditions persist,
THEN follow the guidelines in 00I-01.01, BNP Conduct of Operations Supplement.....

12. **IF** any diesel generator is loaded to an E bus connected to the grid,
THEN restore the diesel generator to standby in accordance with applicable procedures.....

13. **IF** system voltage is less than 3700 volts for greater than 10 seconds,
THEN ensure:
 - **The affected E bus master/slave breakers OPEN**.....
 - **The affected diesel generator starts and loads**.....

37. 295004 1

Which one of the following completes both statements below?

IAW 0AOP-39.0, *Loss of DC Power*, before 125 VDC battery voltage reaches (1) , remove loads as directed by the Unit CRS.

IAW 1EOP-01-SBO, *Station Blackout*, if either division battery chargers can NOT be restored within (2) then load strip the affected battery.

- A. (1) 105 volts
(2) 1 hour
- B. (1) 105 volts
(2) 2 hours
- C. (1) 129 volts
(2) 1 hour
- D. (1) 129 volts
(2) 2 hours

Answer: A

K/A:

295004 Partial or Complete Loss of D.C. Power

AK2 Knowledge of the interrelations between PARTIAL OR COMPLETE LOSS OF D.C. POWER and the following: (CFR: 41.7 / 45.8)

01 Battery charger

RO/SRO Rating: 3.1/3.1

Tier 1 / Group 1

K/A Match: This meets the K/A because this is testing knowledge of the relationship between the loss of DC power and time requirement to re-energize the battery charger.

Pedigree: New

Objective: LOI-CLS-LP-051, Obj. 14

Describe the consequences/problems associated with the following: a. Battery chargers remaining out of service during a loss of off-site power / station blackout.

Reference: None

Cog Level: Fundamental

Explanation: AOP-39.0 directs to load strip before reaching 105 VDC to prevent cell reversal. The alarm for undervoltage comes in at 129 VDC. The station Blackout procedure states that if the battery charger is not energized in 1 hour to load strip the batteries. There is a time critical 2 hour action in the SBO procedure for opening the Reactor Building doors.

Distractor Analysis:

Choice A: Correct Answer, see explanation.

Choice B: Plausible because the first part is correct and the second part is a time critical action time limit in the SBO procedure.

Choice C: Plausible because 129 volts is the annunciator setpoint for the batteries and the second part is correct.

Choice D: Plausible because 129 volts is the annunciator setpoint for the batteries and the second part is a time critical action time limit in the SBO procedure.

SRO Basis: N/A

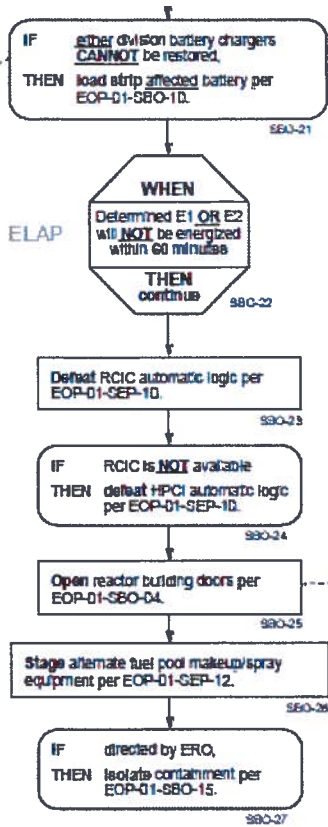
LOSS OF DC POWER	0AOP-39.0
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4.2 Supplementary Actions

1. Loss of Battery Chargers:

- a. **Monitor 125V and 24V DC battery voltages**
- b. **IF power has been removed from the battery chargers for greater than 1 hour, THEN remove selected loads from the battery based on OOI-50, 125/250 and 24/48 VDC Electrical Load List and Unit CRS direction.**
- c. **Before 125V DC battery voltage reaches the low voltage limit of 105 volts, remove loads as directed by the Unit CRS as necessary to maintain battery voltage greater than 105 volts.**
- d. **Before 24V battery voltage reaches the low voltage limit of 21 volts, remove loads as directed by the Unit CRS as necessary to maintain battery voltage greater than 21 volts.**
- e. **IF battery charger AC power has been lost due to Station Blackout, THEN enter 1EOP-01-SBO(2EOP-01-SBO), Station Blackout.**

Time Critical
Battery load stripping required within 60 minutes.
Time _____



ELAP

Time Sensitive
RB roof hatch required open within 2 hours.
Time _____

38. 295005 1

Which one of the following identifies the reason an operator is directed to trip the main turbine as an immediate action IAW 0AOP-32.0, Plant Shutdown From Outside Control Room?

- A. To initiate a scram on TSV/TCV closure.
- B. To prevent reverse power starts of the Diesel Generators.
- C. The turbine cannot be tripped once the Control Room is evacuated.
- D. To bring bypass valves into operation until Remote Shutdown Panel control is established.

Answer: B

K/A:

295005 Main Turbine Generator Trip

AK3 Knowledge of the reasons for the following responses as they apply to MAIN TURBINE GENERATOR TRIP: (CFR: 41.5 / 45.6)

04 Main generator trip

RO/SRO Rating: 3.2/3.2

Tier 1 / Group 1

K/A Match: This question requires the operator to have knowledge of the reason for turbine/generator trip. AOP-32 was used to include plausibility of distractors.

Pedigree: Bank

Objective: LOI-CLS-LP-302E, Obj. 6

Given plant conditions and entry into 0AOP-32.0, Plant Shutdown From Outside Control Room, explain the basis for a specific caution, note, or series of procedure steps.

Reference: None

Cog Level: Fundamental

Explanation: Following a reactor scram, the turbine control valves throttle shut in an effort to control RPV pressure at the setpoint of 928 psig. Without operator action, the turbine control valves will fully close, causing the generator to motor. Reverse power on the generator will cause a generator primary lockout and auto start of the diesel generators. The main turbine is therefore manually tripped to prevent it from automatically tripping on generator reverse power. This also reduces the number of cold start demands on the diesel generators.

Distractor Analysis:

Choice A: Plausible because a reactor scram is inserted as a step in the AOP, but it is performed earlier.

Choice B: Correct Answer, see explanation

Choice C: Plausible because the procedure states to perform the step prior to exiting the control room but it could still be done at the turbine front standard.

Choice D: Plausible because this would allow use of the bypass valves, but MSIVs are manually closed prior to leaving the control room. This brings SRVs into operation. If MSIVs are not closed prior to leaving the control room, RPS EPA breakers are opened prior to establishing control at Remote Shutdown panel, which would close MSIVs.

SRO Basis: N/A

5.2 Step RSP-2



Step RSP-2 includes the potential for multiple sensor and sensor relay failures in the automatic RPS logic where an automatic reactor scram should have initiated but did not. If needed a manual scram is inserted to accomplish an automatic action which should have taken place. A manual reactor scram is also required when directed from other EOPs and no condition exists which would have automatically initiated a reactor scram (e.g., entry from PCCP because of high torus temperature).

Step RSP-2 also addresses other Reactor Operator scram immediate actions and includes:

- ARI initiation is an additional means of inserting control rods if needed.
- Placing the reactor mode switch to shutdown. When the reactor mode switch is placed in SHUTDOWN position, a diverse and redundant reactor scram signal is generated by the RPS logic. If the mode switch is taken out of RUN prior to RPV pressure decreasing to 835 psig, the MSIV closure due to low main steam line pressure is prevented.

For Unit 2 only, if the mode switch is taken out of RUN when steam flow is above 33%, the MSIVs will close. Therefore, for Unit 2 the mode switch is placed in SHUTDOWN after steam flow is below 3×10^6 lb/hr.

- Following a reactor scram, the turbine control valves throttle shut in an effort to control RPV pressure at the setpoint of 928 psig. Without operator action, the turbine control valves will fully close, causing the generator to motor. Reverse power on the generator will cause a generator primary lockout and auto start of the diesel generators. The main turbine is therefore manually tripped to prevent it from automatically tripping on generator reverse power. This also reduces the number of cold start demands on the diesel generators.

39. 295006 1

Unit One has entered RSP with the following conditions:

Six control rods are at position 02, all others are fully inserted
B Recirc Pump has tripped

Which one of the following completes both statements below?

The control rods will be inserted by ____ (1) ____ IAW 0EOP-01-LEP-02, *Alternate Control Rod Insertion*.

After the control rods are inserted, a CRD flow rate of approximately ____ (2) ____ will be established.

- A. (1) placing the individual scram test switches to the Scram position
(2) 30 gpm
- B. (1) placing the individual scram test switches to the Scram position
(2) 45 gpm
- C. (1) driving rods using RMCS
(2) 30 gpm
- D. (1) driving rods using RMCS
(2) 45 gpm

Answer: C

K/A:

295006 Scram

AA1 Ability to operate and/or monitor the following as they apply to SCRAM: (CFR: 41.7 / 45.6)

06 CRD hydraulic system

RO/SRO Rating: 3.5/3.6

Tier 1 / Group 1

K/A Match: This meets the K/A because this is testing operation of CRD controls after a scram.

Pedigree: new

Objective: LOI-CLS-LP-300-C, Obj. 10

Given plant conditions and the Reactor Scram Procedure, determine the required operator actions

Reference: None

Cog Level: High

Explanation: Even if the reactor will remain shutdown under all conditions without boron the LEP is used to insert the control rods using RMCS. If more control rods were out then the scram test switches would be an option. If a recirc pump is tripped then CRD flow is set to 30 gpm to minimize the stratification in the bottom head region.

Distractor Analysis:

Choice A: Plausible because this is an option used to insert the control rods in the LEP. The second part is correct.

Choice B: Plausible because this is an option used to insert the control rods in the LEP. The second part is the nominal setting for the CRD flowrate.

Choice C: Correct Answer, see explanation.

Choice D: Plausible because the first part is correct and the second part is the nominal setting for the CRD flowrate.

SRO Basis: N/A

7. **WHEN either:**

- All control rods in..... RO
- Only one control rod **NOT** fully inserted RO
- **NO** more than 10 control rods withdrawn to position 02 **AND** **NO** control rod withdrawn beyond position 02..... RO
- Reactor engineering has determined the reactor will remain shutdown under all conditions without boron..... RO

THEN perform Section 2.2, Control Rod Insertion Verification on Page 7..... RO

10. **IF any control rod NOT fully inserted, THEN insert control rods:**

- a. **Record in** Control Room log the control rod number and position of any rods **NOT** fully inserted..... RO

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2.2.3 Control Rod Verification Actions (continued)

- b. **Bypass RWM**..... RO
- c. **Insert control rods with Emergency Rod In Notch Override switch**..... RO

2.6.3 Scram Individual Control Rods Actions (continued)

10. **Unit 1 Only:** Insert control rods with individual scram test switches:

- a. Identify any control rod **NOT** inserted to or beyond Position 00. RO

NOTE	
• A sound powered phone jack is located on the column beside Panel XU-76 and in Panels XU-12, 58, 49 and 61.....	<input type="checkbox"/>
• The preferred sound-powered phone switchboard bus for use is Bus 1.....	<input type="checkbox"/>

- b. Establish communication between Panel P610 and Control Room. RO

NOTE	
The individual scram test switch SCRAM position is down.	<input type="checkbox"/>

- c. Place individual scram test switch to SCRAM position for any control rod **NOT** inserted to or beyond Position 00. RO

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2.2.3 Control Rod Verification Actions (continued)

- (3) **IF both** CRD pumps running,
THEN stop one CRD pump. RO
- (4) **Set the setpoint** tape on C11(C12)-FC-R600 (CRD Flow Control) to 30 gpm. RO

NOTE
The actions in Section 2.2.3 Step 9 h(5) may be repeated as necessary. <input type="checkbox"/>

- (5) **Adjust cooling water differential pressure, CRD flow rate and drive pressure:**
 - C11(C12)-FC-R600 (CRD Flow Control) to maintain cooling water differential pressure between 10 and 26 psid. RO
 - **IF a reactor recirculation pump is tripped, THEN establish a CRD flow rate of approximately 30 gpm.** RO
 - **IF both reactor recirculation pumps running, THEN establish a CRD flow rate between 30 and 60 gpm.** RO

40. 295009 1

A total loss of Unit One feedwater results in reactor water level lowering to 87 inches.

Drywell pressure is 2.1 psig.

Reactor water level is being restored with RCIC and CRD.

Which one of the following completes both statements below?

RVCP ____ (1) ____ required to be entered.

The expected response of the G31-F001, Inboard RWCU Isolation Valve, and the G31-F004, Outboard RWCU Isolation Valve, is that ____ (2) ____ should be closed.

- A. (1) is
(2) ONLY the G31-F004
- B. (1) is
(2) BOTH
- C. (1) is NOT
(2) ONLY the G31-F004
- D. (1) is NOT
(2) BOTH

Answer: B

K/A:

295009 Low Reactor Water Level

AK2 Knowledge of the interrelations between LOW REACTOR WATER LEVEL and the following: (CFR: 41.7 / 45.8)

04 Reactor water cleanup

RO/SRO Rating: 2.6/2.6

Tier 1 / Group 2

K/A Match: This meets the K/A because this is testing the LL2 relationship to Group 3 (RWCU) isolation.

Pedigree: New

Objective: LOI-CLS-LP-014, Obj 8

Given plant conditions, determine if the RWCU system should have isolated, including expected changes in RWCU System components

Reference: None

Cog Level: High

Explanation: Based on conditions RVCP should be entered. By knowing the entry conditions for RVCP (2# DW pressure) this eliminates the RSP. The low level condition will isolate the F001 and F004. There are some signals that will isolate only the F004 only.

Distractor Analysis:

Choice A: Plausible because the first part is correct and some of the Group 3 signals do only close the F004.

Choice B: Correct Answer, see explanation.

Choice C: Plausible because the RSP would be entered, but there is an entry condition for RVCP (2# in the DW). Some of the Group 3 signals do only close the F004.

Choice D: Plausible because the RSP would be entered, but there is an entry condition for RVCP (2# in the DW). The second part is correct.

SRO Basis: N/A

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<< Group Isolation Checklist >>

Group 3 Isolation Signals

Signal	Tech Spec Value	Setpoint Value
Low Level 2	+101 inches	+105 inches
High Differential Flow	73 gpm	43 gpm (after 28.5 minute time delay)
Area High Temperature	150°F	140°F
Area Ventilation ΔT High	50°F	47°F
Non-Regen Hx Outlet Temp Hi	N/A	135°F
SLC Initiation	N/A	N/A
RWCU Outside Pump/Hx Rms	120°F	115°F
RWCU Differential Flow High Time Delay	30 minutes	28.5 minutes

Group 3 Isolation Valves

Control Room - RTGB - Panel H12-P601

Valve Number	Power Supply Unit 1(Unit 2)	Normal Position	Fail Position	Checked
[Note 1] G31-F001	1XC(2XC)/E1(E3)	NO	[Note 2] FAI	
G31-F004	1XDB(2XDB) [DC]	NO	FAI	

Note 1: SLC Initiation and RWCU Non-Regen Hx Outlet Temperature Hi signals do **NOT** isolate the RWCU Inlet Inboard Isolation Valve, G31-F001.

41. 295016 1

CAUTION

There are seven keylock *NORMAL/LOCAL* switches located on Diesel Generator 2 control panel. Six of these are located in a row. The seventh switch is located in the row above the six switches.

Which one of the following completes both statements below concerning the caution above from 0ASSD-02, *Control Building*?

The six switches in a row must be placed in *LOCAL* ____ (1) ____ placing the seventh switch in *LOCAL*.

The purpose of this sequence is to prevent a loss of DG2 due to a loss of the redundant power supply fuses for the ____ (2) ____ circuitry.

- A. (1) before
(2) output breaker
- B. (1) before
(2) engine run control
- C. (1) after
(2) output breaker
- D. (1) after
(2) engine run control

Answer: B

K/A:

295016 Control Room Abandonment

AK3 Knowledge of the reasons for the following responses as they apply to CONTROL ROOM ABANDONMENT: (CFR: 41.5 / 45.6)

03 Disabling control room controls

RO/SRO Rating: 3.5/3.7

Tier 1 / Group 1

K/A Match: This meets the K/A because the six local switches remove control room controls and the seventh switch supplies an alternate power supply to the equipment.

Pedigree: Bank

Objective: LOI-CLS-LP-304, Obj. 21

Explain why the Diesel Generator *NORMAL/LOCAL* switches must be placed in *LOCAL* in a particular sequence.

Reference: None

Cog Level: Fundamental

Explanation: The six switches in a row isolate DG2 engine and generator control circuitry from the control room (the fire area) since a fire induced fault in wiring in the fire area may result in loss of the DG. The seventh switch inserts redundant control power fuses to the circuitry that has been isolated in the event a fault has already resulted in blowing the normal fuses. This seventh switch must be turned last with the potentially faulted circuitry already isolated or the alternate fuses may also blow making the DG unavailable. The DG engine lockout is already tripped if the DG had been running since the operator is directed to trip the DG using emergency stop. Of the first six switches, they include: - Diesel START/STOP (2 switches) - Diesel Governor (2 switches) - Generator Voltage Regulation (2 switches)

Distractor Analysis:

Choice A: Plausible because the six switches are placed in local first and the output breaker does have redundant control power fuses.

Choice B: Correct Answer, see explanation.

Choice C: Plausible because this is the opposite of the correct sequence and the output breaker does have redundant control power fuses.

Choice D: Plausible because this is the opposite of the correct sequence and the second part is correct.

SRO Basis: N/A

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The Governor Control At Setpoint indicator light provides a status of the DRU speed reference for the 2301A governor. The light is an indicator that the Governor Control System is ready to operate at the Setpoint "speed". During actual operation of the DG, the Governor Control At Setpoint indicator light may or may not be illuminated depending on the speed of the DG.

Voltage Adjust Switches

Two three position (RAISE-NEUT-LOWER) spring return to NEUT switches are provided per engine to permit the adjustment of voltage regulators from the local panel regardless of EDG mode of operation. The auto adjust switch is normally used.

ASSD Keylock Switches

Brass handled two-position NORM - LOCAL ASSD keylock switches on the local engine panels permit the operator to transfer control of the engine and generator to the local control panel. ASSD operations are performed when a fire exists in the plant and components required to be operated may be damaged by the fire.

These switches isolate control room controls and indications to isolate the EDG control circuitry from potential fire induced faults. There are six ASSD switches (2 for EDG run/stop controls, 2 for governor controls, and 2 for voltage regulation controls) located on each local EDG panel. When in the "ASSD" mode, operation of the Diesel engine can only be accomplished by the LOCAL EMERGENCY STOP and LOCAL EMERGENCY START pushbuttons.

In addition to the six ASSD switches, for EDG 2 and 4 only, there is a seventh ASSD switch located above the other six switches. This switch provides an alternate set of control power fuses for EDG control circuitry. This may be necessary since fire induced faults may have blown normal control fuses. When operating the ASSD switches for EDGs 2 or 4, the seventh switch must be turned last after the potentially faulted circuitry has been isolated to prevent blowing the alternate fuses, making the EDG unavailable to provide power to Safe Shutdown loads.

42. 295017 1

During accident conditions, the source term from the Unit One Reactor Building must be estimated. Three RB HVAC supply fans and three RB HVAC exhaust fans are running.

IAW OPEP-03.6.1, *Release Estimates Based on Stack/Vent Readings*, which one of the following is the calculated release rate?

ATTACHMENT 2
Page 1 of 1
Source Term Calculation From #1 RX Gas (1-CAC-AQH-1264-3)

TIME	METER READING (cpm)	FLOW ¹ (cfm)	EFFICIENCY ²⁾ FACTOR	RELEASE ³⁾ RATE (μCi/sec)
1 minute ago	4.0 E+3	43,200 CFM per exhaust fan	1.275 E-5	

(1) If not available use 43,200 cfm per exhaust fan times the number of fans operating.

(2) The efficiency factors can be obtained from OE&RC-2020 (contact E&RC counting room).

(3) Release Rate = (cpm) x (cfm) x (Efficiency Factor)

- A. 2.2 E+3 μCi/sec.
- B. 6.6 E+3 μCi/sec.
- C. 1.3 E+4 μCi/sec.
- D. 6.6 E+4 μCi/sec.

Answer: B

K/A:

295017 High Off-Site Release Rate

AA2 Ability to determine and/or interpret the following as they apply to HIGH OFF-SITE RELEASE RATE: (CFR: 41.10 / 43.5 / 45.13)

03 Radiation levels

RO/SRO Rating: 3.1/3.9

Tier 1 / Group 2

K/A Match: This meets the K/A because it is testing the source term for a release off-site.

Pedigree: Bank

Objective: LOI-CLS-LP-301A, Obj. 6

Determine data required for offsite dose projection in accordance with AD-EP-ALL-0202, Emergency Response Offsite Dose Assessment, and PEP-03.6.1, Release Estimates Based Upon Stack/Vent Readings.

Reference: None

Cog Level: High

Explanation: Per Attachment 2 the calculated release rate is:

Meter reading (CPM) X Flow (43,200 per fan X no of discharge fans) X efficiency factor
or
 $(4 \text{ E}+3) (43,200 \text{ X } 3) (1.275 \text{ E}-5) = 6.6 \text{ E}+3 \text{ mCi/sec}$

Distractor Analysis:

Choice A: Plausible because it is the calculation without multiplying times the number of running exhaust fans.

Choice B: Correct Answer, see explanation.

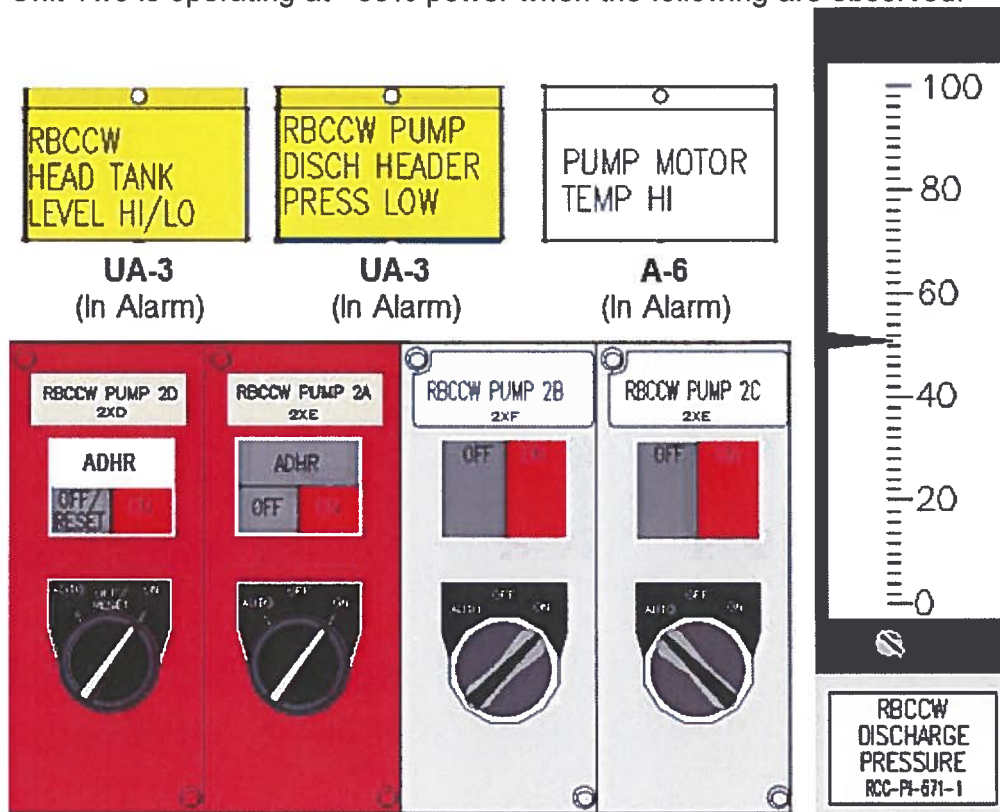
Choice C: Plausible because it uses the total number of fans running vs. the number of exhaust fans.

Choice D: Plausible because it is the correct numerical value but is off by a factor of 10.

SRO Basis: N/A

43. 295018 1

Unit Two is operating at ~65% power when the following are observed:



Which one of the following completes both statements below IAW 0AOP-16.0, *RBCCW System Failure*?

A complete loss of RBCCW ____ (1) ____ occurred.

A reactor scram ____ (2) ____ required.

- A. (1) has
(2) is
- B. (1) has
(2) is NOT
- C. (1) has NOT
(2) is
- D. (1) has NOT
(2) is NOT

Answer: A

K/A:

295018 Partial or Complete Loss of Component Cooling Water

AK2 Knowledge of the interrelations between PARTIAL OR COMPLETE LOSS OF COMPONENT COOLING WATER and the following: (CFR: 41.7 / 45.8)

02 Plant operations

RO/SRO Rating: 3.4/3.6

Tier 1 / Group 1

K/A Match: This meets the K/A because it is testing the relationship of the loss of RBCCW and the actions required for plant operations

Pedigree: Last used on the 04 NRC Exam

Objective: LOI-CLS-LP-302-H, Obj. 4a
Given plant conditions, determine the required supplementary actions in accordance with the following AOPs: 0AOP-16.0, RBCCW System Failure

Reference: None

Cog Level: High

Explanation: A complete loss of RBCCW is defined as discharge header pressure below 60 psig and all available RBCCW pumps running (AOP-16.0). A complete loss requires a manual scram.

Distractor Analysis:

Choice A: Correct Answer, see explanation.

Choice B: Plausible because the first part is correct and for a loss of TBCCW only a performing power reduction is allowed.

Choice C: Plausible because the pumps are running and system pressure is available and a reactor scram could be thought of to be needed due to alarms.

Choice D: Plausible because the pumps are running and system pressure is available and for a loss of TBCCW only a performing power reduction is allowed.

SRO Basis: N/A

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4.2 Supplementary Actions (continued)

- b. **IF** ADHR Mode piping is **NOT** the source of the leakage, **THEN** re-align RBCCW Pumps A and D from ADHR Mode to RBCCW Mode, as necessary.....

NOTE
A complete loss of RBCCW is defined as discharge header pressure less than 60 psig, high temperature alarms on components supplied by RBCCW, and all available (no more than three) RBCCW pumps operating on the RBCCW header..... <input type="checkbox"/>

4. **IF** there is a complete loss of RBCCW, **THEN**:.....
- a. **Trip all RBCCW pumps** (including RBCCW Drywell HVAC Cooling Pump if operating on the affected unit and pumps operating in ADHR Mode).....
- b. **Close the following valves:**
- RCC-V28 (RBCCW To DW Isol Vlv).....
 - RCC-V52 (RBCCW TO DW Isol Vlv).....
- c. **Trip RWCU pump(s)**.....
- d. **Isolate RWCU System by closing the following valves:**
- G31-F001 (RWCU Inboard Isol Vlv).....
 - G31-F004 (RWCU Outboard isol Vlv).....
- e. **Reduce reactor power with recirc flow in accordance with 0ENP-24.5, Form 2, Immediate Reactor Power Reduction Instructions**.....
- f. **Insert a manual scram**.....
- g. **Enter 1EOP-01-RSP(2EOP-01-RSP), Reactor Scram Procedure, **AND** perform concurrently with this procedure**.....
- h. **Trip both reactor recirculation pumps** by performing the following:
- (1) **Depress VFD A Emerg Stop**.....
 - (2) **Depress VFD B Emerg Stop**.....

44. 295019 1

Unit Two has entered 0AOP-20.0, *Pneumatic (Air/Nitrogen) System Failures*, due to a loss of instrument air pressure with the following annunciator status:

UA-01 (1-1) <i>RB Instr Air Receiver 2A Press Low</i>	Alarm sealed in
UA-01 (1-2) <i>RB Instr Air Receiver 2B Press Low</i>	NOT in Alarm
UA-01 (3-2) <i>Air Compr D Trip</i>	Alarm sealed in
UA-01 (4-4) <i>Inst Air Press Low</i>	Alarm sealed in
UA-01 (5-4) <i>Service Air Press-Low</i>	Alarm sealed in

Which one of the following completes both statements below?

On a loss of instrument air, the RB HVAC Butterfly Isolation Valves will fail (1).

IAW 0AOP-20.0, the reactor (2) required to be scrammed.

- A. (1) as-is
(2) is
- B. (1) as-is
(2) is NOT
- C. (1) open
(2) is
- D. (1) open
(2) is NOT

Answer: B

K/A:

295019 Partial or Complete Loss of Instrument Air

AA2 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF INSTRUMENT AIR: (CFR: 41.10 / 43.5 / 45.13)

02 Status of safety-related instrument air system loads

RO/SRO Rating: 3.6/3.7

Tier 1 / Group 1

K/A Match: This meets the K/A because it is testing status of equipment on a loss of air and the action that is required from the AOP

Pedigree: New

Objective: LOI-CLS-LP-302K, Objective 6

Summarize the consequences associated with improper equipment operation specified in 0AOP-20.0, *Pneumatic (Air/Nitrogen) System Failures*

Reference: None

Cog Level: Fundamental

Explanation: A loss of instrument air the BFIVs fail as-is. Other equipment will fail open or closed. A reactor scram is required if unable to maintain at least one division non-interruptible instrument air pressure greater than 95 psig.

Distractor Analysis:

Choice A: Plausible because the first part is correct and a scram is required if both divisions are pressure cannot be maintained. The BFIV's are closed if either divisions air pressure cannot be maintained.

Choice B: Correct Answer, see explanation.

Choice C: Plausible because air operated valves can be designed to fail open, closed or as-is. Part 2 because a reactor scram is required if unable to maintain at least one division non-interruptible instrument air pressure greater than 95 psig.

Choice D: Plausible because air operated valves can be designed to fail open, closed or as-is. Part 2 is correct.

SRO Basis: N/A

PNEUMATIC (AIR/NITROGEN) SYSTEM FAILURES	0AOP-20.0
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4.0 OPERATOR ACTIONS

NOTE	
The following should be considered for establishment as critical parameters during performance of this procedure: <input type="checkbox"/>	
<ul style="list-style-type: none">• Instrument air pressure• PNS pressure• MSIV position• Condensate and Feedwater System minimum flow valve status• Control rod positions	

4.1 Immediate Actions

1. **IF** any of the following conditions exist:
 - Unable to maintain at least one division non-interruptible instrument air pressure greater than 95 psig
 - Unable to maintain at least one division drywell pneumatic pressure greater than 95 psig
 - Instrumentation indicates unsafe reactor operation
- THEN:**
- a. **Insert a manual scram**
 - b. **Enter 1EOP-01-RSP(2EOP-01-RSP), Reactor Scram Procedure and perform concurrently with this procedure**

PNEUMATIC (AIR/NITROGEN) SYSTEM FAILURES	0AOP-20.0
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- e. **IF** UA-01 1-1, RB Instr Air Receiver 1A(2A) Press Low
OR UA-01 1-2, RB Instr Air Receiver 1B(2B) Press Low,
alarm is received,
THEN perform the following:

NOTE

Isolation of the reactor building supply and exhaust valves renders the building ventilation system INOPERABLE. Standby Gas Treatment System operation may be required to maintain reactor building negative pressure.....

- (1) **IF** required to maintain reactor building negative pressure,
THEN start the Standby Gas Treatment System in accordance with 1OP-10(2OP-10), Standby Gas Treatment System.

- (2) Close the following valves:

Unit 1 Only:

- 1A-BFIV-RB and 1C-BFIV-RB (RB Vent Inbd Valves).....
- 1B-BFIV-RB and 1D-BFIV-RB (RB Vent Outbd Valves)

Unit 2 Only:

- 2A-BFIV-RB and 2C-BFIV-RB (RB Vent Inbd Valves).....
- 2B-BFIV-RB and 2D-BFIV-RB (RB Vent Outbd Valves).....

45. 295020 1

I&C Techs inadvertently cause a low level 3 (LL3) signal.

Unit Two plant conditions are:

Reactor pressure	930 psig
Drywell pressure	1.7 psig, steady
Drywell temp (average)	140°F, slow rise
Drywell leak calculation	Normal

Which one of the following completes the statement below?

All Drywell Cooler Fans are:

- A. tripped, but can be overridden on.
- B. tripped, and cannot be overridden on.
- C. running, but can be tripped at the RTGB.
- D. running, and cannot be tripped at the RTGB.

Answer: A

K/A:

295020 Inadvertent Containment Isolation

AA1 Ability to operate and/or monitor the following as they apply to INADVERTENT CONTAINMENT

ISOLATION: (CFR: 41.7 / 45.6)

02 Drywell ventilation/cooling system

RO/SRO Rating: 3.2/3.2

Tier 1 / Group 2

K/A Match: This meets the K/A because it is testing what the DW coolers do on an isolation signal.

Pedigree: Bank

Objective: LOI-CLS-LP-04, Obj. 20

Given plant conditions determine if the drywell coolers should auto start or trip

Reference: None

Cog Level: High

Explanation: LOCA signal on LL3 closes Group 10 which fails dampers open, but also trips fan motors. Override for LOCA trip can be performed as long as a LOCA does not really exist which is overridden in back panels (XU-27/XU-28). The low level condition also is a scram signal which provides an auto start signal for the DW Coolers which is prioritized by the trip signal.

Distractor Analysis:

Choice A: Correct Answer, see explanation.

Choice B: Plausible because the fans do trip and if the conditions were different they would not be able to be overridden.

Choice C: Plausible because the fans do auto start on a scram signal or usually when the dampers are opened and under different conditions they would be able to be tripped from the RTGB.

Choice D: Plausible because the fans do auto start on a scram signal or usually when the dampers are opened and under different conditions they would not be able to be tripped from the RTGB.

SRO Basis: N/A

Placing a Unit 2 Drywell Cooling Fan control switch in *START* causes the fan's discharge damper to open. WHEN the discharge damper is full open, the fan will start. The control switch should be held in the *START* position until the discharge damper is full open. The RBCCW cooling water valve to the coils will open concurrently with a fan start.

Placing the Drywell Cooling 1B Fan control switch in *START* causes the fan's discharge damper to open. WHEN the discharge damper is full open, the fan will start. The control switch should be held in the *START* position until the fan starts. The common air inlet damper and the RBCCW cooling water valve to the coils will open concurrently with a fan start.

WHEN the control switch for Drywell Cooling Fan 1A, 1C, or 1D is placed in *START*, the associated fan starts and the discharge backdraft damper opens from the fan air flow. The discharge damper position indication does not input to the start logic for Drywell Cooling Fans 1A, 1C, and 1D. The RBCCW cooling water valve to the coils will open concurrently with a fan start.

The Drywell Lower Vent dampers can be positioned to either MIN or MAX position by a two-position control switch on Panel XU-3. Normal plant operating position for these dampers is the MIN position. Placing these dampers to MAX position during plant operation may produce extreme temperature excursions in the upper drywell regions. Low scram air header pressure will reposition these dampers to the MAX position and automatically start any idle drywell cooling fan selected for AUTO.

Drywell Cooler Override Switches, VA-CS-5993/5994, are provided in Panels XU-27/28 to facilitate various modes of Drywell cooler operation as required by the EOPs.

The Pneumatic Nitrogen System or Reactor Building Non-Interruptible Instrument Air pneumatically operates the drywell cooling fans discharge dampers. These dampers will fail open on loss of pneumatics. Unit 2 and 1B drywell cooling fans discharge dampers fail closed on loss of the associated 120 VAC distribution panel.

A contactor in the associated fan's 480 VAC breaker provides drywell cooler FAN ON indication on RTGB Panel XU-3.

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The drywell coolers receive a LOCA trip signal from the Core Spray initiation relays.

46. 295021 1
Unit One in MODE 5.
The fuel pool gates are removed.
SDC Loop B is in service.
Fuel pool cooling assist is in operation.

The RHR Loop B pumps tripped and can NOT be restarted.

Which one of the following completes both statements below?
(consider each statement separately)

Fuel pool cooling assist ____ (1) ____.

Fuel pool cooling assist ____ (2) ____ capable of being aligned to the SDC Loop A IAW
1OP-17, *Residual Heat Removal System Operating Procedure*.

- A. (1) remains in service
(2) is
- B. (1) remains in service
(2) is NOT
- C. (1) is lost
(2) is
- D. (1) is lost
(2) is NOT

Answer: D

K/A:

295021 Loss of Shutdown Cooling

AK2 Knowledge of the interrelations between LOSS OF SHUTDOWN COOLING and the following:
(CFR: 41.7 / 45.8)

05 Fuel pool cooling and cleanup system

RO/SRO Rating: 2.7/2.8

Tier 1 / Group 1

K/A Match: This meets the K/A because it is testing the relationship of using SDC and the Fuel Pool.

Pedigree: New

Objective: LOI-CLS-LP-017, Obj 5

Given a drawing of the RHR system, trace the flow path for all of the six (6) modes of operation.

Reference: None

Cog Level: High

Explanation: Fuel pool cooling assist mode utilizes the B Loop of RHR so that when it is lost so too will the fuel pool cooling assist operations. If the gates were installed then the A Loop of SDC could be used with the B loop discharge flowpath, but with the gates removed this is NOT an option.

Distractor Analysis:

Choice A: Plausible because the students may think that the FPC pumps provide the motive force for this mode of operation and if the gates were installed then this would be correct.

Choice B: Plausible because the students may think that the FPC pumps provide the motive force for this mode of operation and the second part is correct.

Choice C: Plausible because the first part is correct and if the gates were installed then this would be correct.

Choice D: Correct Answer, see explanation

SRO Basis: N/A

8.11 Fuel Pool Cooling Assist Mode With Fuel Pool Gates Removed

U:

CAUTION

The following section has the potential to significantly raise area dose rates.

8.11.1 Initial Conditions

Date/Time Started _____

Initials

1. Reactor in Mode 5 with fuel pool gates removed. _____
2. Fuel pool temperature can **NOT** be maintained less than 125°F. _____
3. OPT-08.0C has been completed satisfactorily within previous 92 days. _____
4. Fuel Pool Cooling system in operation in accordance with 1OP-13 with available fuel pool cooling heat exchangers in operation. _____
5. **RHR Loop B is operating in shutdown cooling in accordance with Section 5.7 or 5.8.** _____

47. 295023 1

Unit Two is performing refueling operations when the refueling SRO reports that a spent fuel bundle has been dropped.

The following radiation monitoring alarms are received:

UA-03 (3-7) *Area Rad Refuel Floor High*
UA-03 (4-5) *Process Rx Bldg Vent Rad Hi*

Which one of the following identifies the "Immediate Action" that is required IAW 0AOP-05.0, *Radioactive Spills, High Radiation, and Airborne Activity*?

- A. Verify Group 6 isolation.
- B. Evacuate all personnel from the refuel floor.
- C. Place Control Room Emergency Ventilation System in operation.
- D. Isolate Reactor Building Ventilation and place Standby Gas Treatment trains in operation.

Answer: C

K/A:

295023 Refueling Accidents

AA1 Ability to operate and/or monitor the following as they apply to REFUELING ACCIDENTS:
(CFR: 41.7 / 45.6)

04 Radiation monitoring equipment

RO/SRO Rating: 3.4/3.7

Tier 1 / Group 1

K/A Match: This meets the K/A because it is testing the immediate operator actions for a radiation event.

Pedigree: Bank

Objective: LOI-CLS-LP-302J, Obj. 5

List the immediate operator actions required to be performed in accordance with 0AOP-05, *Radioactive Spills, High Radiation, and Airborne Activity*

Reference: None

Cog Level: Fundamental

Explanation: This is an Immediate Action identified in AOP-05.0.

Distractor Analysis:

Choice A: Plausible because this is an auto action not an immediate operator action of the AOP

Choice B: Plausible because IAW 0AOP-05.0 this is the first supplemental action.

Choice C: Correct Answer, see explanation.

Choice D: Plausible because RBHVAC isolation and SBGT start requires *PROCESS RX BLDG VENT RAD HI-HI* (UA-03 3-5) in alarm and these are supplementary actions in the procedure.

SRO Basis: N/A

RADIOACTIVE SPILLS, HIGH RADIATION, AND AIRBORNE ACTIVITY	0AOP-05.0
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4.0 OPERATOR ACTIONS

NOTE
The following should be considered for establishment as critical parameters during performance of this procedure: <input type="checkbox"/>
<ul style="list-style-type: none"> • Area radiation levels • Personnel habitability in the affected area

4.1 Immediate Actions

1. **IF** a fuel assembly was dropped or damaged, **THEN ensure** the Control Room Emergency Ventilation System (CREVS) is in operation. {7.1.1}.....

48. 295024 1

Unit Two is operating at rated power when high drywell pressure switch C72-PTM-N002A-1 fails high resulting in the annunciation of A-05-(5-6) *Pri Ctmt Press Hi Trip*.

Which one of the following completes the statement below?

RPS high drywell pressure relay C72-K4A will ____ (1) ____.

The RSP ____ (2) ____ be required to be entered.

- A. (1) energize
(2) will
- B. (1) energize
(2) will NOT
- C. (1) de-energize
(2) will
- D. (1) de-energize
(2) will NOT

Answer: D

K/A:

295024 High Drywell Pressure

EA1 Ability to operate and/or monitor the following as they apply to HIGH DRYWELL PRESSURE:
(CFR: 41.7 / 45.6)

05 RPS

RO/SRO Rating: 3.9/4.0

Tier 1 / Group 1

K/A Match: This meets the K/A because it is testing the ability to monitor RPS (half scram condition) for a high DW pressure condition

Pedigree: New

Objective: LOI-CLS-LP-003, Objectives:

7.g Given plant conditions state the Normal, Initiation, and Fail position/condition of the following components: (Open/Closed Energized/De Energized) RPS Logic

9. Given any scram signal, describe the logic arrangement for the signal including what combination of signals will cause a Full Scram.

Reference: None

Cog Level: High

Explanation: The RPS relays are de-energize to actuate and a single relay actuates the alarm and will cause a half scram.

Distractor Analysis:

Choice A: Plausible because there are logics that are energize to actuate and there are also logics that only require one instrument to actuate (Nuclear instrumentation).

Choice B: Plausible because there are logics that are energize to actuate and the half scram is the result.

Choice C: Plausible because the first part is correct and some logics do cause a full scram (Nuclear instrumentation).

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

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FRI CTMT PRESS HI TRIP

AUTOMATIC ACTIONS

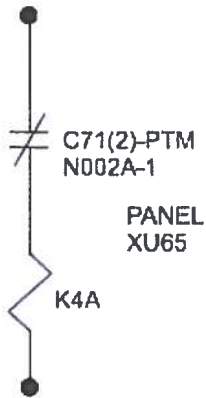
1. If the primary containment pressure high trip signal is received in only one RPS Trip System, a half Scram will occur.
2. If the primary containment pressure high trip signal is received in both RPS Trip Systems, a reactor Scram will occur.

DEVICE/SETPOINTS

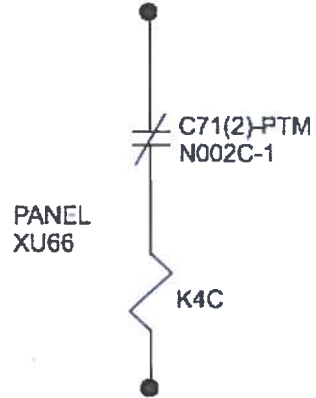
Relay C72-K4A-D	Deenergized
Pressure Switch C72-PTM-N002A-1, B-1, C-1, or D-1	1.7 psig

FIGURE 03-15
High Drywell Pressure Trip

TRIP CHANNEL "A1"

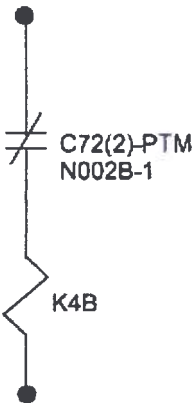


TRIP CHANNEL "A2"

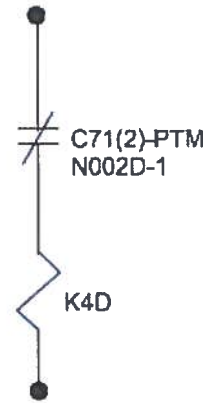


NOTE: PRESSURE SWITCH CONTACTS OPEN
ON HIGH DRYWELL PRESSURE CONDITION

TRIP CHANNEL "B1"



TRIP CHANNEL "B2"



49. 295025 1

Unit One was operating at power when a turbine trip occurred.
85 control rods fail to insert.
Reactor pressure peaks at 1145 psig.

Which one of the following completes both statements below?

The reactor recirc pumps ____ (1) ____ tripped.

Tripping of the reactor recirc pumps results in a rapid decrease in reactor power due to ____ (2) ____.

- A. (1) must be manually
(2) voiding of the moderator
- B. (1) must be manually
(2) a reduction in reactor water level
- C. (1) have automatically
(2) voiding of the moderator
- D. (1) have automatically
(2) a reduction in reactor water level

Answer: C

K/A:

295025 High Reactor Pressure

EK3 Knowledge of the reasons for the following responses as they apply to HIGH REACTOR PRESSURE: (CFR: 41.5 / 45.6)

02 Recirculation pump trip

RO/SRO Rating: 3.9/4.1

Tier 1 / Group 1

K/A Match: This meets the K/A because it is testing the reason the recirc pump is tripped.

Pedigree: Bank

Objective: LOI-CLS-LP-002, Obj. 30

Given Plant conditions determine if the ATWS-RPT protection logic should have actuated

Reference: None

Cog Level: Fundamental

Explanation: The Anticipated Transient Without Scram circuit provides an alternate means of reducing reactor power in the unlikely event that the control rods fail to insert into the core following a Reactor Protection System actuation signal. Tripping of the VFD Input Circuit Breakers (ICB) will rapidly reduce recirculation flow. This results in a rapid decrease in reactor power because of the voiding of the moderator. Setpoints for ATWS trip are high reactor pressure 1137.8 psig and low reactor level LL2 105"

Distractor Analysis:

Choice A: Plausible because the ATWS procedure directs the pumps to be tripped and the second part is correct.

Choice B: Plausible because the ATWS procedure directs the pumps to be tripped and level is reduced in the ATWS procedure which does lower power.

Choice C: Correct Answer, see explanation.

Choice D: Plausible because the first part is correct and level is reduced in the ATWS procedure which does lower power.

SRO Basis: N/A

3.2.6 Anticipated Transient Without Scram Recirculation Pump Trip (ATWS-RPT)

The Anticipated Transient Without Scram circuit provides an alternate means of reducing reactor power in the unlikely event that the control rods fail to insert into the core following a Reactor Protection System actuation signal. Tripping of the VFD Input Circuit Breakers (ICB) will rapidly reduce recirculation flow. This results in a rapid decrease in reactor power because of the voiding of the moderator.

Two signals are used for the initiation of ATWS-RPT. These signals are LL2 reactor vessel water level and high reactor vessel pressure. Each of these parameters is monitored by four sensors. Two level or pressure instruments in one of two logic trains are required to energize relays which trip both Recirculation Pumps.

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50. 295026 1

Unit One failed to scram following a loss of off-site power with the following plant conditions:

Reactor Power	5%
RPV Water Level	-55 inches (N036)
RPV Pressure	850 psig

Which one of the following completes both statements below?

This UA-12 (5-4) alarm is expected to be received when suppression pool water temperature **first** reaches (1) .

IAW 1OP-17, *Residual Heat Removal System Operating Procedure*, the RHR logic requirements to place torus cooling in service under the current plant conditions will require (2) .

- A. (1) 95°F
(2) placing the CS-S17B "Think Switch" to Manual first and then bypassing the 2/3rd core height interlock
- B. (1) 95°F
(2) bypassing the 2/3rd core height interlock first and then placing the CS-S17B "Think Switch" to Manual
- C. (1) 105°F
(2) placing the CS-S17B "Think Switch" to Manual first and then bypassing the 2/3rd core height interlock
- D. (1) 105°F
(2) bypassing the 2/3rd core height interlock first and then placing the CS-S17B "Think Switch" to Manual

Answer: B

K/A:

295026 Suppression Pool High Water Temperature

G2.4.50 Ability to verify system alarm setpoints and operate controls identified in the alarm response manual. (CFR: 41.10 / 43.5 / 45.3)

RO/SRO Rating: 4.2/4.0

Tier 1 / Group 1

K/A Match: This meets the K/A because it is testing when the torus temperature alarm setpoint and what controls need to be operated to establish cooling.

Pedigree: New

Objective: LOI-CLS-LP-017, Obj 09

Given an RHR pump or valve, list the interlocks, permissives and/or automatic actions associated with the RHR pump or valve, including setpoints.

Reference: None

Cog Level: High

Explanation: LOCA signal is sealed in due to being less than LL3 (45 inches) RPV water level is less than 2/3rd core height (-47 inches) therefore the keylock switch and then the Think switch is required (sequencing is essential). When the torus reaches 95°F this alarm will come in, 105°F is the TMax alarm.

Distractor Analysis:

Choice A: Plausible because the first part is correct and the second part is opposite of the required actions.

Choice B: Correct Answer, see explanation.

Choice C: Plausible because this is the alarm setpoint for the *SPTMS DIV I BULK WTR TEMP SETPT TMAX*, and the second part is opposite of the required actions.

Choice D: Plausible because this is the alarm setpoint for the *SPTMS DIV I BULK WTR TEMP SETPT TMAX*, and the second part is correct

SRO Basis: N/A

SPTMS DIV I BULK WTR TEMP SETPOINT TS1

NOTE: Inoperability of this annunciator may result in a TRM Required Compensatory Measure.

AUTO ACTIONS

NONE

CAUSE

1. High suppression pool bulk average water temperature.

OBSERVATIONS

1. Recorder Channel 1 on CAC-TR-4426-1A indicates increasing suppression pool temperature.
2. TS1 indicator illuminated (CAC-TY-4426-1).

ACTIONS

1. If suppression pool temperature is approaching 95°F and no testing is in progress that could add heat to the suppression pool, then refer to AOP-14.0, Abnormal Primary Containment Conditions and AOP-30.0, Safety/Relief Valve Failures.
2. If suppression pool temperature is greater than 95°F due to adding heat to the suppression pool from approved testing procedures, then refer to the appropriate test procedure to maintain suppression pool temperature below 105°F.
3. If suppression pool temperature is greater than 95°F and no testing is in progress that could add heat to the suppression pool, then enter EOP-02-FCCP, Primary Containment Control, and AOP-14.0, Abnormal Primary Containment Conditions.
4. If a circuit or equipment malfunction is suspected, ensure that a WR/WO is prepared.

DEVICE/SETPOINTS

SPTMS Microprocessor CAC-TY-4426-1

95°F

SPTMS DIV I BULK WTR TEMP SETPT TMAX

AUTO ACTIONS

NONE

CAUSE

1. High suppression pool bulk average water temperature.

OBSERVATIONS

1. Recorder Channel 1 on CAC-TR-4426-1A indicates increasing suppression pool temperature.
2. TMAX indicator illuminated (CAC-TY-4426-1).

ACTIONS

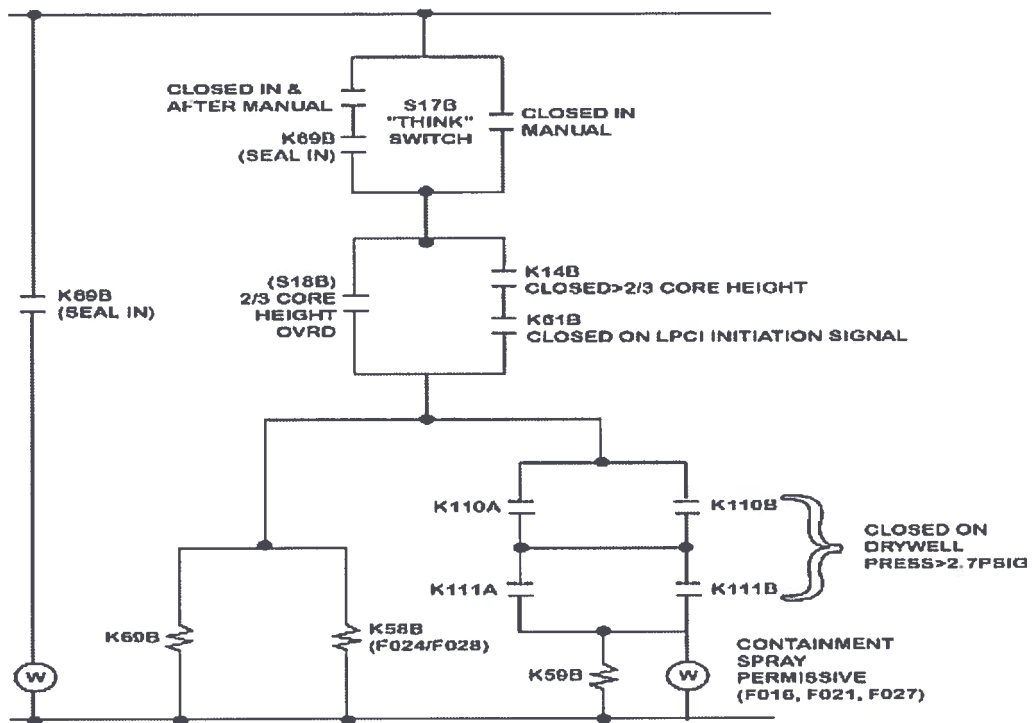
1. If suppression pool temperature is greater than 95°F and no testing is in progress that could add heat to the suppression pool, then enter EOP-02-PCCP, Primary Containment Control, and AOP-14.0, Abnormal Primary Containment Conditions, if not already entered.
2. If suppression pool temperature is approaching 105°F due to adding heat to the suppression pool from approved testing procedures, then refer to the appropriate test procedure to maintain suppression pool temperature below 105°F.
3. If suppression pool temperature is greater than 105°F, then stop all testing and enter EOP-02-PCCP, Primary Containment Control, and AOP-14.0, Abnormal Primary Containment Conditions.
4. If a circuit or equipment malfunction is suspected, then ensure that a WR/WO is prepared.

DEVICE/SETPOINTS

SPTMS Microprocessor CAC-TY-4426-1

105°F

FIGURE 17-12
Cooling/Spray Permissive Logic



51. 295028 1

Unit Two is in MODE 3 following a Station Blackout.

IAW 0EOP-01-SBO-01, *Plant Monitoring*, the AO has reported the following temperatures from the RSDP temperature recorder 2CAC-TR-778:

Point 1 290°F
Point 2 118°F
Point 3 255°F
Point 4 230°F
Point 5 191°F
Point 6 117°F

(REFERENCE PROVIDED)

Which one of the following represents the correct calculated Drywell temperature?

- A. ~205°F
- B. ~249°F
- C. ~258°F
- D. ~267°F

Answer: B

K/A:

295028 High Drywell Temperature

EA2 Ability to determine and/or interpret the following as they apply to HIGH DRYWELL TEMPERATURE: (CFR: 41.10 / 43.5 / 45.13)

01 Drywell temperature

RO/SRO Rating: 4.0/4.1

Tier 1 / Group 1

K/A Match: This meets the K/A because it is testing the students ability to determine drywell temperature.

Pedigree: Bank

Objective: LOI-CLS-LP-303-B, Obj. 3

Given plant conditions, control room or remote shutdown panel indications, and SBO-04, calculate the following parameters: a. Drywell Temperature

Reference: Attachment 4 of 0EOP-01-SBO-01, Plant Monitoring

Cog Level: Fundamental

Explanation: Attachment 4 of 0EOP-01-SBO-01, Plant Monitoring, has a calculation worksheet for figuring Drywell temperature from RSDP temperature recorder readings.

$$\begin{array}{r} 290 * 0.141 = 40.89 \\ 255 * 0.404 = 103.02 \\ 230 * 0.455 = \underline{104.65} \\ \hline 248.56 \end{array}$$

Distractor Analysis:

Choice A: Plausible because this is the average of points 1 - 3 used in calculation.

Choice B: Correct Answer, see explanation.

Choice C: Plausible because this is the average of points 1, 3, & 4.

Choice D: Plausible because this is performing the calculation backwards (points 4, 3, 1)

SRO Basis: N/A

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ATTACHMENT 4

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Drywell Temperature Calculation Using RSDP Recorder Inputs

Values obtained from Recorder CAC-TR-778

Above 70' Elevation

$$\text{PT 1 } \underline{290} \times 0.141 = \underline{40.89} \text{ } ^\circ\text{F}$$

Between 28' and 45' Elevation

$$\text{PT 3 } \underline{255} \times 0.404 = \underline{103.02} \text{ } ^\circ\text{F}$$

Between 10' and 23' Elevation

$$\text{PT 4 } \underline{230} \times 0.455 = \underline{104.65} \text{ } ^\circ\text{F}$$

Average Drywell Temperature 248.56 °F
(Sum of 3 Regional Weighted Areas)

52. 295029 1

Unit Two is performing RVCP with HPCI in pressure control.

Subsequently, A-01 (1-5) *Suppression Chamber Level Hi Hi* is received.

Which one of the following completes both statements below?

The E41-F004, CST Suction Vlv, will ____ (1) ____.

The E41-F008, Bypass to CST Vlv, will ____ (2) ____.

- A. (1) close
(2) close
- B. (1) close
(2) remain open
- C. (1) remain open
(2) close
- D. (1) remain open
(2) remain open

Answer: A

K/A:

295029 High Suppression Pool Water Level

EA1 Ability to operate and/or monitor the following as they apply to HIGH SUPPRESSION POOL
WATER LEVEL: (CFR: 41.7 / 45.6)

01 HPCI

RO/SRO Rating: 3.4/3.5

Tier 1 / Group 2

K/A Match: This meets the K/A because it is testing operation of HPCI on high torus level

Pedigree: New

Objective: LOI-CLS-LP-019. Obj. 3p

Given plant conditions, predict how the HPCI System will respond to the following events:
High/low Suppression Pool water level

Reference: None

Cog Level: High

Explanation: The torus water high level condition (> -25 inches) will cause the torus suction valves to open. When either valve is full open the F008 and F004 will close.

Distractor Analysis:

Choice A: Correct Answer, see explanation.

Choice B: Plausible because the first part is correct. The F008 will get a close signal when the F041 or F042 is full open.

Choice C: Plausible because the high/low level alarm does not affect the valves (annunciation only). The second part is correct.

Choice D: Plausible because the high/low level alarm does not affect the valves (annunciation only).

SRO Basis: N/A

FIGURE 19-7
CST Suction Valve, E41-F004, Control Logic

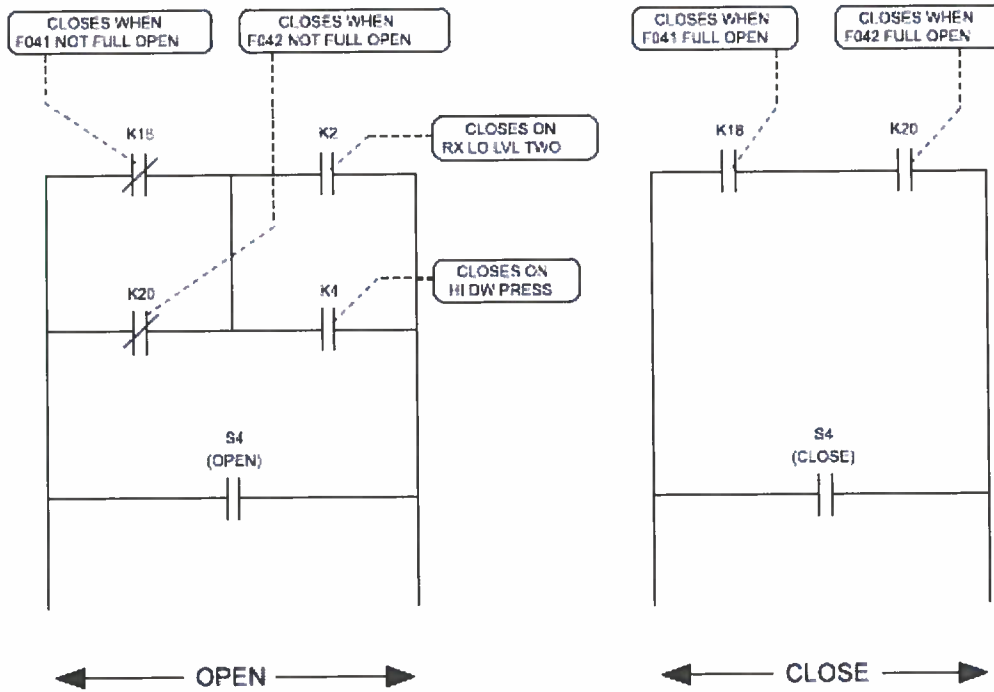
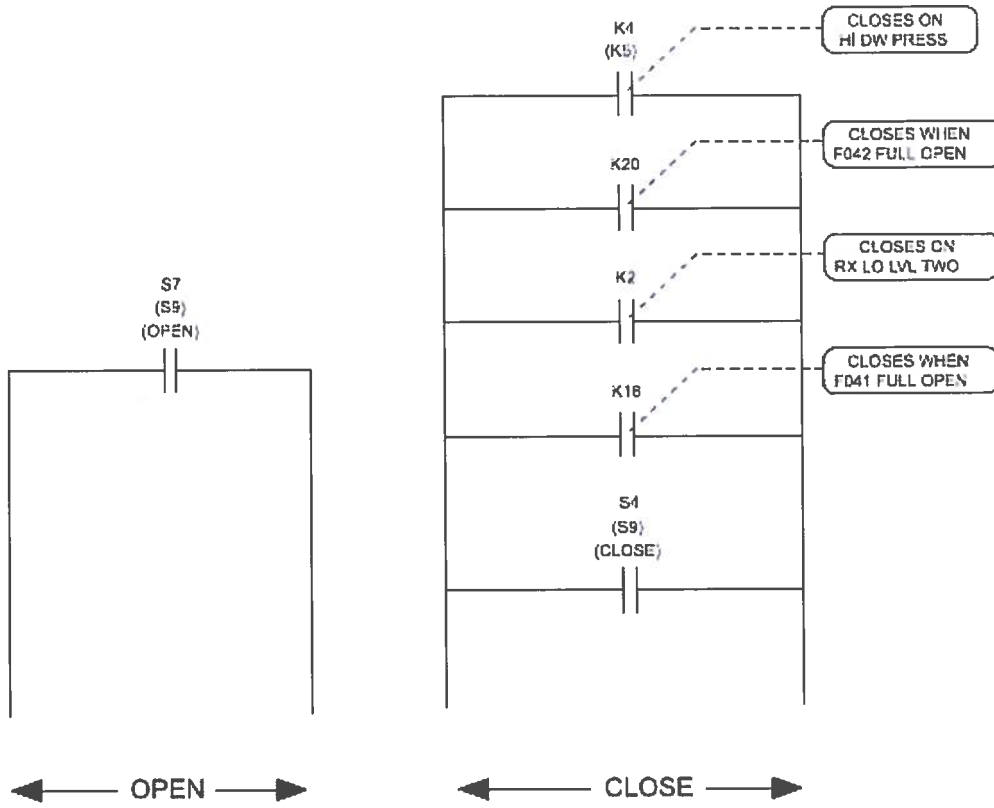
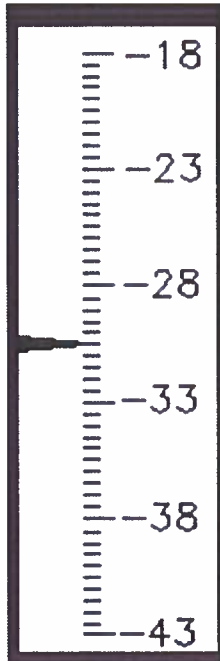


FIGURE 19-15
Test Return Isolation Valve, E41-F008 (E41-F011) Control Logic



53. 295030 1



Unit One is operating at rated power when A-01 (3-7) *Suppression Chamber Lvl Hi/Lo*, is received.

The BOP Operator verifies the alarm using CAC-LI-4177, *Supp Pool Level*, indicator on Panel XU-51. (indication provided to the left)

Which one of the following identifies the action that is required IAW A-01 (3-7) *Suppression Chamber Lvl Hi/Lo*?

The water level in the Unit One torus must be:

- A. lowered by using Core Spray and routed to Radwaste.
- B. lowered using RHR and routed to Radwaste.
- C. raised by opening the HPCI suction from the CST.
- D. raised by opening the Core Spray suction from the CST.

Answer: D

K/A:

295030 Low Suppression Pool Water Level

G2.4.50 Ability to verify system alarm setpoints and operate controls identified in the alarm response manual. (CFR: 41.10 / 43.5 / 45.3)

RO/SRO Rating: 4.2/4.0

Tier 1 / Group 1

K/A Match: This meets the K/A because it is testing ability to know whether the alarm is due to high or low level and knowledge of how to correct.

Pedigree: New

Objective: LOI-CLS-LP-302-D, Obj 2

Given plant conditions and AOP-14.0, determine the required supplementary actions.

Reference: None

Cog Level: High

Explanation: The student will verify that level is low using the provided indication and then will determine that the level must be raised IAW the APP. The low level alarm comes in at -30.5 inches and the high level alarm comes in at -27.5 inches. Level can be raised using RHR or the Core Spray systems.

Distractor Analysis:

Choice A: Plausible because it is a combined alarm and if it is assumed that a high water level condition exists the CS system can take a suction from the torus to correct the level condition, but is not allowed in the procedure.

Choice B: Plausible because it is a combined alarm and if it is assumed that a high water level condition exists the RHR system is utilized in the procedure to lower level.

Choice C: Plausible because level is low requiring it to be raised and the HPCI system could gravity drain to the torus, but is not allowed by the procedure.

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

SUPPRESSION CHAMBER LVL HI/LO

AUTO ACTIONS

NONE

CAUSE

1. Suppression pool water level high (-27 $\frac{1}{2}$ inches)
2. Suppression pool water level low (-30 $\frac{1}{2}$ inches)
3. Circuit malfunction

OBSERVATIONS

1. Suppression pool water level (CAC-LI-2601-1, CAC-LI-4177, CAC-LR-2602)

NOTE: Rapid changes in suppression pool pressure due to conditions such as inerting or air in-leakage can cause level fluctuations in suppression pool up to 1 inch or more.

ACTIONS

NOTE: ECCS keepfill stations makeup flow to the suppression pool is approximately 27 gpm.

1. If the cause of the annunciator is a planned evolution, then refer to the appropriate operating procedure to maintain suppression pool water level.
2. If the cause of the annunciator is not a planned evolution, then determine the cause of addition or loss of water to suppression pool and minimize evolutions which add or remove water to or from the suppression pool.
3. If suppression pool water level is high or low, then enter OACOP-14.0 to drain or fill the suppression pool as necessary.
4. If suppression pool water level is greater than -27 inches or less than -31 inches, then enter OZOP-02-FCCP.
5. If a circuit malfunction is suspected, ensure a WO is prepared.

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4.2.4 Suppression Pool Level High/Low

1. **IF** suppression pool level is approaching -27 inches,
THEN lower suppression pool level to Radwaste in accordance with
1OP-17(2OP-17), Residual Heat Removal System Operating
Procedure.....

2. **IF** suppression pool level is approaching -31 inches,
THEN raise suppression pool level in accordance with the following
applicable procedure:.....

Unit 1 Only:

- 1OP-17, Residual Heat Removal System Operating
Procedure.....

- 1OP-18, Core Spray System Operating Procedure.....

Unit 2 Only:

- 2OP-17, Residual Heat Removal System Operating
Procedure.....

- 2OP 18, Core Spray System Operating Procedure.....

54. 295031 1

Unit One is executing the ATWS procedure with the following plant conditions:

Reactor power 12%
Reactor pressure 940 psig, controlled by EHC
Reactor water level 170 inches, controlled by feedwater

Which one of the following identifies the reason the ATWS procedure directs deliberately lowering RPV water level to 90 inches?

- A. Reduces reactor power so that it will remain below the APRM downscale setpoint.
- B. Provides heating of the feedwater to reduce potential for high core inlet subcooling.
- C. Reduces challenges to primary containment if MSIVs close.
- D. Promotes more efficient boron mixing in the core region.

Answer: B

K/A:

295031 Reactor Low Water Level

EK1 Knowledge of the operational implications of the following concepts as they apply to REACTOR
LOW WATER LEVEL: (CFR: 41.8 to 41.10)

03 Water level effects on reactor power

RO/SRO Rating: 3.7/4.1

Tier 1 / Group 1

K/A Match: This meets the K/A because it is testing the knowledge of why level is lowered in a ATWS

Pedigree: Bank

Objective: LOI-CLS-LP-300-E, Obj 7

Explain the reason for lowering reactor water level while performing the Anticipated Transient
Without Scram Procedure.

Reference: None

Cog Level: fundamental

Explanation: To prevent or mitigate the consequences of any large irregular neutron flux oscillations induced by neutronic/thermal-hydraulic instabilities, reactor water level is lowered sufficiently below the elevation of the feedwater sparger nozzles. This places the feedwater spargers in the steam space providing effective heating of the relatively cold feedwater and eliminating the potential for high core inlet subcooling. For conditions that are susceptible to oscillations, the initiation and growth of oscillations is principally dependent upon the subcooling at the core inlet; the greater the subcooling, the more likely oscillations will commence and increase in magnitude. Twenty-four inches below the lowest nozzle in the feedwater sparger (i.e. 90 inches) has been selected as the upper bound of the reactor water level control band. This water level is sufficiently low that steam heating of the injected water will be at least 65% to 75% effective (i.e., the temperature of the injected water will be increased to 65% to 75% of its equilibrium value in the steam environment). This water level is sufficiently high that even without bypassing the low reactor water level MSIV isolation, reactor water level can be controlled with the feedwater pumps to preclude the isolation.

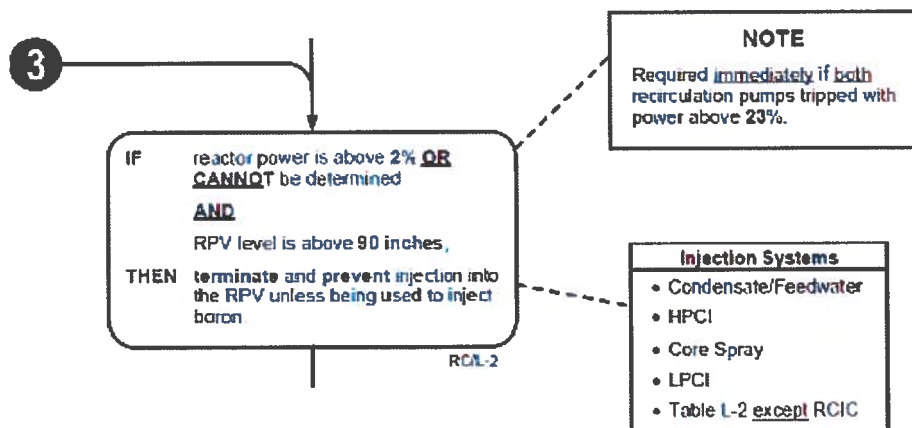
Distractor Analysis:

- Choice A: Plausible because since the operator can re-establish injection at 90 inches irrespective of power level. Power will lower as level is lowered but 90 inches will not guarantee APRMs are downscale
- Choice B: Correct Answer, see explanation.
- Choice C: Plausible because since there is no current challenge to containment from heat input. If level is lowered due to containment heat input, 90 inches is not specified as the top of the level band. This would be either TAF or the level at which downscale are received
- Choice D: Plausible because since lowering level will reduce natural circulation and reduce boron mixing. ATWS procedure directs raising level back to the normal band (170-200 inches) once hot shutdown boron weight is injected

SRO Basis: N/A

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5.4 Step RC/L-2



If reactor power is greater than 23% with both reactor recirculation pumps tripped and RPV level above 90 inches, RPV level needs to be promptly reduced below the feedwater nozzles, to avoid thermal hydraulic instabilities. This is accomplished by termination and prevention of injection systems, from identified systems, particularly feedwater, within 120 seconds.

To prevent or mitigate the consequences of any large irregular neutron flux oscillations induced by neutronic/thermal-hydraulic instabilities, RPV level is initially lowered sufficiently below the elevation of the feedwater sparger nozzles. This places the feedwater spargers in the steam space providing effective heating of the relatively cold feedwater and eliminating the potential for high core inlet subcooling. For conditions that are susceptible to oscillations, initiation and growth of oscillations is principally dependent upon subcooling at the core inlet; the greater the subcooling, the more likely oscillations will commence and increase in magnitude.

55. 295032 1

Which one of the following identifies the reason for performing Emergency Depressurization due to exceeding Maximum Safe Operating Temperatures IAW 00I-37.9, *Secondary Containment Control Procedure Basis Document*?

- A. Prevent an unmonitored release.
- B. Preserve personnel access into the reactor building.
- C. Provide continued operability of equipment required for safe shutdown.
- D. Ensure ODCM site boundary dose limits are not exceeded.

Answer: C

K/A:

295032 High Secondary Containment Area Temperature

EK3 Knowledge of the reasons for the following responses as they apply to HIGH SECONDARY CONTAINMENT AREA TEMPERATURE: (CFR: 41.5 / 45.6)

01 Emergency/normal depressurization

RO/SRO Rating: 3.5/3.8

Tier 1 / Group 2

K/A Match: This meets the K/A because it is testing the reason ED is performed for high secondary containment temperatures.

Pedigree: Bank

Objective: LOI-CLS-LP-300-M, Obj 13a

Given plant conditions and the SCCP, determine the required actions if the following limits are exceeded: Maximum Safe operating values with a primary system discharging into secondary containment.

Reference: None

Cog Level: Fundamental

Explanation: The MSOT values are the area temperatures above which equipment necessary for the safe shutdown of the plant will fail. These area temperatures are utilized in establishing the conditions which reactor depressurization is required. The criteria of more than one area specified in this step identifies the rise in reactor building parameters as a wide spread problem which may pose a direct and immediate threat to secondary containment integrity, equipment located in the RB, and continued safe operation of the plant.

Distractor Analysis:

Choice A: Plausible because this is a purpose of SCCP not the reason for ED on Temperature.

Choice B: Plausible because this is the reason for max safe operating rad levels.

Choice C: Correct Answer, see explanation.

Choice D: Plausible because this is a purpose of SCCP not the reason for ED on Temperature.

SRO Basis: N/A

5.1 **Step SCCP-1**

ENTRY CONDITIONS						
Secondary Containment Integrity <small>Measure 1 and 20 in 10-10</small>	Area Temperature <small>Area 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000</small>					

The conditions which require entry to SCCP are symptomatic of conditions which, if not corrected, could degrade into an emergency. Adverse effects on the operability of equipment located in the reactor building and conditions directly challenging secondary containment integrity or spent fuel pool cooling were specifically considered in the selection of these entry conditions. In addition, personnel accessibility to some of the areas may be required to perform certain actions specified in the procedure. This was also considered in making these determinations.

An area temperature or area differential temperature above its maximum normal operating level is an indication that steam from a primary system may be discharging into the reactor building. As temperatures continue to increase, the continued operability of equipment needed to carry out EOP actions may be compromised.

56. 295034 1

Which one of the following completes both statements below?

IAW 0AOP-5.4, *Radiological Releases*, RRCP is entered when the Turbine Building Vent Rad Monitor indication exceeds an ____ (1) ____ EAL.

IAW RRCP, before the radioactivity release rate reaches a ____ (2) ____ Emergency EAL, Emergency Depressurization is required.

- A. (1) Unusual Event
(2) Site Area
- B. (1) Unusual Event
(2) General
- C. (1) Alert
(2) Site Area
- D. (1) Alert
(2) General

Answer: D

K/A:

295034 Secondary Containment Ventilation High Radiation

G2.4.08 Knowledge of how abnormal operating procedures are used in conjunction with EOPs. (CFR: 41.10 / 43.5 / 45.13)

RO/SRO Rating: 3.8/4.5

Tier 1 / Group 2

K/A Match: This question matches the KA because it tests the knowledge if the AOP and EOP are performed in conjunction with each other.

Pedigree: new

Objective: LOI-CLS-LP-302-J, Obj. 3c

Given plant conditions, determine the required Supplementary Actions in accordance with: 0AOP-05.4, Radiological Release

Reference: None

Cog Level: Fundamental

Explanation: The AOP states that when an Alert EAL is entered then ENTER RRCP. Before a GE is declared ED is required to be performed. (A scram is required before a SAE is declared)

Distractor Analysis:

Choice A: Plausible because an Unusual Event is the first declaration in the EAL network and a SAE is the criteria for a scram in RRCP.

Choice B: Plausible because an Unusual Event is the first declaration in the EAL network and the second part is correct.

Choice C: Plausible because the first part is correct and the SAE is the criteria for a scram in RRCP.

Choice D: Correct Answer, see explanation

SRO Basis: N/A

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3.0 AUTOMATIC ACTIONS (continued)

- SBTG starts
- Group 6 isolation valves close
- 4. **IF** UA-03 2-8, Radwaste Effluent Rad Hi Hi, in ALARM, **THEN** D12-V27A(B) (RW Liq Effluent Disch Vlvs) close
- 5. **IF** UA-23 3-6, Main Steam Line Rad Hi-Hi/Inop, in ALARM, **THEN:**
 - Mechanical vacuum pumps trip
 - OG-V7 (Cndsr Hogging Valve) closes

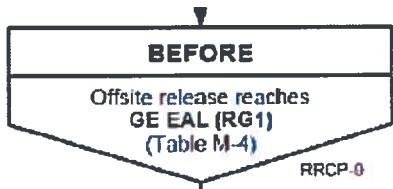
4.0 OPERATOR ACTIONS

4.1 Immediate Actions

None

4.2 Supplementary Actions

1. **IF AT ANY TIME** elevated radiation levels are determined to be from resin injection only, **THEN** go to QAOP-26.0, High Reactor Coolant or Condensate Conductivity
2. **IF AT ANY TIME** gaseous release rate exceeds an Alert level, **THEN** enter OEOP-04-RRCP, Radioactivity Release Control Procedure



57. 295036 1

Following an unisolable RWCU line break in the reactor building the following conditions exist:

South Core Spray Room temperature 155°F
South RHR Room temperature 300°F
UA-12 (2-3) *South Core Spray Room Flood Level Hi*, in alarm
UA-12 (2-4) *South RHR Room Flood Level Hi*, in alarm
UA-12 (1-4) *South RHR Room Flood Level Hi-Hi*, in alarm

(REFERENCE PROVIDED)

Which one of the following completes both statements below?

IAW 0EOP-01-UG, *User's Guide*, (1) equipment required for safe shutdown will fail.

IAW SCCP, Emergency Depressurization (1) required.

- A. (1) ONLY the South RHR room
(2) is
- B. (1) ONLY the South RHR room
(2) is NOT
- C. (1) the South RHR room AND Core Spray room
(2) is
- D. (1) the South RHR room AND Core Spray room
(2) is NOT

Answer: B

K/A:

295036 Secondary Containment High Sump / Area Water Level

EK1 Knowledge of the operational implications of the following concepts as they apply to SECONDARY CONTAINMENT HIGH SUMP/AREA WATER LEVEL: (CFR: 41.8 to 41.10)

02 Electrical ground/ circuit malfunction

RO/SRO Rating: 2.6/2.8

Tier 1 / Group 2

K/A Match: This meets the K/A because this is testing the implication of high water level on equipment and whether ED is required.

Pedigree: New

Objective: LOI-CLS-LP-300-M, Obj, 13a

Given plant conditions and the Secondary Containment Control Procedure, determine the required action if the following limits are exceeded: Maximum Safe operating values WITH a primary system discharging into Secondary Containment

Reference: 0EOP-01-NL, *EOP/SAMG Numerical Limits And Values*, Attachment 3, *Containment Parameters*, Table 3-B, *Secondary Containment Area Temperature Limits*

Cog Level: High

Explanation:

Distractor Analysis:

Choice A: Plausible because the first part is correct and for ED two areas in the same parameter must be at max safe conditions, while this question has two parameters in the same area.

Choice B: Correct Answer, see explanation.

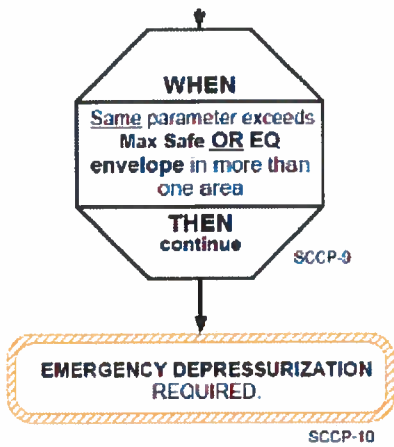
Choice C: Plausible because both areas have a max normal condition and for ED two areas in the same parameter must be at max safe conditions, while this question has two parameters in the same area.

Choice D: Plausible because both areas have a max normal condition and the second part is correct.

SRO Basis: N/A

3.0 DEFINITIONS (continued)

- Core Spray Loop A
 - Core Spray Loop B
 - RHR Loop A (one or two pumps running)
 - RHR Loop B (one or two pumps running)
32. **Maximum Normal Operating (Parameter):** The highest value of the identified parameter expected to occur during normal plant operating conditions with all directly associated support and control systems functioning properly.
33. **Maximum Pressure Suppression Primary Containment Water Level:** The highest primary containment water level at which the pressure suppression capability of the containment can be maintained. This corresponds to the bottom of the ring header.
34. **Maximum Safe Operating Radiation Level:** The radiation level above which personnel access necessary for the safe shutdown of the plant will be precluded. If the maximum safe operating radiation level is exceeded in an area (but is within the EQ envelope as contained in DR-227, Document Reference for Environmental Qualification Service Conditions) and then later clears and is subsequently followed by another area exceeding maximum safe operating radiation level, action for one area exceeding maximum safe operating radiation level should be taken.
35. **Maximum Safe Operating Temperature:** The temperature above which equipment necessary for the safe shutdown of the plant may fail. This temperature is utilized in establishing the conditions under which RPV depressurization is required. Separate temperatures are provided for each Secondary Containment area. If the maximum safe operating temperature is exceeded in an area and then later clears and is subsequently followed by another area exceeding maximum safe operating temperature, action for two areas exceeding maximum safe operating temperature should be taken.
36. **Maximum Safe Operating Water Level:** The water level above which equipment necessary for the safe shutdown of the plant may fail. This water level is utilized in establishing the conditions under which RPV depressurization is required. Separate water levels are provided for each Secondary Containment area. If the maximum safe operating water level is exceeded in an area and then later clears and is subsequently followed by another area exceeding maximum safe operating water level, action for two areas exceeding maximum safe operating water level should be taken.



ATTACHMENT 3
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Containment Parameters

Secondary Containment Area Temperature Limits

Table 3-B

PLANT AREA	PLANT LOCATION DESCRIPTION	MAX NORM OPERATING VALUE (°F)	MAX SAFE OPERATING VALUE (°F)	AUTO GROUP ISOLATION
N CORE SPRAY	N CORE SPRAY ROOM	120	175	N/A
S CORE SPRAY	S CORE SPRAY ROOM	120	175	N/A
RWCU	PMP ROOM A PMP ROOM B HX ROOM	140	225	3
N RHR	N RHR EQUIP ROOM	175	295	N/A
S RHR	S RHR EQUIP ROOM RCIC EQUIP ROOM	175 165	295 295	N/A 5
HPCI	HPCI EQUIP ROOM	165	165	4
STEAM TUNNEL	RCIC STM TUNNEL HPCI STM TUNNEL	190 190	295 295	5 4
20 FT	20 FT NORTH 20 FT SOUTH	140 140	200 200	N/A N/A
50 FT	50 FT NW 50 FT SE	140 140	200 200	N/A N/A
REACTOR BLDG	MULTIPLE AREAS ANNUN. A-02 5-7	ALARM SETPOINT	N/A	3, 4, AND/OR 5
REACTOR BLDG	MSIV PIT ANNUN. A-06 6-7	ALARM SETPOINT	N/A	1

58. 295037 1

The RO has attempted to manually scram Unit One with the following actions taken:

All rods are noted to be greater than position 02

Reactor mode switch is placed in shutdown

ARI was initiated.

Both recirculation pumps were tripped.

Reactor power reported at 12%

SLC is injecting

RPV level is 80 inches and stable

Rod insertion attempts are unsuccessful

Which one of the following completes both statements below?

Reactor power ____ (1) ____ expected to be lowering.

Assuming no rod insertion, SLC injection ____ (2) ____.

- A. (1) is
(2) can be secured when all APRMs are downscale
- B. (1) is
(2) must be continued until the reactor is shutdown under all conditions
- C. (1) is NOT
(2) can be secured when all APRMs are downscale
- D. (1) is NOT
(2) must be continued until the reactor is shutdown under all conditions

Answer: B

K/A:

295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown

EK1 Knowledge of the operational implications of the following concepts as they apply to SCRAM

CONDITION PRESENT AND REACTOR POWER ABOVE APRM DOWNSCALE OR UNKNOWN :

(CFR: 41.8 to 41.10)

03 Boron effects on reactor power (SBLC)

RO/SRO Rating: 4.2/4.4

Tier 1 / Group 1

K/A Match: This meets the K/A because the student will have to know the effects that boron has shutting down the reactor during an ATWS.

Pedigree: Bank

Objective: LOI-CLS-LP-005, Obj 3

List the positive reactivity effects that must be overcome by SLC injection

Reference: None

Cog Level: Fundamental

Explanation: Injection of the CSBW into the RPV will provide adequate assurance that the reactor is and will remain shutdown. It is the least weight of soluble boron which, if injected into the RPV and mixed uniformly, will maintain the reactor shutdown under all conditions. This weight is utilized to assure the reactor will remain shutdown irrespective of control rod position or RPV water temperature. Boron injection is continued until the entire tank is injected or all rods are inserted.

Distractor Analysis:

Choice A: Plausible because the first part is correct and the second part is plausible because in some procedures the reactor is called shutdown if power is downscale on the APRM's.

Choice B: Correct Answer, see explanation

Choice C: Plausible because rods are not being inserted and the second part is plausible because in some procedures the reactor is called shutdown if power is downscale on the APRM's.

Choice D: Plausible because rods are not being inserted and the second part is correct.

SRO Basis: N/A

1.2 System Design Basis

The design basis for the SLC System is as follows:

- 1.2.1 Backup capability for reactivity control is provided, independent of the normal reactivity control provisions in the nuclear reactor, to permit shutdown of the reactor if the normal control ever becomes inoperative.
- 1.2.2 To assure complete shutdown from the most reactive condition at any time in core life, this backup system has the capacity to control the reactivity difference between the steady state rated operating condition of the reactor with voids and the cold shutdown condition, including shutdown margin.
- 1.2.3 The time required to actuate and effect the backup control is consistent with the nuclear reactivity rate of change predicted between rated operating and cold shutdown conditions. A fast scram of the reactor or operational control of fast reactivity transients is not specified for this system.
- 1.2.4 Means are provided by which the functional performance capability of the backup control system components can be verified under conditions approaching actual use requirements.
- 1.2.5 The neutron absorber is dispersed within the reactor core in sufficient quantity to provide a reasonable margin for leakage, dilution, or

59. 295038 1

A radioactive release has occurred in the Turbine Building.

Which one of the following completes both statements below?

IAW 0AOP-05.4, *Radiological Releases*, the Unit Two turbine building ventilation must be in the ___(1)___ operating mode.

This discharge will be monitored by the ___(2)___.

- A. (1) recirc
(2) Main Stack Radiation Monitor
- B. (1) recirc
(2) Wide Range Gaseous Monitor (WRGM)
- C. (1) once through
(2) Main Stack Radiation Monitor
- D. (1) once through
(2) Wide Range Gaseous Monitor (WRGM)

Answer: B

K/A:

295038 High Off-Site Release Rate

EA1 Ability to operate and/or monitor the following as they apply to HIGH OFF-SITE RELEASE RATE:
(CFR: 41.7 / 45.6)

01 Stack-gas monitoring system

RO/SRO Rating: 3.9/4.2

Tier 1 / Group 1

K/A Match: This meets the K/A because the student will have to determine the procedural requirement for the turbine building ventilation operational mode and the rad monitor that monitors it. (ability to monitor)

Pedigree: New

Objective: LOI-CLS-LP-302-J, Obj 3c

Given plant conditions, determine the required Supplementary Actions in accordance with: c.
0AOP-05.4, Radiological Release

Reference: None

Cog Level: Fundamental

Explanation: The turbine building ventilation can be lined up for once through or recirc mode, the AOP has the operator ensure that it is lined up in the recirc mode. The discharge is monitored by the turbine building WRGM.

Distractor Analysis:

- Choice A: Plausible because the first part is correct and the second part is a common radiation monitor for other ventilation systems.
- Choice B: Correct Answer, see explanation.
- Choice C: Plausible because once through is a mode of operation for the TB Ventilation system and the second part is a common radiation monitor for other ventilation systems.
- Choice D: Plausible because once through is a mode of operation for the TB Ventilation system and the second part is correct.

SRO Basis: N/A

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4.2 Supplementary Actions (continued)

NOTE	
• Turbine Building habitability should be considered for establishment as critical parameters during performance of this procedure.....	<input type="checkbox"/>
• Emergency Plan requirements mandate securing once through ventilation for any site radiological release.	<input type="checkbox"/>

- 10. **IF any site radiological release occurring, THEN ensure Unit 2 turbine building ventilation in recirculation mode per 2OP-37.3, Turbine Building Ventilation System Operating Procedure.**

60. 300000 1

Unit One is operating at rated power when the following alarms are received:

UA-01 (4-4) *Instr Air Press-Low*
UA-01 (5-1) *Air Dryer 1A Trouble*

The AO reports that the cause of the alarms is due to filter blockage.

Which one of the following completes both statements below?

The Service Air Dryer malfunction will cause SA-PV-5067, Service Air Dryer Bypass Valve, to open when pressure **first** lowers to (1) .

IAW 0AOP-20.0, Pneumatic (Air/Nitrogen) System Failures, the required action is to (2) .

- A. (1) 105 psig
 (2) place the 1B Service Air Dryer in service
- B. (1) 105 psig
 (2) set the service air dryer maximum sweep value to zero
- C. (1) 98 psig
 (2) place the 1B Service Air Dryer in service
- D. (1) 98 psig
 (2) set the service air dryer maximum sweep value to zero

Answer: C

K/A:

300000 Instrument Air System

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 operation: (CFR: 41.5 / 45.6)

01 Air dryer and filter malfunctions

RO/SRO Rating: 2.9/2.8

Tier 2 / Group 1

K/A Match: This meets the KA because it is predicting the response on the system and then using procedure (AOP-20) determine the action required.

Pedigree: New

Objective: LOI-CLS-LP-046, Obj. 6

Given plant conditions, determine if the following automatic actions should occur:

a. Service Air Isolation g. Air Dryer bypass.

Reference: None

Cog Level: High

Explanation: 98 psig is when the bypass valve auto opens, the 105 psig is the isolation setpoint for Service Air. The AOP will direct placing the standby Air Dryer in service.

Distractor Analysis:

Choice A: Plausible because 105 is the isolation setpoint for the service air system and the second part is correct.

Choice B: Plausible because 105 is the isolation setpoint for the service air system and this is an action in the AOP but would not be performed for this failure. If there is a high demand then this is performed to limit the amount of air that is used for the blowdown of the air dryer filter when cycling filters.

Choice C: Correct Answer, see explanation.

Choice D: Plausible because the first part is correct and this is an action in the AOP but would not be performed for this failure. If there is a high demand then this is performed to limit the amount of air that is used for the blowdown of the air dryer filter when cycling filters.

SRO Basis: N/A

4.2 Supplementary Actions (continued)

NOTE	
• Service Air System pre-filter or after-filter differential pressure should NOT exceed 15 psid.....	<input type="checkbox"/>
• In service air compressor high discharge pressure (Unit 1 : greater than or equal to 125 psig, Unit 2 : greater than or equal to 130 psig) or relief valves lifting could be an indication of air dryer high differential pressure potentially caused by power failures resulting in valves in the flow path failing closed.....	<input type="checkbox"/>
• 1(2)SA-PV-5067 [Serv Air Dryer 1(2)A Bypass Pressure Control Valve], is located in the Turbine Building air compressor area.....	<input type="checkbox"/>

i. **IF** UA-01 5-3, Air Dryer 1(2)A Trouble, is in alarm, **THEN** perform the following:

- (1) **Unit 1 Only**: Confirm 1-SA-PV-5067 (Serv Air Dryer 1A Bypass Pressure Control Valve), is OPEN.....

CAUTION	
The service air dryer provides a low dew point pneumatic source to downstream components. A low dew point is necessary to insure long term reliability of these components. The time the dryer is bypassed should be minimized {7.1.1}.....	<input type="checkbox"/>

- (2) **Unit 1 Only**: **IF** 1-SA-PV-5067 is **NOT** open, **THEN** open 1-SA-V5089 (Serv Air Dryer Manual Bypass Valve).....
- (3) **Unit 2 Only**: Confirm 2-SA-PV-5067 (Serv Air Dryer 2A Bypass Pressure Control Valve), is OPEN.....
- (4) **Unit 2 Only**: **IF** 2-SA-PV-5067 is **NOT** open, **THEN** open 2-SA-V5089 (Serv Air Dryer Manual Bypass Valve).....
- (5) **IF** available, **THEN** place 1B Service Air Dryer in service **AND** shutdown 1(2)A Service Air Dryer in accordance with OOP-46, Instrument and Service Air System Operating Procedure.....

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4.2 Supplementary Actions (continued)

- c. **IF** air is **NOT** cross-tied,
AND cross-tie operation will **NOT** cause a loss of instrument
air on the unaffected unit,
THEN perform the following:
 - (1) **Obtain permission from the non-affected unit.**
 - (2) **Ensure 1-SA-PV-5071 (Cross-Tie Valve), located on
Unit 1, Panel XU-2, is OPEN.**
 - (3) **Ensure 2-SA-PV-5071 (Cross-Tie Valve), located on
Unit 2, Panel XU-2, is OPEN.**
 - (4) **IF** opening the cross-tie valve degrades the
non-affected unit,
THEN return to Step 1.b(4).....

- d. **IF** the in service air dryer is in sweep mode,
THEN consider securing sweep mode in accordance with
Attachment 1, Setting Service Air Dryer(S) Maximum Sweep
Value To Zero.



61. 300000 2

Unit One is in MODE 3 following a seismic event and reactor scram with the following plant conditions:

Reactor level	55 inches
Reactor pressure	500 psig
Drywell pressure	9 psig
Division I PNS header pressure	93 psig
Division II PNS header pressure	98 psig

Which one of the following completes both statements below?

Div I Backup N2 Rack Isol Vlv, RNA-SV-5482 is _____ (1) _____.

Div II Backup N2 Rack Isol Vlv, RNA-SV-5481 is _____ (2) _____.

- A. (1) open
(2) open
- B. (1) open
(2) closed
- C. (1) closed
(2) open
- D. (1) closed
(2) closed

Answer: B

K/A:

300000 Instrument Air System

K3 Knowledge of the effect that a loss or malfunction of the (INSTRUMENT AIR SYSTEM) will have on the following: (CFR: 41.7 / 45.6)

01 Containment air system

RO/SRO Rating: 2.7/2.9

Tier 2 / Group 1

K/A Match: This meets the KA because it is testing the effect of the low pressure (loss or malfunction) of the air system on containment air (N2 backup).

Pedigree: Last used on 2007 NRC Exam

Objective: LOI-CLS-LP-046-A, Obj. 8

Given plant conditions, determine the effects that the following conditions will have on the Pneumatic System: (LOCT) b. Low Instrument Air/Pneumatic Nitrogen (IAN/RNA/PNS) Header Pressure

Reference: None

Cog Level: High

Explanation: No LOCA signal is present so the Backup N2 valves will not be open on a Core Spray initiation signal. The Backup N2 valves open at 95 psig or lower in the PNS header. This would result in Division I Backup N2 valve (5482) being open and Division II (5481) being closed.

Distractor Analysis:

Choice A: Plausible if the student believes that either division will open both valves.

Choice B: Correct Answer, see explanation.

Choice C: Plausible if the student uses the valves for the division separation.

Choice D: Plausible if the student only checks the LOCA signal and not the low pressure signal.

SRO Basis: N/A

Unit 1
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RB INSTR AIR RECEIVER 1A PRESS LOW

AUTO ACTIONS

1. RNA-SV-5482, High Pressure Bottle Rack Isolation Valve, opens, supplying SRVs and CAC-16 with a pneumatic source.

DEVICE/SETPOINTS

RNA-PSL-3596

95 psig decreasing

Unit 1
APP UA-01 1-2
Page 1 of 2

RB INSTR AIR RECEIVER 1B PRESS LOW

AUTO ACTIONS

1. RNA-SV-5481, High Pressure Bottle Rack Isolation Valve, opens, supplying SRVs and CAC-17 with a pneumatic source.

DEVICE/SETPOINTS

RNA-PSL-3597

95 psig decreasing

62. 400000 1

Unit One is operating at rated power with the following conditions:

CSW Pump 1A trips
Conventional header pressure lowers to 35 psig

Which one of the following completes both statements below?

If CSW header pressure remains at this pressure for (1) seconds,
the SW-V3, SW To TBCCW HXs Otbd Isol Vlv, and SW-V4, SW To TBCCW HXs Inbd
Isol Vlv, will close to a throttled position.

IAW 0AOP-19, *Conventional Service Water System Failure*, the SW-V3 and SW-V4 are
reopened (2) .

- A. (1) 30
(2) ONLY after a reactor Scram is inserted
- B. (1) 30
(2) if system pressure is restored by starting the standby CSW pump
- C. (1) 70
(2) ONLY after a reactor Scram is inserted
- D. (1) 70
(2) if system pressure is restored by starting the standby CSW pump

Answer: D

K/A:

400000 Component Cooling Water System (CCWS)

A2 Ability to (a) predict the impacts of the following on the CCWS and (b) based on those predictions,
use procedures to correct, control, or mitigate the consequences of those abnormal operation:
(CFR: 41.5 / 45.6)

01 Loss of CCW pump

RO/SRO Rating: 3.3/3.4

Tier 2 / Group 1

K/A Match: This meets the KA because it is testing the auto start signal/logic for a cooling water system.

Pedigree: Last used on the 2010 NRC exam

Objective: CLS-LP-302-H, Obj. 4 Given plant conditions and any of the following AOPs, determine
the required supplementary actions: d. 0AOP-19.0, Conventional Service Water System
Failure

Reference: None

Cog Level: High

Explanation: **IF** conventional service water header pressure remains below 40 psig for 70 seconds,

THEN:

- SW TO TBCCW HXS OTBD ISOL, SW-V3 closes to a throttled position
 - SW TO TBCCW HXS INBD ISOL, SW-V4 closes to a throttled position
- The Standby CSW pump should start and restore CSW header pressure to normal prior to the SW valves throttling closed. If the standby CSW pump fails to auto start, manually starting the pump will restore CSW header pressure. AOP-19 provides guidance to re-open the SW valves only after header pressure has been restored and the cause of low pressure is known (pump trip).

Distractor Analysis:

- Choice A: Plausible because 30 seconds is when the DG cooling water valves close and a Scram is inserted only after the SW valves have closed to the throttled position AND CSW header pressure cannot be immediately restored above 40 psig - under this condition all CSW pumps would be shutdown.
- Choice B: Plausible because 30 seconds is when the DG cooling water valves close and system pressure restored by the STBY pump start is correct.
- Choice C: Plausible because 70 seconds is correct and a Scram is inserted only after the SW valves have closed to the throttled position AND CSW header pressure cannot be immediately restored above 40 psig - under this condition all CSW pumps would be shutdown.
- Choice D: Correct Answer, see explanation

SRO Basis: N/A

CONVENTIONAL SERVICE WATER SYSTEM FAILURE	0AOP-19.0
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3.0 AUTOMATIC ACTIONS

1. Standby pump selected to the conventional service water header starts at 40 psig.....

2. **IF** all conventional service water pumps are tripped,
THEN:
 - SW-V36 (SW To CW Pumps Inbd Vlv), closes
 - SW-V37 (SW To CW Pumps Otbd Vlv), closes.....
 - CWIPs trip on low bearing lubricating water flow (5 - 6 gpm, time-delayed 15 minutes), resulting in loss of condenser vacuum.....

3. **IF** conventional service water header pressure remains less than 40 psig for 70 seconds,
THEN:
 - SW-V3 (SW To TBCCW HXs Otbd Isol), closes to a throttled position.....
 - SW-V4 (SW To TBCCW HXs Inbd Isol), closes to a throttled position.....

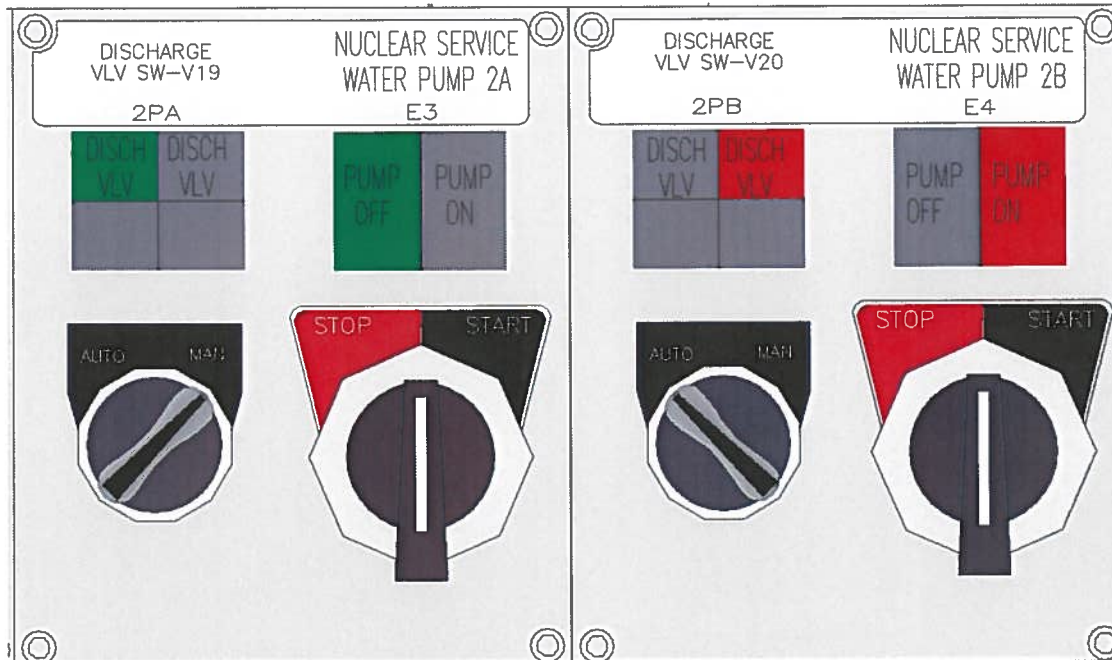
CONVENTIONAL SERVICE WATER SYSTEM FAILURE	0AOP-19.0
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4.2 Supplementary Actions (continued)

- d. **Attempt to isolate any source of leakage.**
- e. **Ensure discharge valves are CLOSED on shutdown pump(s).**
- f. **Check service water traveling screens for excessive build-up
AND wash if excessive buildup is occurring.**
- g. **Check service water trash racks for excessive build-up
AND notify Maintenance to clean if excessive buildup is
occurring.**
- h. **Locally monitor each pump discharge strainer differential
pressure.**
- i. **Check Annunciator Panel UA-01 for lit annunciators.**
- 10. **Refer to Technical Specification 3.7.2, Service Water (SW) System
and Ultimate Heat Sink (UHS) for operability requirements.**
- 11. **WHEN conventional service water header pressure is restored to
normal
AND the cause of low header pressure has been corrected,
THEN:**
 - a. **Open SW-V3 (SW To TBCCW HXs Otbd Isol).**
 - b. **Open SW-V4 (SW To TBCCW HXs Inbd Isol).**

63. 400000 2

Unit Two Nuclear Service Water (NSW) pumps are aligned as follows in preparation for equipment realignment:



Subsequently, Off-site power is lost.

Which one of the following completes the statement below?

___ (1) ___ NSW pump(s) will auto start ___ (2) ___ associated E Bus is re-energized.

- A. (1) 2A and 2B
(2) immediately when their
- B. (1) 2A and 2B
(2) five seconds after their
- C. (1) 2B ONLY
(2) immediately when its
- D. (1) 2B ONLY
(2) five seconds after its

Answer: A

K/A:

400000 Component Cooling Water System (CCWS)

K4 Knowledge of CCWS design feature(s) and or interlocks which provide for the following: (CFR: 41.7)

01 Automatic start of standby pump

RO/SRO Rating: 3.4/3.9

Tier 2 / Group 1

K/A Match: This meets the KA because it is testing the auto start signal/logic for a cooling water system.

Pedigree: Bank

Objective: LOI-CLS-043, Objective 8a
State the power supply (bus and voltage) for the following Service Water System components:
Nuclear Service Water Pumps.

Reference: N/A

Cog Level: High

Explanation: NSW pumps auto start immediately after LOOP signal regardless of mode selector switch or discharge valve position. 5 second timer applies only on a LOCA.

Distractor Analysis:

Choice A: Correct Answer, see explanation

Choice B: Plausible because this would be the case with a LOCA signal present.

Choice C: Plausible because examinee must know the power supply scheme.

Choice D: Plausible because examinee must know the power supply scheme.

SRO Basis: N/A

Each pump is powered by a 4160 VAC motor supplied from the emergency bus power supplies:

<u>Component</u>	<u>Power Supply</u>
1A CSW pump	E4
1B CSW pump	E1
1C CSW pump	E2
1A NSW pump	E1
1B NSW pump	E2
2A CSW pump	E3
2B CSW pump	E4
2C CSW pump	E1
2A NSW pump	E3
2B NSW pump	E4

In addition to the low header pressure auto start, the NSW pumps will start five seconds after receipt of a LOCA signal, regardless of mode selector switch or discharge valve position. For example, a Division I LOCA signal from either Unit 1 or Unit 2 will auto start the 1A and 2A NSW pumps; the Division II LOCA logic will auto start 1B and 2B NSW pumps.

The NSW pumps, powered through the 4160 VAC emergency buses, will also automatically start immediately after the start of the diesel generators and reenergization of the emergency buses on loss of off-site power (LOOP), regardless of mode selector switch or discharge valve position. For example, a Division I LOOP signal from either Unit 1 or Unit 2 will auto start the 1A and 2A NSW pumps; the Division II LOOP logic will auto start 1B and 2B NSW pumps. If a LOCA signal exists on the division sensing the LOOP, auto start will occur after five seconds, provided that a LOOP signal is not present on the opposite unit. On a dual unit LOOP the NSW pump(s) of the LOCA (and non-LOCA) unit start immediately after the emergency buses are reenergized by their respective diesel generators without the five second delay.

64. 600000 1

Which one of the following identifies the potential consequence of failing to place backup nitrogen in service by placing RNA keylock switches in LOCAL IAW 0ASSD-02, *Control Building*?

RNA keylock switch noun names:

2-RNA-CS-001, Override Switch For Valve RNA-SV-5482

2-RNA-CS-002, Override Switch For Valve RNA-SV-5253

- A. Misoperation of RCIC.
- B. Loss of drywell cooling.
- C. Inability to operate SRVs.
- D. Spurious operation of MSIVs.

Answer: C

K/A:

600000 Plant Fire On Site

AK3 Knowledge of the reasons for the following responses as they apply to PLANT FIRE ON SITE:
(CFR: 41.5 / 45.6)

04 Actions contained in the abnormal procedure for plant fire on site

RO/SRO Rating: 2.8/3.4

Tier 1 / Group 1

K/A Match: This matches the KA because it tests the reason a step in the ASSD procedure is performed. The ASSD procedures are the plant fire procedures.

Pedigree: Bank

Objective: LOI-CLS-LP-304, Obj. 25k

Given ASSD procedures and plant conditions, predict the consequences of FAILURE to perform the following actions: Deenergize RNA-SV-5482 and RNA-SV-5253 via keylock switches RNA-CS-001 and RNA-CS-002.

Reference: None

Cog Level: fundamental

Explanation: The Reactor Building MCC Operator places the key lock switches to the LOCAL position to ensure Nitrogen System is lined up to provide reliable operation of the SRVs.

Distractor Analysis:

Choice A: Plausible because actions for the operation of RCIC are contained in the ASSD procedures.

Choice B: Plausible because a loss of pneumatics would cause the DW cooler dampers to close.

Choice C: Correct Answer, see explanation.

Choice D: Plausible because actions to prevent the spurious operation of the MSIV is contained in the ASSD procedure.

SRO Basis: N/A

SECTION B1
UNIT 2 RX BLDG MCC OPERATOR ACTIONS
Initial Actions and RCIC Operations

- 1.6.5 **WHEN** directed to start RCIC, **THEN PERFORM** the following at MCC 2XDB:
1. **OPEN RCIC TURB TR & THR VLV, E51-V8, at Compt B37 (Row C1).**
 2. **OPEN RCIC TURB STM SPLY VLV, E51-F045, at Compt B44 (Row F2).**
 3. **INFORM** Unit 2 CRS RCIC should be running.
- 1.7 **WHEN** directed, **THEN PERFORM** the following at Unit 2 Reactor Building 50 foot elevation:
- 1.7.1 **PLACE** keylock switch 2-RNA-CS-001 in LOCAL for valve 2-RNA-SV-5482.
 - 1.7.2 **PLACE** keylock switch 2-RNA-CS-002 in LOCAL for valve 2-RNA-SV-5253.
 - 1.7.3 **INFORM** the Unit 2 CRS that backup nitrogen has been made available for SRV operation.
- 1.8 **IF** directed, **THEN TRANSFER** RCIC suction from CST to suppression pool at MCC 2XDB as follows:
- 1.8.1 **OPEN RCIC SUPP POOL SUCT VLV, E51-F031, at Compt B45 (Row G1).**
 - 1.8.2 **OPEN RCIC SUPP POOL SUCT VLV, E51-F029, at Compt B46 (Row G2).**
 - 1.8.3 **CLOSE RCIC CST SUCT VLV, E51-F010, at Compt B38 (Row C2).**

65. 700000 1

A grid disturbance occurs with the following Unit One plant parameters:

Generator Load	980 MWe
Generator Reactive Load	160 MVARs, out
Generator Gas Pressure	50 psig

(REFERENCE PROVIDED)

Which one of the following identifies both available options that will place the Unit within the Estimated Capability Curve?

- A. Raise gas pressure to 58 psig or lower power to 940 MWe.
- B. Raise gas pressure to 58 psig or raise reactive load to 240 MVARs.
- C. Raise gas pressure to 58 psig or lower reactive load to 70 MVARs.
- D. Lower power to 940 MWe or raise reactive load to 240 MVARs.

Answer: A

K/A:

700000 Generator Voltage and Electric Grid Disturbances

AA2 Ability to determine and/or interpret the following as they apply to GENERATOR VOLTAGE AND ELECTRIC GRID DISTURBANCES: (CFR: 41.5 and 43.5 / 45.5, 45.7, and 45.8)

03 Generator current outside the capability curve

RO/SRO Rating: 3.5/3.6

Tier 1 / Group 1

K/A Match: This meets the K/A because the tests the ability to determine action needed to remain within capability curve.

Pedigree: Last used on 2014 NRC exam

Objective:

CLS-LP-27, Obj. 9 - Given the Generator estimated capability curves, hydrogen pressure and either MVARs, MW, or power factor, determine the limit for MW and MVARs.

Reference: 10P-27 Attachment 2, Estimated Capability Curves

Cog Level: High

Explanation: Based on the conditions the student should plot the current location on the graph. Plot MWe along the bottom and MVARs up the side. Where these two points intersect, based on 50 psig gas pressure line is outside of the safe area. (Must be inside the curve to be safe) Lowering MWe or raising gas pressure are the only options. For this case lowering or raising MVARs would still be outside the curve.

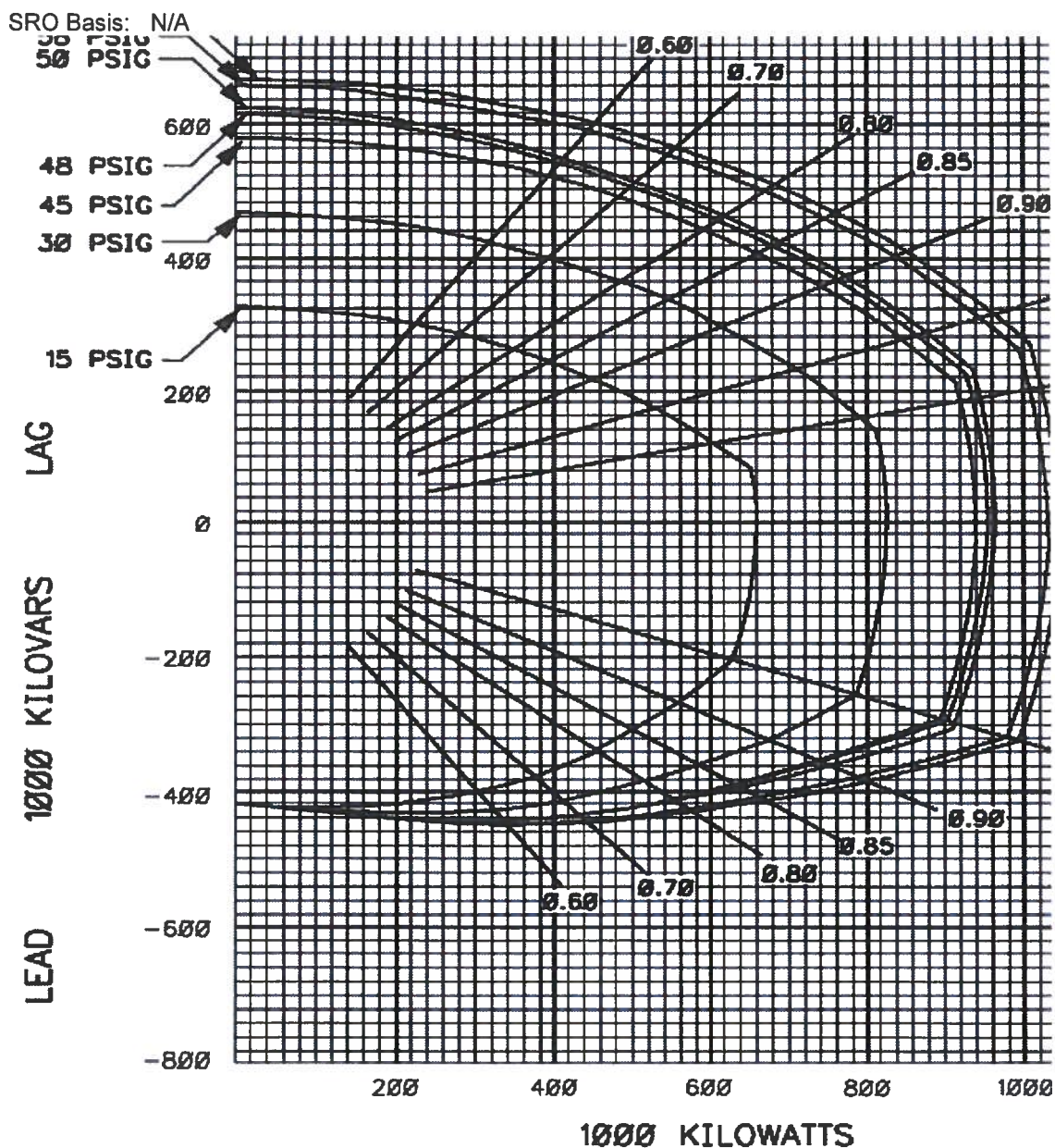
Distractor Analysis:

Choice A: Correct Answer, see explanation

Choice B: Plausible because raising pressure will move the plant within the limits of the curve. Raising MVARS will not move the plant within the limits of the curve.

Choice C: Plausible because raising pressure will move the plant within the limits of the curve. Lowering MVARS will not move the plant within the limits of the curve.

Choice D: Plausible because raising MWe will move the plant within the limits of the curve. Raising MVARS will not move the plant within the limits of the curve.



66. G2.1.01 1

Which one of the following completes both statements below IAW AD-OP-ALL-1000, *Conduct of Operations*?

With the Unit operating at rated, steady state power, steam flow / feed flow (1) a key parameter that the OATC must monitor to assure a constant awareness of its value and trend.

An end to end control panel walk down shall be performed every (2) and documented in the Narrative Logbook.

- A. (1) is NOT
(2) one hour
- B. (1) is NOT
(2) two hours
- C. (1) is
(2) one hour
- D. (1) is
(2) two hours

Answer: D

K/A:

G2.1.01 Knowledge of conduct of operations requirements. (CFR: 41.10 / 45.13)

RO/SRO Rating: 3.8/4.2

Tier 3

K/A Match: This meets the K/A because it is testing knowledge of the Conduct of Operations Manual

Pedigree: New

Objective: LOI-CLS-LP-201-D, Obj. 1j - Explain/describe the following IAW AD-OP-ALL-1000, Conduct of Operations, OOI-01.01, BNP Conduct of Operations Supplement and OPS-NGGC-1314, Communications: Control Board walkdown and monitoring requirements

Reference: None

Cog Level: Fund

Explanation: IAW the conduct of operations document board walk downs must be completed every two hours and section 5.5.6 lists the key parameters to watch.

Distractor Analysis:

Choice A: Plausible because jet pump flow has a daily surveillance requirement and if a watchstander is relieved for greater than one hour it must be entered in narrative logbook.

Choice B: Plausible because jet pump flow has a daily surveillance requirement and part two is correct.

Choice C: Plausible because part one is correct and if a watchstander is relieved for greater than one hour it must be entered in narrative logbook.

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

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5.5.6 Control Board Monitoring (continued)

k. Unless involved in activities where Reactor Operator involvement is required by the Conduct of Operations (for example reactivity manipulations, peer checks or detailed panel reviews), the operator shall monitor the following key parameters at a frequency to assure a constant awareness of their value and trend:

- Rx Power
- RPV level (BWR)
- Steam generator pressure (PWR)
- RCS temperature
- Steam generator level (PWR)
- RCS pressure
- Steam flow / feed flow
- Pressurizer level (PWR)

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5.5.6 Control Board Monitoring (continued)

3. The CRS ensures that a licensed operator performs an end to end control panel walk down every two hours. The walk down shall be documented in the Narrative Logbook.

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4. Whenever a watch station is relieved for greater than one hour, this information shall be entered in a Narrative Log Program, a formal turnover and shift turnover sheet will be completed, including the logs signed over.

67. G2.1.32 1

Which one of the following completes the statement below?

1OP-10, *Standby Gas Treatment System Operating Procedure*, prohibits venting the drywell and the suppression pool chamber simultaneously with the reactor at power because this would cause the:

- A. unnecessary cycling of reactor building to torus vacuum breakers.
- B. unnecessary cycling of torus to drywell vacuum breaker.
- C. SBGT Train water seal to blow out of the trough.
- D. pressure suppression function to be bypassed.

Answer: D

K/A:

G2.1.32 Ability to explain and apply system limits and precautions. (CFR: 41.10 / 43.2 / 45.12)

RO/SRO Rating: 3.8/4.0

Tier 3

K/A Match: This meets the K/A because it is testing the ability to explain the system precaution.

Pedigree: Last used on 2012 NRC exam

Objective:

Reference: None

Cog Level: Fundamental

Explanation: Per OP-10, torus and drywell cannot be vented at the same time in Modes 1, 2 or 3. per the LER reference, this could result in bypassing pressure suppression function.

Distractor Analysis:

Choice A: Plausible because these vacuum breakers prevent drawing a negative pressure in the suppression pool. Cross connecting the drywell and the suppression pool free air space will not cause a negative pressure in the suppression pool.

Choice B: Plausible because this lineup equalizes pressure between the drywell and the suppression pool free air space since the vacuum breakers operate on a d/p between the spaces this would bypass them, not open them.

Choice C: Plausible because venting containment through large valves with an elevated pressure may blow out the SBGT water seal.

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

STANDBY GAS TREATMENT SYSTEM OPERATING PROCEDURE	1OP-10
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1.0 PURPOSE

1. This procedure provides instructional guidance for operation of the Standby Gas Treatment System and its associated deluge system.

2.0 SCOPE

1. This procedure provides the prerequisites, precautions, limitations, and instructional guidance for startup, normal operation, shutdown, and infrequent operation of the Standby Gas Treatment System and its associated deluge system.

3.0 PRECAUTIONS AND LIMITATIONS

1. The Standby Gas Treatment System will **NOT** automatically start if the control switch is in STBY.
2. Venting the drywell and suppression pool simultaneously is **NOT** performed when the plant is in MODE 1, 2, or 3. {8.1.1}.....

STANDBY GAS TREATMENT SYSTEM OPERATING PROCEDURE	1OP-10
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8.0 REFERENCES

8.1 Commitments

1. LER 1-97-011, Drywell and Torus Inerting/Deinerting Lineup Results in Unanalyzed Suppression Pool Bypass Path

68. G2.1.36 1

A core reload is in progress during a refueling outage. The initial loading of fuel bundles around each SRM centered 4-bundle cell was completed with all four SRMs fully inserted and reading 50 cps.

It is now approximately half way through the core loading sequence and SRMs read 80 cps.

Which one of the following completes the statement below IAW 0FH-11, *Refueling*?

Fuel movement must be suspended when any SRM reading **first** rises to _____ upon insertion of the **next** fuel bundle.

- A. 100 cps
- B. 160 cps
- C. 250 cps
- D. 400 cps

Answer: B

K/A:

G2.1.36 Knowledge of procedures and limitations involved in core alterations. (CFR: 41.10 / 43.6 / 45.7)

RO/SRO Rating: 3.0/4.1

Tier 3

K/A Match: This meets the K/A because it is testing the fuel movement requirements that an RO would monitor.

Pedigree: New

Objective: LOI-CLS-LP-305, Objectives 18

Given the conditions during a refueling outage state the operator actions required for rising SRM count rates and/or inadvertent criticality.

Reference: None

Cog Level: High

Explanation: An increase in counts by a factor of two during a single bundle insertion is reason to suspend fuel movements. An increase by a factor of five from the baseline is also a reason.

Distractor Analysis:

Choice A: Plausible because this is a doubling of the baseline counts which is used for a different criteria for suspension of fuel movements.

Choice B: Correct Answer, see explanation

Choice C: Plausible because this is an increase of the baseline counts by a factor of five which is a reason to suspend fuel movements.

Choice D: Plausible because this is an increase of the counts by a factor of five which is a reason to suspend fuel movements.

SRO Basis: N/A

FH-11:

24. Suspension of fuel movement and notification of the Reactor Engineer is required if either of the following occur:

- An SRM reading rise by a factor of two upon insertion of any single bundle. During a spiral reload, this restriction applies only after the initial loading of fuel bundles around each SRM is complete. During a Core Shuffle, this restriction does **NOT** apply to the SRM that is having an adjacent fuel bundle inserted or removed.
- An SRM rise by a factor of five relative to the SRM baseline count rate recorded on Attachment 6, Documentation for SRM Baseline

25. SRM count rate may drop to less than 3 cps during either of the following conditions:

- With less than or equal to four fuel assemblies adjacent to the SRM and **NO** other fuel assemblies in the associated core quadrant
- During a core spiral offload

69. G2.2.02 1

Unit Two is conducting a routine power reduction for rod pattern improvement. The Reactivity Management Plan contains actions for the RO to insert a group of four rods from position 24 to position 12.

Which one of the following completes the statement below IAW AD-OP-ALL-0203, *Reactivity Management*?

The movement of these rods should be:

- A. single notched for the entire movement.
- B. continuously inserted to the final intended position.
- C. continuously inserted to settle four notches prior to reaching the intended position and then single notched into the final intended position.
- D. continuously inserted to settle one notch prior to reaching the intended position and then single notched into the final intended position.

Answer: D

K/A:

G2.2.02 Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels. (CFR: 41.6 / 41.7 / 45.2)

RO/SRO Rating: 4.6/4.1

Tier 3

K/A Match: This question matches the KA because it tests the generic requirements of control rod movement during any power level.

Pedigree: Bank

Objective: LOI-CLS-LP-201-D, Obj. 22f

Explain the following regarding AD-OP-ALL-0203, *Reactivity Management*: The procedural requirements for positioning intermediate control rods

Reference: None

Cog Level: High

Explanation: If a rod is to be moved between 46 and 02 three notches or less, it must be single notched the entire move. When moving a control rod four notches or more, the control rod should be stopped one notch prior to reaching the intended position and then single notched into the final intended position.

Distractor Analysis:

Choice A: Plausible because this would apply if the movement was \leq four notches.

Choice B: Plausible because this would apply under emergency conditions.

Choice C: Plausible because the rod does have to be single notched into its final position but the rod can be continuously move if greater than four notches not for four notches.

Choice D: Correct Answer, see explanation.

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5.2.8 [BWR] Single Recirculation Loop Operation

{7.1.5}

1. Standards
 - a. Single-Loop operation for extended periods of time is discouraged.
2. Expectations
 - a. Plant procedures that address Single Recirculation Loop Operation will identify applicable limitations and trip criteria.
 - b. For operations not covered by an approved procedure the Operational Decision Making process will be used to evaluate continued operation in Single-Loop.
 - c. The risk associated with single recirculation loop operations shall be carefully considered and appropriate contingencies will be developed.
 - d. Operator JITT shall be conducted for planned Single-Loop operations.

5.2.9 Control Rod Manipulations

1. Standards
 - a. Ensure all control rod movements are made in a deliberate, carefully controlled manner while constantly monitoring nuclear instrumentation and redundant indications of reactor power and neutron flux.
2. Expectations
 - a. [BWR] To minimize the possibility of mispositioning a control rod when inserting or withdrawing to an intermediate position (notch positions '02' through '46'), the following practices shall be followed:
 - (1) When moving a control rod four notches or more, the control rod should be stopped one notch prior to reaching the intended position and then single notched into the final intended position. This guidance does not supersede any other requirement to single notch control rods.
 - (2) When moving a control rod three notches or less, the control rod should be single notched for the entire move.

70. G2.2.04 1

Which one of the following identifies the Unit Two "Scram Immediate Operator Action" that utilizes a different criteria for performance than on Unit One?

- A. Tripping of the main turbine.
- B. Tripping one of the running feed pumps.
- C. Master level controller setpoint setdown.
- D. Placing the reactor mode switch to Shutdown.

Answer: D

K/A:

G2.2.04 Ability to explain the variations in control board/control room layouts, systems, instrumentation, and procedural actions between units at a facility. (CFR: 41.6 / 41.7 / 41.10 / 45.1 / 45.13)

RO/SRO Rating: 3.6/3.6

Tier 3

K/A Match: This meets the K/A because it is testing the differences between the Units

Pedigree: Bank

Objective: LOI-CLS-LP-300-C, Obj. 2
List the immediate operator actions for a Reactor Scram. (LOCT)

Reference: None

Cog Level: fund

Explanation: On Unit Two the mode switch cannot be placed to shutdown until MSL flow is less than 3 Mlbms. This restriction does not exist on Unit One.

Distractor Analysis:

Choice A: Plausible because this is an immediate operator action.

Choice B: Plausible because this is an immediate operator action.

Choice C: Plausible because this is an immediate operator action.

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

Unit 2 Scram Immediate Actions (0EOP-01-UG)

SCRAM IMMEDIATE ACTIONS

1. Ensure SCRAM valves OPEN by manual SCRAM or ARI initiation.
2. **WHEN** steam flow less than 3×10^6 lb/hr,
THEN place reactor mode switch in SHUTDOWN.
3. **IF** reactor power below 2% (APRM downscale trip),
THEN trip main turbine.
4. Ensure master RPV level controller setpoint at +170 inches.
5. **IF:**
 - Two reactor feed pumps running**AND**
 - RPV level above +160 inches**AND**
 - RPV level rising,**THEN** trip one.

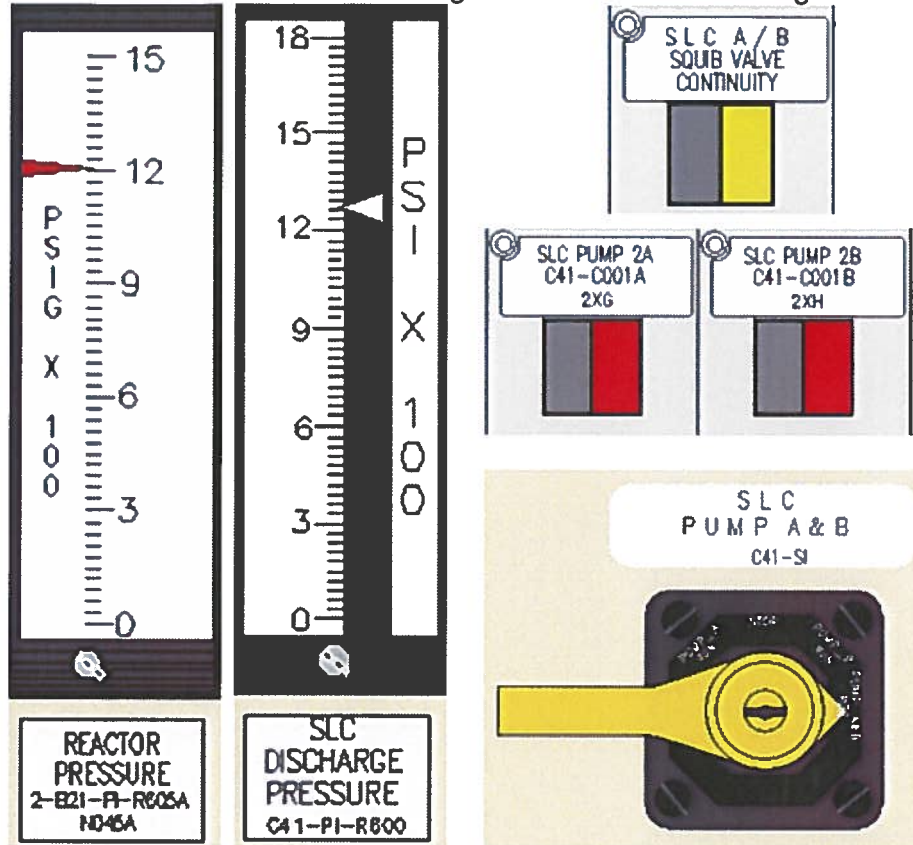
Unit 1 Scram Immediate Actions (0EOP-01-UG)

SCRAM IMMEDIATE ACTIONS

1. Ensure SCRAM valves OPEN by manual SCRAM or ARI initiation.
2. Place reactor mode switch in SHUTDOWN.
3. **IF** reactor power below 2% (APRM downscale trip),
THEN trip main turbine.
4. Ensure master RPV level controller setpoint at +170 inches.
5. **IF:**
 - Two reactor feed pumps running**AND**
 - RPV level above +160 inches**AND**
 - RPV level rising,**THEN** trip one.

71. G2.2.44 1

The OATC observes the following indications after initiating SLC during an ATWS.



Which one of the following completes both statements below?

Squib valve ____ (1) ____ has failed to fire.

IAW 20P-05, *Standby Liquid System Operating Procedure*, the OATC is required to ____ (2) ____.

- A. (1) A
(2) place the CS-S1, SLC Pump A & B, in the PUMP B RUN position
- B. (1) A
(2) leave the CS-S1, SLC Pump A & B, in the PUMP A/B RUN position
- C. (1) B
(2) place the CS-S1, SLC Pump A & B, in the PUMP A RUN position
- D. (1) B
(2) leave the CS-S1, SLC Pump A & B, in the PUMP A/B RUN position

Answer: C

K/A:

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)

RO/SRO Rating: 4.2/4.4

Tier 3

K/A Match: This meets the K/A because it is testing knowledge of the indications and what action is required based on the system lineup.

Pedigree: Previously used on the 2014 NRC exam

Objective: LOI-CLS-LP-005, Obj 13 -

Predict the effect of the following on the Standby Liquid Control System, and based on those predictions use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: a. Failure of one or both squib valves to fire.

Reference: None

Cog Level: Hi

Explanation: The SLC squib valve continuity lights are normally lit and go out when fired on SLC initiation. Per OP-05, if one squib valve fails to fire, two pump SLC operation may still continue provided reactor pressure is below 1184 psig, which it is not.

Distractor Analysis:

Choice A: Plausible because the student may think that the light is illuminated when the squib valve fires and securing 1 pump is correct.

Choice B: Plausible because the student may think that the light is illuminated when the squib valve fires and if reactor pressure was lower this would be correct.

Choice C: Correct Answer, see explanation

Choice D: Plausible because the B squib did not fire and if reactor pressure was lower this would be correct.

SRO Basis: N/A

NOTE: The SLC pump discharge relief valve should NOT actuate with two pumps operating and only one squib valve open unless reactor pressure exceeds 1184 psig, which is possible during an ATWS even with 10 SRVs open.

2. **IF SLC A SQUIB VALVE CONTINUITY OR SLC B SQUIB VALVE CONTINUITY** indicating light on Panel P603 remains on **AND** reactor pressure is greater than or equal to 1184 psig, **THEN PERFORM** the following:

- a. **PLACE SLC PUMP A & B Control Switch, C41-CS-S1, to the SLC PUMP A OR SLC PUMP B position.**
- b. **ENSURE** the selected SLC pump red indicating light on.

72. G2.3.12 1

Two operators are required to enter a room that is posted as a Locked High Radiation Area (LHRA) to hang a clearance for **scheduled** work.

Which one of the following completes both statements below?

The radiation level at which a LHRA posting is required is (1) in one hour at 30 centimeters from the radiation source.

The LHRA key is obtained from (2) .

- A. (1) >100 mrem
 (2) the Shift Manager
- B. (1) >100 mrem
 (2) a RP Technician
- C. (1) >1000 mrem
 (2) the Shift Manager
- D. (1) >1000 mrem
 (2) a RP Technician

Answer: D

K/A:

G2.3.12 Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 45.9 / 45.10)

RO/SRO Rating: 3.2/3.7

Tier 3

K/A Match: This question matches the KA because it is testing the rad requirements for entering a LHRA.

Pedigree: Bank (from Farley)

Objective: LOI-CLS-LP-201-F, Obj. 10
Explain the requirement regarding control of High Radiation Areas per E&RC-0040.

Reference: None

Cog Level: Fundamental

Explanation: Locked High Radiation Area (LHRA) criteria is an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 1.0 rem (1000 mrem) (10 mSv) in one hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates or an area accessible to individuals with dose rates in excess of 1.0 rem per hour at 30 cm from the radiation source or 30 cm from any surface that the radiation penetrates but less than 500 rads in one hour at one meter from the radiation source or from any surface penetrated by the radiation. The Shift Manager has a LHRA key for emergency use.

Distractor Analysis:

- Choice A: Plausible because this is the limit for a high radiation area not a LHRA. The Shift manager has a key for LHRA but it is for emergency use, not scheduled work.
- Choice B: Plausible because this is the limit for a high radiation area not a LHRA. The second part is correct.
- Choice C: Plausible because the first part is correct and the Shift manager has a key for LHRA but it is for emergency use, not scheduled work.
- Choice D: Correct Answer, see explanation.

SRO Basis: N/A

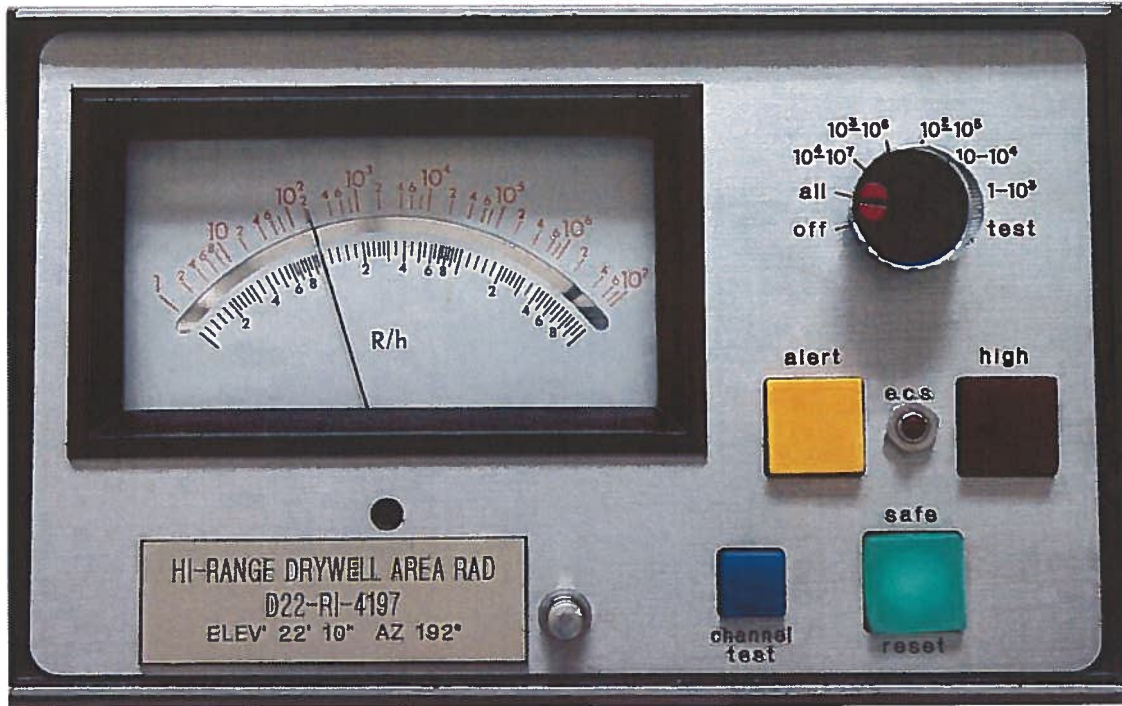
- 14. **High Radiation Area (HRA):** An area, accessible to individuals in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 0.1 rem (100 mrem) (1 mSv) in one hour at 30 cm from the radiation source or 30 cm from any surface the radiation penetrates.
- 15. **Hot Spot (HS):** An accessible, localized source of radiation with a contact dose rate of greater than 100 mrem per hour and greater than five times the general area dose rate at 30 cm.
- 16. **Licensed Material:** Source material, special nuclear material, or byproduct material received, possessed, used, transferred or disposed of under a general or specific license.
- 17. **Locked High Radiation Area (LHRA):** An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 1.0 rem (1000 mrem) (10 mSv) in one hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates or an area accessible to individuals with dose rates in excess of 1.0 rem per hour at 30 cm from the radiation source or 30 cm from any surface that the radiation penetrates but less than 500 rads in one hour at one meter from the radiation source or from any surface penetrated by the radiation.

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5.1 General Instructions (continued)

- 12. Entry into HRAs, LHRAs, or VHRAs require a briefing per AD-RP-ALL-2011, Radiation Protection Briefings. {7.1.2}
- 13. HRA, LHRA less than 10 R/hr, and LHRA greater than or equal to 10 R/hr master keys may be under the control of the Operations Shift Manager for emergency use.

73. G2.3.15 1



Which one of the following identifies the DW radiation value indicated above?

- A. ~ 10 R/hr
- B. ~ 20 R/hr
- C. ~ 100 R/hr
- D. ~ 200 R/hr

Answer: D

K/A:

G2.3.15 Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.12 / 43.4 / 45.9)

RO/SRO Rating: 2.9/3.1

Tier 3

K/A Match: This question matches the KA as it requires knowledge of the DW rad monitoring system to answer question.

Pedigree: Bank

Objective: CLS-LP-11.1, Obj. 03a

Describe the function/operation of the following: Drywell High Range Radiation Monitors

Reference: None

Cog Level: Fundamental

Explanation: Drywell high range area monitors provide indications of gross fuel failure and are used to determine emergency plan emergency action level associated with abnormal core conditions. With the function switch in the ALL position the upper (red) scale is used, meter readings are taken from the upper scale between 1 - 1,000,000 R/h. Current indication of 200 R/h

Distractor Analysis:

Choice A: Plausible because this is the reading on the bottom scale.

Choice B: Plausible because if function switch is not taken into account the answer could be 20 R/h.

Choice C: Plausible because if the reading on the bottom scale is adjusted by a factor of 10.

Choice D: Correct Answer, see explanation.

SRO Basis: N/A

74. G2.4.20 1

A transient has occurred on Unit Two with the following plant conditions:

RPV pressure	1000 psig
Drywell ref leg area temp	197°F
Rx Bldg 50' temp	135°F
Wide Range Level	170 inches (N026A/B)
Shutdown Range Level	160 inches (N027A/B)

(REFERENCE PROVIDED)

Which one of the following completes both statements below concerning the level instruments that can be used to determine reactor water level IAW EOP Caution 1?

Wide Range Level instruments N026A/B (1) be used.

Shutdown Range Level instruments N027A/B (2) be used.

- A. (1) can
(2) can
- B. (1) can
(2) can NOT
- C. (1) can NOT
(2) can
- D. (1) can NOT
(2) can NOT

Answer: B

K/A:

G2.4.20 Knowledge of the operational implications of EOP warnings, cautions, and notes.
(CFR: 41.10 / 43.5 / 45.13)

RO/SRO Rating: 3.8/4.3

Tier 3

K/A Match: The question meets the KA because it is testing the knowledge of EOP Caution 1 which deals with the water level instruments availability to determine level.

Pedigree: New

Objective: LOI-CLS-LP-300-B, Objective 16
Given Plant conditions, determine if the RPV water level instrument is providing valid trending information IAW Caution 1.

Reference: Caution 1 (EOP-01-UG, Att. 19, Att. 22 & Att. 31 pages 1 and 2)

Cog Level: High

Explanation: N026s can be used since reading >20" and RB 50' temp is <140 degrees and N027s cannot be used since in unsafe region for minimum indicated level

Distractor Analysis:

Choice A: Plausible because the first part is correct and if Attachment 19 is only looked at then this is plausible.

Choice B: Correct Answer, see explanation.

Choice C: Plausible because if the temperature was a little higher on the RB 50 foot this would be correct and if Attachment 19 only is looked at for the second part this would be correct.

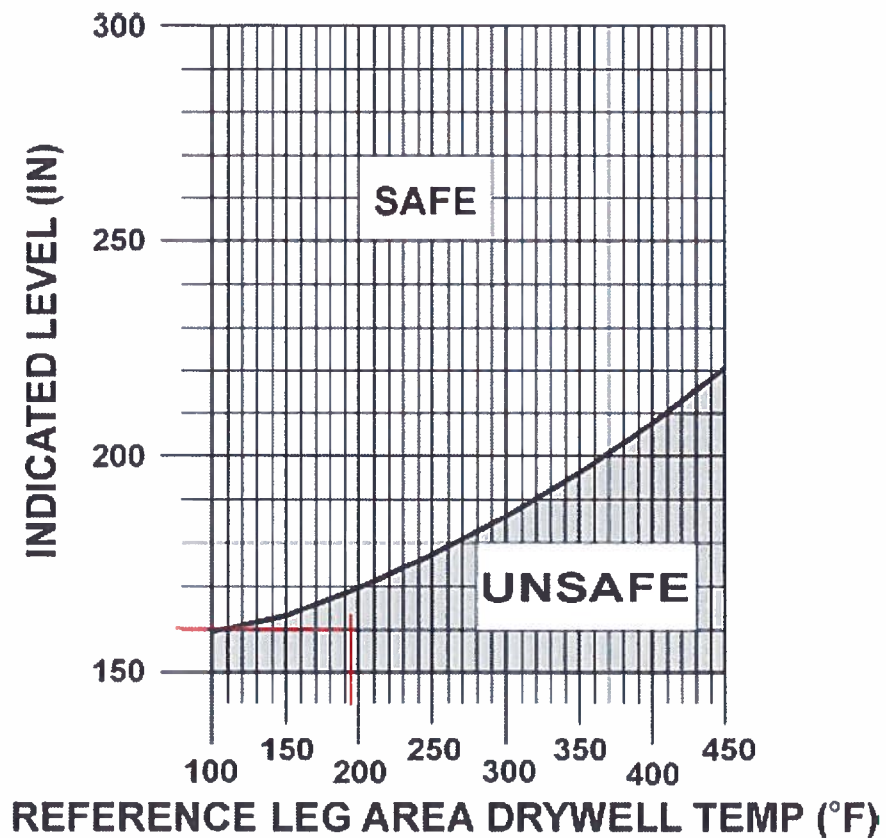
Choice D: Plausible because if the temperature was a little higher on the RB 50 foot this would be correct and the second part is correct.

SRO Basis: N/A

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ATTACHMENT 22
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**<< Shutdown Range Level
Instrument (N027A, B) Caution >>**



75. G2.4.27 1

A fire has been reported and confirmed in the turbine building breezeway.
A fire hose is being used to control/suppress the fire.

Which one of the following completes both statements below IAW 0PFP-013, *General Fire Plan*?

The RO is required to sound the fire alarm and announce the location of the fire ____ (1) ____.

A call for offsite assistance to the Brunswick County 911 Center ____ (2) ____ required.

- A. (1) ONLY once
(2) is
- B. (1) ONLY once
(2) is NOT
- C. (1) three times
(2) is
- D. (1) three times
(2) is NOT

Answer: C

K/A:

G2.4.27 Knowledge of "fire in the plant" procedures. (CFR: 41.10 / 43.5 / 45.13)

RO/SRO Rating: 3.4/3.9

Tier 3

K/A Match: This meets the K/A because it is testing knowledge of the actions contained in the plant fire procedure

Pedigree: New

Objective: FPT-CLS-LP-205

Lesson plan discusses the actions for the control room but no objective is listed.

Reference: None

Cog Level: Fundamental

Explanation: The operator aid (from the General Fire Plan, PFP-013) for the control room operators states to announce the fire location 3 times. The procedure also states to request off site assistance if a fire hose is used for extinguishing the fire.

Distractor Analysis:

- Choice A: Plausible because EP announcements are performed once and the second part is correct.
- Choice B: Plausible because EP announcements are performed once and the second part because the stem says that the fire is under control.
- Choice C: Correct Answer, see explanation
- Choice D: Plausible because EP announcements are performed once and the second part because the stem says that the fire is under control.

SRO Basis: N/A

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ATTACHMENT 2
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<< (Information Use) - Control Room/Operator Fire Actions >>

1. **Sound fire alarm, announce location of the fire 3 times, then:**
 - **Announce:**.....
"Fire brigade muster at the fire house."
 - **IF** fire is outside the Protected Area,
THEN announce:
"All personnel **NOT** involved in fire fighting or direct support activities are to evacuate the involved area immediately."
 - **IF** fire is inside the Protected Area,
THEN announce:
"All personnel in the affected area are to evacuate the involved area immediately and report to your normal work location. **If your normal work location is inaccessible, report to the O&M lunch room or TAC auditorium as conditions dictate.**"
 - **Announce:**
"Use of the PA and radio is restricted to emergency fire communications, except as directed by the Unit CRS for operational safety concerns."
2. **Announce the fire over Unit 1 and Unit 2 radio channels.**.....
- c. **IF** the investigating operator confirms a fire **AND** any of the following conditions exist,
THEN immediately request off site assistance by calling 911:.....
 - Extreme force is necessary to gain entry into fire area.....
 - **A fire hose is required for fire suppression**.....
 - Fire is located outside the Protected Area, but within the Owner-Controlled Area.....