

Final Submittal
(Blue Paper)

FINAL RO
WRITTEN EXAMINATION
AND REFERENCES

CRYSTAL RIVER OCTOBER 2007

EXAM NO. 50-302/2007-301

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

Applicant Information

Name:

Date: October 30, 2007

Facility/Unit: Crystal River Nuclear Plant

Region: II

Reactor Type: BW

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 six hours after the examination starts.

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

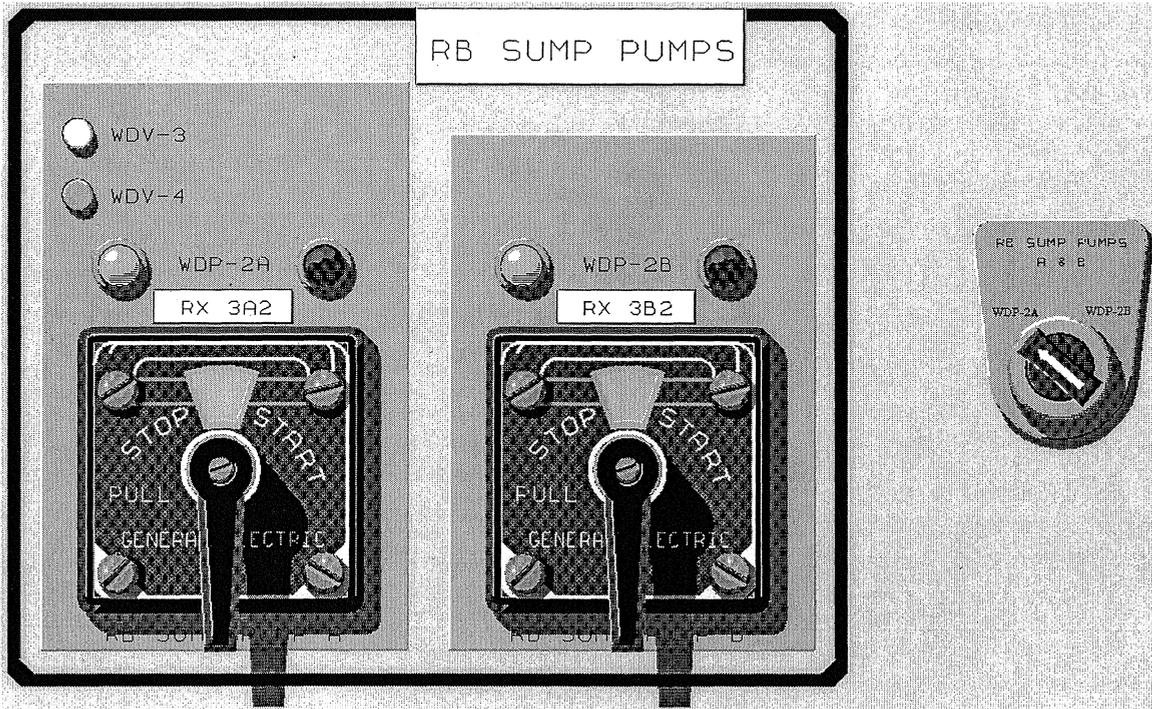
Applicant's Score _____ Points

Applicant's Grade _____ Percent

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1. With the plant aligned per the drawing below, which ONE of the following choices represents the automatic start functions associated with the RB Sump Pumps?

[Note that the white light labeled WDV-3 is lit]



- A. WDP-2A will start at 12" and WDP-2B will start at 18".
- B. WDP-2A will start at 18" and WDP-2B will start at 12".
- C. WDP-2A will start at 12" but WDP-2B will not start.
- D. Neither WDP-2A or WDP-2B will automatically start.

2. Which ONE of the following conditions will cause a white permissive light to be lit for the "D" Reactor Coolant Pump, RCP-1D?

- A. Seal injection flow to RCP-1D is 2 gpm.
- B. Reactor power is 35%.
- C. Lift oil pressure to RCP-1D is 120 psig.
- D. RCP-1D SW return flow is 250 gpm.

3. The following plant conditions exist:

- Plant startup in progress.
- The plant is at normal operating pressure.
- Reactor power at 20%.
- MUV-31 is in manual

A malfunction has just occurred causing a Tave and PZR transient. After the transient the following plant conditions are noted:

- Tave is 576° F.
- PZR temperature is 610° F.

If RCS pressure reaches Psat for the current temperature which of the following describes the initial plant response?

- A. Variable low pressure trip setpoint is reached; makeup flow lowers
- B. Variable low pressure trip setpoint is not reached; makeup flow lowers
- C. Variable low pressure trip setpoint is reached; makeup flow rises
- D. Variable low pressure trip setpoint is not reached; makeup flow rises

4. During normal full power operation a gas space leak occurs in the Makeup Tank (MUT-1) which results in the tank depressurizing to 1 psig. Following this depressurization, NPSH to the running MUP will be:
- A. reduced but still adequate. Operation with this MUT level/pressure relationship will place the MUT in the "Preferred Operating Region" as shown in OP-103B, Plant Operating Curves.
 - B. reduced but still adequate. Operation with this MUT level/pressure relationship will place the MUT in the "Acceptable Operating Region" as shown in OP-103B, Plant Operating Curves.
 - C. inadequate. Operation with this MUT level/pressure relationship will place the MUT in the "Restricted Operating Region" as shown in OP-103B, Plant Operating Curves.
 - D. inadequate. Operation with this MUT level/pressure relationship will place the MUT in the "Unacceptable Operating Region" as shown in OP-103B, Plant Operating Curves.

5. The following plant conditions exist:

- The plant is being shutdown and cooled down for maintenance.
- All RCPs have been secured.
- RCS temperature is 150° F.
- RCS pressure is 250 psig.

It is desired to secure both DHPs for 30 minutes. Given the requirements (1-3) below, which ONE of the following describes the combination of Technical Specification requirements that are required to be met to allow this activity?

- (1) Ensure core outlet temperature will remain subcooled for the duration.
- (2) Ensure no activities which could reduce RCS boron occur.
- (3) Ensure no RCS drain activities occur.

- A. (2) only
- B. (1) and (2) only
- C. (1) and (3) only
- D. (1), (2), and (3)

6. The following plant conditions exist:

- A plant heatup and pressurization are in progress.
- Current RCS pressure is 300 psig.

Which ONE of the following describes the expected plant response of the ES actuation bistables if *no* operator action is taken?

- A. HPI will actuate when RCS pressure reaches 1770 psig.
- B. HPI will actuate when RCS pressure reaches 1625 psig.
- C. LPI will actuate when RCS pressure reaches 900 psig.
- D. LPI will actuate when RCS pressure reaches 500 psig.

7. The plant is at normal full power operation.

Two (2) ES "B" Train 4 psig pressure switches have failed in the actuated condition.

Which ONE of the following sets of actions MUST be taken to prevent a reactor trip on high RCS pressure?

- A. Bypass RBIC by selecting at least two (2) of the three (3) RB ISO RB1, RB2 and RB3 switches to Bypass and secure only the "C" MUP.
- B. Bypass RBIC by selecting at least two (2) of the three (3) RB ISO RB1, RB2 and RB3 switches to Bypass and secure the "B" and "C" MUPs.
- C. Select the ES "B" Train HPI Auto Test Select pistol grip to the push-in "Test 1" position and secure only the "C" MUP.
- D. Select the ES "B" Train HPI Auto Test Select pistol grip to the push-in "Test 1" position and secure the "B" and "C" MUPs.

8. While operating at 100% power the RCDT pressure is observed to be reading abnormally high at 6 psig. Attempts to reduce RCDT pressure via venting were unsuccessful. Which ONE of the following choices represents a potential consequence of this condition and the appropriate method for reducing pressure IAW OP-407J, Operation of the RCDT?
- A. Diversion of RCP seal leakoff to the RB sump.
Blowdown the loop seal using N2.
 - B. Diversion of RCP seal leakoff to the RB sump.
Raise SW flow to the RCDT.
 - C. Unacceptable Code Safety valve setpoint shift.
Blowdown the loop seal using N2.
 - D. Unacceptable Code Safety valve setpoint shift.
Raise SW flow to the RCDT.

9. A step in EOP-8A, LOCA Cooldown, states:

“Ensure only 1 ES selected RB cooling unit running in low speed.”

Which ONE of the following describes the reason for this step per the EOP-8A TBD?

- A. SW temperatures could exceed design limits if the RB Fan Coolers were in a clean, non-degraded condition.
- B. SW temperatures could exceed design limits if the RB Fan Coolers were in a fouled, degraded condition.
- C. This mode of operation will allow one of the ES selected RB cooling units to remain as a backup in the event the running cooling unit were to fail.
- D. Analysis has determined that two RB cooling units operating simultaneously in a high density, post LOCA atmosphere, may cause fan suction ductwork damage.

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10. The air supply line to SWV-763 (CRDM Temperature Control Valve) fails causing a loss of air to the valve.

SWV-763 will fail (1) and the Control Rod Drives may experience (2).

- A. (1) open
(2) excessive moisture due to condensation
- B. (1) open
(2) insulation damage due to overheating
- C. (1) closed
(2) excessive moisture due to condensation
- D. (1) closed
(2) insulation damage due to overheating

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11. The plant has experienced an RCS leak of approximately 150 gpm. A cooldown to Mode 5 is in progress, with current RCS temperature at 460° F. The RCS temperature 30 minutes ago was 500° F and 60 minutes ago RCS temperature was 535° F.

The cooldown rate is (1) and the cooldown rate (2) .

- A. (1) excessive
 (2) cannot be controlled due to HPI/break cooling
- B. (1) excessive
 (2) can be controlled by adjusting TBVs or ADVs
- C. (1) acceptable
 (2) cannot be controlled due to HPI/break cooling
- D. (1) acceptable
 (2) can be controlled by adjusting TBVs or ADVs

12. The following plant conditions exist:

- A normal plant cooldown is in progress.
- RCS pressure is 1550 psig.
- Control Rod Group 1 is fully withdrawn.

The RCS narrow range pressure SASS module output fails high. With no operator action which ONE of the following describes the resulting plant response?

- A. RPS bistable trip on low pressure.
- B. RPS bistable trip on high pressure.
- C. HPI bistable trip.
- D. LPI bistable trip.

13. The following plant conditions exist:

- A Large Break LOCA has occurred.
- Some fuel damage has occurred.
- ECCS suction transfer to RB sump has just been completed.
- Alarm Window H-02-02 "Atmospheric Monitor Warning" is received.
- RM-A8 "Aux Bldg Exhaust Duct" counts are rising with the "Warn" light lit.

Uncontrolled radiation leakage to the environment is limited by Aux Bldg Ventilation supply isolation which:

- A. occurred as a result of the Reactor Building Isolation and Cooling (RBIC) actuation.
- B. occurred as a result of the High Pressure Injection (HPI) actuation.
- C. will occur when RM-A8 reaches the high alarm setpoint.
- D. will occur when RM-A2 reaches the high alarm setpoint.

14. The following plant conditions exist:

- RCS Pressure is 920 psig.
- Cooldown to Mode 5 in progress.
- All RPS channels in Shutdown Bypass.
- Group 1 Control Rods fully withdrawn.

A transient occurs which results in an uncontrolled rise in RCS pressure. All RPS channels fail to trip at the high pressure setpoint associated with shutdown bypass operation.

Which ONE of the following statements describes the next RCS high pressure trip protection which is required/available as pressure continues to rise?

- A. No automatic actions will occur until pressure reaches the Diverse Scram System actuation setpoint.
- B. The associated RPS channels will come out of bypass and the normal RPS high pressure trip bistables will actuate and trip the RPS channels.
- C. Shutdown Bypass automatically changes the RPS high pressure trip setpoint to a lower value.
- D. A second high pressure trip bistable with a setpoint higher than the Shutdown Bypass high pressure trip setpoint will actuate and trip the RPS channels.

15. The following plant conditions exist:

- RCS Pressure 1920 psig.
- A cooldown to Mode 5 is in progress.

Of the following choices, the **highest** pressure at which HPI can be bypassed is (1) and once it is bypassed an automatic RBIC signal (2) cause an HPI actuation.

- A. (1) 1820 psig
(2) will
- B. (1) 1820 psig
(2) will not
- C. (1) 1750 psig
(2) will
- D. (1) 1750 psig
(2) will not

16. Based on the following plant conditions:

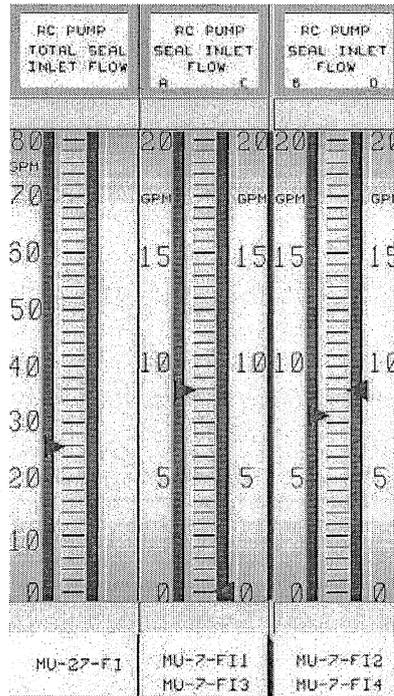
- All ICS stations are in "AUTO" except for the Unit Load Master (ULD) which is in hand.
- Unit is at 79% with a power escalation in progress at 15 MWe per hour.
- "JOG" speed is selected on the Diamond Control Panel.

Which ONE of the following statements is correct regarding control rod speed during a Loss of Main Feedwater Pump runback?

- A. Control rod speed will reduce reactor power at 30% per minute.
- B. Control rod speed will reduce reactor power at 50% per minute.
- C. Control rods insert at a rate of 3" per minute.
- D. Control rods insert at a rate of 30" per minute.

17. The following plant conditions exist:

- The reactor is currently at 85% power.
- MUV-16, Seal Injection flow control valve, failed closed while in automatic.
- MUV-16 manual control has been selected and seal injection flow is being restored.
- Seal injection flows to each Reactor Coolant Pump (RCP) are as depicted below:



What action(s) should be taken with respect to the RCPs if *SW flow* to the RCPs is lost? (Assume no further actions taken for seal flow.)

RCP-1C must be tripped:

- A. within two minutes. All other RCPs can continue to operate.
- B. within five minutes. All other RCPs can continue to operate.
- C. within two minutes. All other RCPs must be tripped within five minutes.
- D. immediately. All other RCPs must be tripped within five minutes.

18. Which ONE of the following describes how a loss of NNI-X DC affects the operation of MUV-16, Seal Injection Control Valve, and the appropriate procedure for addressing the failure?
- A. MUV-16 fails closed. Utilize the guidance in OP-402, Operation of the Makeup and Purification System, to restore seal injection flow.
 - B. MUV-16 fails closed. Utilize the guidance in AP-581, Loss of NNI-X, to restore seal injection flow.
 - C. MUV-16 will remain in its current position. Utilize the guidance in OP-402, Operation of the Makeup and Purification System, for proper valve operation.
 - D. MUV-16 will remain in its current position. Utilize the guidance in AP-581, Loss of NNI-X, for proper valve operation.

19. The following plant conditions exist:

- MUP-1A was running with MUP-1A and MUP-1C ES selected.
- MUP-1A experienced an overcurrent trip due to a motor fault.

It is now desired to start MUP-1B to restore MU flow, with both MUP-1B and MUP-1C ES selected. Where is the switch that will be used to ES select MUP-1B?

- A. "A" ES 4160V Switchgear Room
- B. "B" ES 4160V Switchgear Room
- C. MUP-1B Pump Area
- D. "A" 480V Switchgear Room

20. Which ONE of the following describes a feature that is utilized in the "Mechanical" cooling mode in the Industrial Cooling System, but not in the "Free" cooling mode?

Passing the CI system water loop flow through the:

- A. Heat Exchanger (CIHE-3).
- B. RB Chiller (CIHE-4A/4B).
- C. Cooling Tower (CIHE-1A/1B).
- D. Electric Water Heaters (CIHE-2A/2B).

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21. Following a reactor trip three control rods did not fully insert into the core. Which ONE of the following sets of actions/parameters satisfies the boration requirements for this condition IAW EOP-2, Vital System Status Verification?
- A. Start CAP-1A and borate through CAV-60.
MUT level rise of 5 inches over 10 minutes.
PZR level is constant.
 - B. Start CAP-1B and borate using the Batch Controller.
MUT level rise of 5 inches over 10 minutes.
PZR level is constant.
 - C. Open the BWST suction valves.
MUT level is constant.
PZR level rise of 5 inches over 10 minutes.
 - D. Open the BWST suction valves.
MUT level rise of 5 inches over 10 minutes.
PZR level lowers 7 inches over 10 minutes.

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22. The plant is in Mode 5 with the following plant conditions:

- "A" Decay Heat Removal Pump (DHP-1A) is in service.
- The Reactor Building (RB) sump level is rising.
- RM-A6 (RB ventilation duct) is rising and is now in HIGH alarm.
- The "A" 480V ES bus has just lost power due to a bus fault.

Which of the following procedures will contain guidance for this situation?

- A. AP-404, Loss of Decay Heat Removal, only.
- B. AP-520, Loss of RCS Coolant or Pressure, only.
- C. AP-520, Loss of RCS Coolant or Pressure, and AP-250, Radiation Monitor Actuation.
- D. AP-404, Loss of Decay Heat Removal, and AP-520, Loss of RCS Coolant or Pressure.

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23. Nuclear Services Closed Cycle Cooling surge tank (SWT-1) low level alarm has just been received. Which ONE of the following describes conditions that could cause this alarm?
- A. SWHE-1A tube leak coincident with an SW Differential Flow alarm.
 - B. RCDT cooler tube leak coincident with an SW Differential Flow alarm.
 - C. PZR Sample Cooler tube leak coincident with an RM-L3 radiation monitor warning alarm.
 - D. Reactor Coolant Pump seal return cooler tube leak coincident with an RM-L3 radiation monitor warning alarm.

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24. Which ONE of the following is the power supply to BSV-4, RB Spray Header Inlet Isolation Valve?

- A. DPDP-8A
- B. DPDP-8B
- C. ES MCC 3A1
- D. ES MCC 3B2

25. The following plant conditions exist:

- The plant tripped from 100% power due to a loss of RCP-1B.
- Following the trip, ADV MSV-26 failed open.
- Prior to isolating the ADV, pressurizer level lowered to 10".
- MSV-26 has been isolated and the overcooling terminated.
- Tincore is now 546° F and stable.
- RCS pressure is 1835 psig.
- Pressurizer level has just been stabilized at 100".
- Pressurizer temperature is currently reading 590° F.

Over the next several minutes RCS pressure will:

- A. rise because spray flow has been lost with the trip of RCP-1B.
- B. rise because pressurizer heaters are raising pressurizer temperature.
- C. lower because all heaters remain de-energized until manually reset.
- D. lower because subcooled liquid insurged into the pressurizer.

26. The following plant conditions exist:

- The plant was operating near beginning of life.
- A seismic event has occurred.
- The plant was tripped per AP-961 "Earthquake".
- While CRD groups 1-7 fully inserted, a large number of individual rods remain stuck out.
- Power range NIs indicate 4% and stable.

The required EOP-2 Immediate Action for these conditions is (1) and the reactivity effect of taking this action would be (2) negative at BOL than at EOL.

- A. (1) De-energize the CRD System
(2) more
- B. (1) De-energize the CRD System
(2) less
- C. (1) Start emergency boratation
(2) more
- D. (1) Start emergency boratation
(2) less

27. The following plant conditions exist:

- Plant is in Mode 5 following a refueling outage.
- 480V ES Bus 3B is tagged out for planned maintenance.
- A ground fault causes a loss of 480V ES Bus 3A.

Which ONE of the following represents the effect of this failure over the next hour and the reason for that effect?

- A. RCS temperature will rise due to the DHHE temperature control failing to minimum cooling.
- B. RCS temperature will rise due to the trip of DHP-1A.
- C. Spent Fuel Pool temperature will rise due to the loss of DC cooling to the SF heat exchangers.
- D. Spent Fuel Pool temperature will rise due to the loss of SFP-1A.

28. The following plant conditions exist:

- The plant has been in Mode 6 for 3 weeks.
- Fuel movement is in progress.
- Annunciators H-02-01 "Atmospheric Radiation High" and H-02-02 "Atmospheric Monitor Warning" are received.
- Investigation reveals that the RM-A1 Gas channel is in high alarm.

Which ONE of the following describes the appropriate response to this alarm?

- A. Ensure RB purge or mini-purge is in progress using OP-417 "Containment Operating Procedure."
- B. Ensure RB purge or mini-purge is in progress using AP-250 "Radiation Monitor Actuation."
- C. Ensure any RB purge is secured using OP-417 "Containment Operating Procedure."
- D. Ensure any RB purge is secured using AP-250 "Radiation Monitor Actuation."

29. The following plant conditions exist:

- Plant is at 100% power.
- 'A' OTSG Operating Level transmitter (SP-1A-LT2) fails high.
- The pen for 'A' OTSG on SP-1A-LIR1 remains constant.

Assuming no operator actions are taken actual 'A' OTSG level will:

- A. lower, but stabilize at approximately 30".
- B. lower, and remain offscale low.
- C. remain constant because the non-selected transmitter failed high.
- D. remain constant because this instrument cannot provide high level control.

30. A step in EOP-6 "Steam Generator Tube Rupture" directs the operator to concurrently perform EOP-14, Enclosure 7, EFWP Management if EFW is required but no EFWPs are running.

For EOP-6, which ONE of the following choices represents the **least** preferred pump and the reason it is least preferred?

- A. EFP-2, because it can cause an undesirable cooldown at low decay heat.
- B. EFP-1, because it is not safety related and has no auto-start capability.
- C. FWP-7, because it is not safety related and lacks a safety related power supply.
- D. FWP-7, because it has no auto-start and requires manual flow control.

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31. Which ONE of the following conditions would NOT cause the "EF Pump 2 Out of Service" alarm?

- A. ASV-204 closed with DC control power un-available.
- B. ASV-5 closed with DC control power un-available.
- C. MSV-56 closed.
- D. MSV-55 closed.

32. The following plant conditions exist:

- A 75 gpm tube leak has occurred on the 'B' OTSG.
- During the power reduction, a loss of offsite power and reactor trip occurred.
- RCS pressure is 1950 psig and rising slowly.
- RCS temperature is 555°F.

The CRS directs a cooldown be commenced per EOP-6. The cooldown should be established using ___(1)___ and the most limiting component for the specified cooldown rate limit is the ___(2)___.

- A. (1) Turbine Bypass Valves
(2) reactor vessel closure head
- B. (1) Turbine Bypass Valves
(2) reactor vessel beltline
- C. (1) Atmospheric Dump Valves
(2) reactor vessel closure head
- D. (1) Atmospheric Dump Valves
(2) reactor vessel beltline

33. A step in EOP-12, Station Blackout, states:

ACTION: Align backup air supply to ADVs.

DETAIL: Notify SPO to open IAV-676 "ADV BACKUP AIR SUPPLY ISO".

IAV-676 is located on the (1) and must be opened to provide backup air to ensure the (2) hour SBO **cop**ing requirement is met.

- A. (1) 119' turbine building
(2) four
- B. (1) 119' turbine building
(2) two
- C. (1) 95' turbine building
(2) four
- D. (1) 95' turbine building
(2) two

34. Reactor power is 70% when the A MFWP trips. During the transient the following parameters are noted:

- Rx Power 55%
- RCS Pressure 2250 psig
- Main Condenser Vacuum 6" HgA
- Autostop Oil Pressure 40 psig

Which ONE of the following represents the procedure that should be in use?

- A. AP-510 Rapid Power Reduction
- B. AP-545 Plant Runback
- C. AP-660 Turbine Trip
- D. EOP-2 Vital System Status Verification

35. The following plant conditions exist:

- A TS required shutdown is in progress due to both SWP-1A and SWP-1B inoperable and unavailable.
- At 50% power, the B MFWP was secured for governor maintenance.
- A tagging error caused a loss of the A MFWP and subsequent plant trip.
- On the plant trip, a Loss of Offsite Power occurred.

Which ONE of the following represents a list of components that are available based on the above conditions:

- A. MUP-1A and EFP-1
- B. MUP-1B and EFP-2
- C. MUP-1B and EFP-1
- D. MUP-1A and EFP-2

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36. The plant has experienced a Station Blackout and a loss of all instrument and station air. Which ONE of the following describes the effect on MUV-49 (Letdown Isolation) and MUV-51 (Letdown Orifice Bypass)?

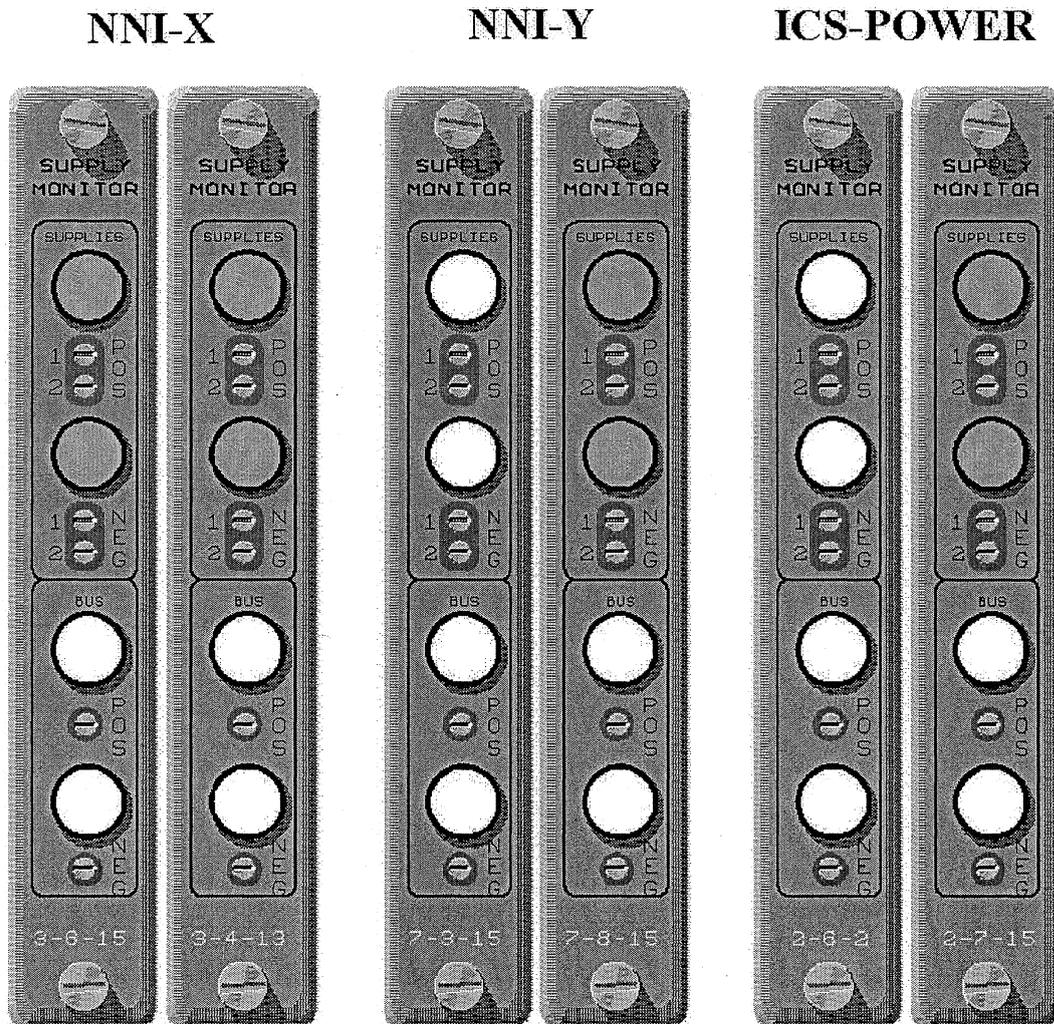
MUV-49

MUV-51

- | | | |
|----|--------|--------|
| A. | closed | closed |
| B. | open | closed |
| C. | closed | as-is |
| D. | open | as-is |

37. EOP-14, Enclosure 14 (Main Generator Purging) directs the SPO to purge the Main Generator with nitrogen. What is the reason, IAW EOP-14 TBD, that nitrogen is used instead of the normal source, carbon dioxide?
- A. The Main Generator can be purged faster using nitrogen. This allows the purge to be completed before depletion of the Non-1E battery.
 - B. The nitrogen tanks are further from the Main Generator than the carbon dioxide tank. This prevents ice migration from the nitrogen tanks to the Main Generator.
 - C. The power supply to the carbon dioxide Hex Vaporizer will not be available during a LOOP. The nitrogen tank Vaporizer requires no power.
 - D. The power supply to the carbon dioxide Hex Vaporizer will not be available during a LOOP. The nitrogen tank Vaporizer can be supplied by EGDG-1C.

38. With the plant operating at 100% power, an electrical transient occurs. The following indications are observed on the NNI and ICS Power Supply Monitors. What is the status of PZR level control valve MUV-31 (assume no operator actions)? [WHITE INDICATES LIGHT IS ON]



- A. Failed closed
- B. Failed as-is
- C. Automatic control failed, but manual available.
- D. Both manual and automatic control available.

39. The following plant conditions exist:

- Plant is at 80% power.
- FWV-2 (B Main Feedwater Booster Pump Suction Valve) open limit switch fails such that the valve no longer indicates full open.

Which ONE of the following represents required actions and/or verifications for the above plant conditions?

- A. Maintain plant power at 80%.
- B. Reduce power to 60% to 75% and monitor the Main Feedwater Pumps for signs of cavitation.
- C. Trip one Main Feedwater Pump and ensure the plant runs back to $\leq 52\%$.
- D. Verify the B Main Feedwater Pump has automatically tripped and ensure the plant runs back to $\leq 52\%$.

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40. Which ONE of the following lists of Main Feedwater valves receive a close command from a Main Feedwater Isolation signal?

- | | | |
|----|------------------------------|-------------|
| A. | Both main block valves | FWV-29 & 30 |
| | Both startup control valves | FWV-39 & 40 |
| | Both low load control valves | FWV-37 & 38 |
| | Both MFWP suction valves | FWV-14 & 15 |
| B. | Both main block valves | FWV-29 & 30 |
| | Both startup block valves | FWV-33 & 36 |
| | Both low load block valves | FWV-31 & 32 |
| | Both MFWP discharge valves | FWV-22 & 23 |
| C. | Both main block valves | FWV-29 & 30 |
| | Both startup block valves | FWV-33 & 36 |
| | Both low load block valves | FWV-31 & 32 |
| | Both MFWP suction valves | FWV-14 & 15 |
| D. | Both emergency block valves | FWV-34 & 35 |
| | Both startup block valves | FWV-33 & 36 |
| | Both low load block valves | FWV-31 & 32 |
| | Both MFWP suction valves | FWV-14 & 15 |

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41. The plant is in a refueling outage with fuel movement in progress. The Fuel Handling Building (Spent Fuel floor) ventilation duct radiation monitor, RM-A4, goes in to high alarm. Assuming all automatic actions occur correctly and no manual actions are taken, which of the following would correctly describe the effect on the plant ventilation?

- A. No effect. There are no automatic actions associated with RM-A4.
- B. The Auxiliary Building supply fans, AHF-11A and AHF-11B, would trip.
- C. The Fuel Handling Area supply fan, AHF-10 would trip.
- D. The running Auxiliary Building exhaust fans, either AHF-14A and AHF-14C OR AHF-14B and AHF-14D, would trip.

42. Which ONE of the following describes the fuel supply for Diesel Driven EFW Pump EFP-3? Fuel can be supplied via pumps that are driven by:

- A. a DC motor only.
- B. a DC motor and the engine.
- C. an AC motor and the engine.
- D. an AC motor and a DC motor.

43. The following plant conditions exist:

- The plant has experienced a loss of the A ES 4160V Bus.
- Annunciator Q-02-03, 4160V ES BUS A UV LOCKOUT ACT, is in alarm.
- Electricians have reported that there is no fault on the "A" 4160V ES bus.
- The Offsite Power Transformer is now available.

Which of the following describes the required actions for MUV-49 and the procedure actions required to allow closure of Breaker 3211, "A" Offsite Power Transformer 4160V ES Bus Supply Breaker, and energize the "A" ES 4160V ES Bus?

- A. MUV-49 should remain open.
Open the AY Knife Switch, depress and release the "4160V ESA UV Reset" pushbutton, and reclose the AY Knife Switch.
- B. MUV-49 must be closed.
Open the AY Knife Switch, depress and release the "4160V ESA UV Reset" pushbutton, and reclose the AY Knife Switch.
- C. MUV-49 should remain open.
Depress and hold the "4160V ESA UV Reset" pushbutton until the 4160V ES BUS A UV LOCKOUT ACT alarm clears. The AY Knife Switch does not need to be operated.
- D. MUV-49 must be closed.
Depress and hold the "4160V ESA UV Reset" pushbutton until the 4160V ES BUS A UV LOCKOUT ACT alarm clears. The AY Knife Switch does not need to be operated.

44. The following plant conditions exist:

- o SW-RW flow is significantly reduced due to heat exchanger blockage
- o SWP-1C is in service
- o RCP SW return temperatures:
 - RCP-1A - 163°F
 - RCP-1B - 170°F
 - RCP-1C - 181°F
 - RCP-1D - 168°F
- o CRDM stator temperatures:
 - ROD 2-1 160°F
 - ROD 2-3 165°F
 - ROD 3-4 162°F
 - ROD 3-5 173°F
 - ROD 4-3 182°F
 - ROD 4-7 175°F
 - ROD 5-2 167°F
 - ROD 6-2 153°F
 - ROD 6-5 181°F
 - ROD 7-4 177°F

Which ONE of the following describes the action(s) required to be taken?

- A. Reduce power and shut down RCP-1C.
- B. Reduce power and de-energize ROD 4-3 and ROD 6-5.
- C. Start SWP-1A and trip SWP-1C.
- D. Trip the reactor.

45. What effect will the loss of DPDP-5A have on the "A" Emergency Diesel Generator, EGDG-1A?

EGDG-1A will:

- A. immediately start and go to 900 rpm with proper voltage and frequency.
- B. immediately start and go to 900 rpm with no indication of voltage.
- C. remain in a standby condition. If an undervoltage condition occurs EGDG-1A will start and energize the bus.
- D. remain in a standby condition. If an undervoltage condition occurs EGDG-1A will start, but will *not* energize the bus.

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46. EGDG-1B is being operated in parallel with the grid per SP-354B with a load of 2700 KW and 1.2 MVAR out. A grid disturbance occurs. Following the grid disturbance diesel load is 2700 KW and 2.5 MVAR out. Post-disturbance loading is ____ (1) ____ and the component that would be used (per SP-354B) to adjust MVAR loading in this mode of diesel operation is the ____ (2) ____.

- A. (1) not acceptable
(2) local B EDG VOLTAGE ADJUST rheostat
- B. (1) acceptable
(2) local B EDG VOLTAGE ADJUST rheostat
- C. (1) not acceptable
(2) EDG B EXC VOLT ADJUST rheostat
- D. (1) acceptable
(2) EDG B EXC VOLT ADJUST rheostat

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47. Maintenance workers in the "A" Diesel Generator Control Room accidentally damaged the relief valve on one of the air receivers causing it to fail partially open. The air compressor has started and is maintaining pressure in the receivers at 175 psig. If an undervoltage condition were to occur at this time, which of the following describes the response of the EDG and required operator action, if any?
- A. EDG will not start under these conditions. Isolate the affected receiver and open the crosstie valves to the station air system.
 - B. EDG will not start under these conditions. Isolate the affected receiver and open the crosstie valves to the "B" side air receivers.
 - C. EDG will not start under these conditions. Isolate the relief valve and allow air pressure to recover sufficiently to start the diesel.
 - D. EDG will start.

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48. Which ONE of the following conditions will send a trip signal to the control complex normal duty supply fans (AHF-17A/B)?

- A. Toxic gas actuation.
- B. RM-A5 Gas actuation.
- C. 4 psi Engineered Safeguards actuation.
- D. Placing a Control Complex Isolate/Reset switch in "Isolate".

49. The following plant conditions exist:

- The plant has been tripped for 30 minutes; no cooldown is in progress.
- Pressurizer level is lowering.
- The makeup valve to the pressurizer, MUV-31, is 100% open.
- Makeup tank level is lowering.
- Reactor Building (RB) pressure is 0.5 psig and steady.
- The "A" OTSG is at low level limits.
- The "B" OTSG is at 50 inches and rising.
- Both OTSGs have a pressure of 1010 psig.

Which of the following sets of radiation monitor indications would be indicative of the above conditions? RM-G26 is the "B" MS line monitor and RM-G28 is the "B" MS line release (ADV) monitor.

- A. RM-G26 rising
RM-G28 rising
- B. RM-G26 steady
RM-G28 steady
- C. RM-G26 rising
RM-G28 steady
- D. RM-G26 steady
RM-G28 rising

50. Which ONE of the following represents the effect of depressing the "CHECK SOURCE" button on RM-L2 and the reason for having a check source?

Pressing this button ___(1)__. A check source is used to ___(2)___:

- A. (1) exposes the detector to a known radioactive substance
(2) verify proper monitor response
- B. (1) injects an electronic signal downstream of the detector
(2) verify proper monitor response
- C. (1) exposes the detector to a known radioactive substance
(2) provide a signal for monitor calibration
- D. (1) injects an electronic signal downstream of the detector
(2) provide a signal for monitor calibration

51. EOP-7, Inadequate Core Cooling, contains a step that requires stopping all RCPs once Tincore reaches the Severe Accident Region.

Which ONE of the following is the reason for this step in accordance with the EOP-7 TBD?

- A. Off site dose may rise due to thermally induced OTSG tube failures.
- B. HPI cooldown is the preferred cooldown method once the Severe Accident Region is reached.
- C. RCPs are of little use once the Severe Accident Region is reached so the pumps are secured to prevent further pump damage.
- D. The additional pump heat input to the RCS retards the cooldown rate that is trying to be achieved.

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52. If the Nuclear Services Intake Screen (CWTS-2) becomes clogged with debris from the intake which of the following pump's suction will be affected?

- A. RWP-1, RWP-2A & RWP-3A
- B. CWP-1A, CWP-1B, CWP-1C & CWP-1D
- C. CWP-1B, CWP-1D, RWP-1, RWP-2B & RWP-3B.
- D. RWP-1, RWP-2B & RWP-3B (CWP-1B & CWP-1D are not affected)

53. The following plant conditions exist:

- The plant is operating at 100% reactor power.
- RCS Dose Equivalent I-131 (DEI) is 110 $\mu\text{Ci/gm}$.

Which ONE of the following statements describes the required actions for this condition?

(Reference Included)

- A. Maintain current power, verify DEI is within the acceptable region and restore DEI to within limits in 48 hours.
- B. Reduce power to 70%, verify DEI is within the acceptable region and restore DEI to within limits in 48 hours.
- C. Shut down the plant and be in Mode 3 with Tave less than 500° F within 6 hours unless the DEI concentration returns to the acceptable region.
- D. Perform SR 3.4.15.2 within 4 hours and be in Mode 3 with Tave less than 500° F within 6 hours.

54. The following plant conditions exist:

- Plant startup is in progress.
- Main Turbine is ready to roll.
- Backup ES Transformer is supplying the "A" ES bus.
- Offsite Power Transformer is supplying the "B" ES bus.
- A sudden pressure fault on the Startup transformer has just occurred.

Based on the above conditions which of the following Raw Water Pumps (RWPs), if any, would be in operation?

- A. No RWPs would be operating.
- B. Normal Duty RWP, RWP-1.
- C. "A" Emergency Duty Nuclear Services RWP, RWP-2A.
- D. "B" Emergency Duty Nuclear Services RWP, RWP-2B.

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55. Which of the following automatic actions would be expected on a total loss of SC?

- A. FWP-1A trip on high oil cooler temperature at 160°F.
- B. FWP-2A trip on high oil cooler temperature at 180°F.
- C. IAP-3A trip on high oil cooler temperature at 170°F.
- D. IAP-3A trip on high 2nd stage air temperature at 125°F.

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56. A loss of offsite power has occurred causing a plant trip. The 230kv switchyard and 12kv line are de-energized. Both EDGs have started and are powering their respective ES 4160V busses. Prior to the loss of offsite power IAP-3C was in lead, IAP-3B was in first lag, IAP-3A was in second lag and IAP-4 was in auto. Shortly after the loss of offsite power the control board operator observed that instrument air pressure lowered to ≈ 83 psig and began to slowly recover. Which ONE of the following accurately states the status of the instrument air system?

- A. IAP-3C not running
IAP-3B not running
IAP-3A not running
IAP-4 running loaded
IADR-2 de-energized with both towers in service and purge valve closed
- B. IAP-3C running loaded
IAP-3B running loaded
IAP-3A running loaded
IAP-4 running loaded
IADR-2 energized with only one tower in service
- C. IAP-3C running loaded
IAP-3B not running
IAP-3A running loaded
IAP-4 running loaded
IADR-2 de-energized with both towers in service and purge valve closed
- D. IAP-3C not running
IAP-3B not running
IAP-3A not running
IAP-4 running loaded
IADR-2 energized with only one tower in service

57. The plant is operating at 100% power with an RB entry planned for this shift. What remote indications are available that would indicate that the entry has started?

- A. Security Central Alarm Station alarm only
- B. MCB alarm only
- C. MCB indicating lights and a Security Central Alarm Station alarm
- D. MCB indicating lights and a MCB alarm

58. The following plant conditions exist:

- The reactor is producing 1842 MW_{thermal}.
- Three reactor coolant pumps are operating.
- Control rod group 7 is 60% withdrawn.

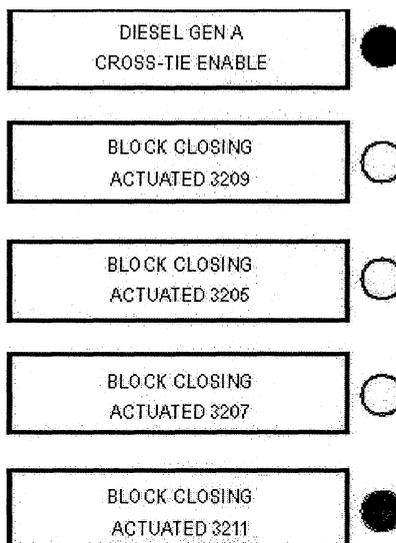
Which of the following describes the ICS response, and required additional operator action(s), if any, if control rod 7-3 dropped fully into the core?

- A. ICS will automatically run back to \approx 54% ULD demand. Further action to manually lower reactor power is not required.
- B. ICS, using an NI signal, will automatically run back to \approx 60% reactor power. Further action to manually lower reactor power is not required.
- C. ICS, using an NI signal, will automatically run back to \approx 60% reactor power. The operator must then take manual action to lower and maintain reactor power less than 45%.
- D. ICS will automatically run back to \approx 54% ULD demand. The operator must then take manual action to lower and maintain reactor power less than 45%.

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59. The following light indications are present on the main control board. (Dark filled in circles indicate the light is ON.)

Startup	3203	3204
BEST	3205	3206
Unit Aux	3207	3208
EDG	3209	3210
OPT	3211	3212



Which of the following sets of conditions will cause the above indication? Assume sufficient time for automatic actions to have occurred.

- A. SP-354A is in progress with Breaker 3209 closed.
The offsite power transformer is OOS (tagged out) for oil leak repair.
A spurious 'A' train ES actuation has just occurred.
- B. SP-354A is in progress with Breaker 3209 closed.
The Startup Transformer is OOS (tagged out) for oil leak repair.
A loss of Off-Site power has just occurred, Bkr 3211 has failed to open.
- C. SP-354B is in progress with Breaker 3210 closed.
The offsite power transformer is OOS (tagged out) for oil leak repair.
A spurious 'B' train ES actuation has just occurred.
- D. SP-354B is in progress with Breaker 3210 closed.
The Startup Transformer is OOS (tagged out) for oil leak repair.
A loss of Off-Site power has just occurred, Bkr 3212 has failed to open.

60. AP-1080 "Refueling Canal/Spent Fuel Pool Level Lowering" contains the following step:

IF refueling canal level is lowering, THEN notify PPO to close fuel transfer tube valves as far as possible.

Which ONE of the following represents the reason this step directs the valves to be closed "as far as possible" vice closed completely?

- A. Fuel transfer carriage cable interference if cables are connected.
- B. Manual blocks installed to ensure redundant makeup paths available.
- C. Postulated high D/P in the event of a leak in the SFP side.
- D. Postulated high D/P in the event of a leak in the RB side.

61. The following plant conditions exist:

<u>PARAMETER</u>	<u>DATA</u>
Rx power	90%
Linear amp power range	top 45% bottom 45%
RCS T _{hot}	601° F
RCS pressure	1955 psig
RCS flow	1.47 x 10 ⁸ lbm/hr
RB pressure	+0.5 psig
RCP monitor	A 8,300 kw B 7,100 kw C 9,500 kw D 8,000 kw
Turbine auto stop oil	99 psig
MFW control oil	114 psig

Based on the above data which ONE of the following parameter changes will require immediate entry into EOP-2, Vital System Status Verification? (consider each option independently)

- A. Linear amp power range top 40 bottom 60
- B. RCP monitor B 2152 kw
- C. RCS pressure 1925 psig
- D. MFW control oil 60 psig

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62. Following a reactor trip and completion of EOP-2, Vital System Status Verification, Immediate Actions, the SPDS screens display a "-11" with a yellow background. What does this display mean and what action should follow?
- A. Reactor Coolant temperature and pressure have entered the Inadequate Core Cooling Region; EOP-3, Inadequate Subcooling Margin, is required to be entered prior to the completion of EOP-2.
 - B. Subcooling Margin has been lost; EOP-3, Inadequate Subcooling Margin, is required to be entered prior to the completion of EOP-2.
 - C. Reactor Coolant temperature and pressure have entered the Inadequate Core Cooling Region; EOP-2, Vital System Status Verification, is required to be completed prior to transition to another procedure.
 - D. Subcooling Margin has been lost; EOP-2, Vital System Status Verification, is required to be completed prior to transition to another procedure.

63. EOP-4 requires the RCPs be stopped when incore temps rise 50°F above the value recorded when the EOP was entered.

What is the basis for this requirement in accordance with the EOP-TBD for EOP-4?

- A. Adequate SCM will soon be lost.
- B. Limit OTSG tube to shell stresses.
- C. Protects RCP seals.
- D. Maintains RCS less than 70% void fraction.

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64. The plant is in Mode 3. A reactor trip occurred from 100% power. The plant had been at 100% power for the last 150 days. EOP-2, Vital System Status Verification, immediate actions are complete and verified. The following plant conditions exist:

- Reactor Coolant (RCS) pressure is 2000 psig.
- Pressurizer level is 33 inches.
- "A" OTSG pressure is 890 psig.
- "B" OTSG pressure is 1029 psig.
- RM-A12 reads 5000 cpm.
- ARP-1B is in service.
- Letdown flow is 70 gpm.
- Flow through MUV-31 is 95 gpm.
- Tincore has dropped from 555° F to 545° F in 5 minutes.

Which of the following transitions should be made, if any?
(Reference Included)

- A. None, remain in EOP-2.
- B. EOP-6, Steam Generator Tube Rupture.
- C. EOP-4, Inadequate Heat Transfer
- D. EOP-5, Excessive Heat Transfer.

65. EOP-09, Natural Circulation Cooldown, contains a table which provides limits on natural circulation cooldown rates.

Which ONE of the following describes the basis for the natural circulation cooldown rate per the EOP-9 TBD?

- A. To limit voiding in the reactor vessel head region.
- B. To limit thermal stress on the OTSG tubesheet.
- C. To maintain a stable or lowering core ΔT .
- D. To conserve EFT-2 inventory.

66. Which ONE of the following describes how Plant Line 2 can be accessed?

Plant Line 2 can be accessed from the four digit phone (UTF) system by dialing _____.

- A. 11
- B. 12
- C. 14
- D. 71

67. A Limit and Precaution in OP-409, Plant Ventilation System, states that only one Chilled Water pump and one Control Complex chiller may run at a time. What is the basis for this statement?

Ensures:

- A. proper CH system flow balance.
- B. proper SW system flow balance.
- C. proper SC system flow balance.
- D. a minimum heat load is available for the running chiller to prevent excessive cycling.

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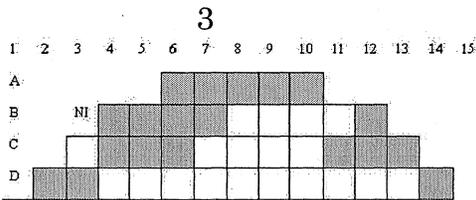
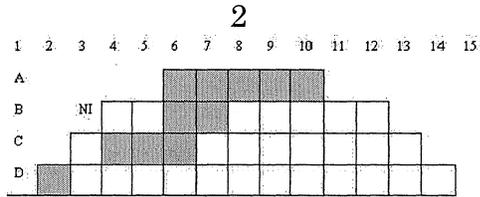
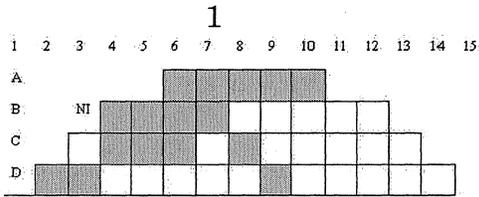
68. Which of the following represents a case where it is acceptable to manipulate a piece of equipment with a clearance tag on it per OPS-NGGC-1301, Equipment Clearance?
- A. A PPO performing an initial valve lineup checks a valve that is tagged "OPEN".
 - B. A mechanic uses a valve wrench to manually seat a leaking MOV. Permission from the SPO was obtained.
 - C. The SPO racks a tagged "OPEN & NOT RACKED IN" RCP breaker into the "Test" position with no Concurrent Verification.
 - D. Two electricians remove a breaker on ES MCC 3A1 for PM that is tagged "OPEN & NOT RACKED IN"

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69. FP-203 "Defueling and Refueling Operations" contains a limit and precaution that states:

"Core reload/offload refueling patterns shall be arranged such that no more than one fuel assembly is in an uncoupled condition at any time during offload and reload of the fuel assemblies."

Determine which of the following patterns are acceptable [gray area=assembly loaded].



- A. Patterns 1, 2, and 3 are NOT acceptable
- B. Pattern 1 is acceptable
Patterns 2 and 3 are NOT acceptable
- C. Patterns 1 and 2 are acceptable
Pattern 3 is NOT acceptable
- D. Pattern 1, 2, and 3 are acceptable

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70. The following information is available from the CRD PI panel and the computer for Absolute Position Indication (API) and Relative Position Indication (RPI):

Control Rod	RPI (PI Panel)	API (PI Panel)
7-1	92	93
7-2	93	92
7-3	88	85
7-4	93	93
7-5	94	94
7-6	91	92
7-7	91	92
7-8	92	92

From the above information evaluate the rod position indication with regard to Asymmetric conditions/faults and determine which of the following is the correct indication?

- A. PI panel - Asymmetric Fault OFF
Diamond Control panel - Asymmetric Fault OFF
- B. PI panel - Asymmetric Fault OFF
Diamond Control panel - Asymmetric Fault ON
- C. PI panel - Asymmetric Fault ON
Diamond Control panel - Asymmetric Fault ON
- D. PI panel - Asymmetric Fault ON
Diamond Control panel - Asymmetric Fault OFF

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71. An area accessible to plant personnel exhibits the following conditions:

- Removable surface contamination of 1,500 dpm/100 cm² beta-gamma.
- 200 mr/hour at **15** centimeters from a point source hot spot.

Determine the required postings for the conditions above.

- A. "Contaminated Area" posting required.
"Radiation Area" posting required.
- B. "Contaminated Area" posting **NOT** required.
"Radiation Area" posting required.
- C. "Contaminated Area" posting required.
"High Radiation Area" posting required.
- D. "Contaminated Area" posting **NOT** required.
"High Radiation Area" posting required.

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72. Work is to be completed in a radiation area. This work requires a team of two employees. The following information is provided on the employees:

Employee ONE, TEDE = 1.25 Rem

Area that employee ONE will be in has a dose rate of 200mr/hr

Employee TWO, TEDE = 1.0 Rem

Area that employee TWO will be in has a dose rate of 335mr/hr

What is the maximum amount of time this team can work together without exceeding either the Administrative and/or NRC Limits? (Assume all dose received year-to-date has been Progress Energy dose.)

- A. 2.9 hours
- B. 3.7 hours
- C. 11.9 hours
- D. 18.7 hours

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73. For which ONE of the following alarms is the Reactor Operator **required** to refer to the appropriate Main Control Board Annunciator Response procedure?

- A. G-08-08, "Waste Disposal Panel Trouble"
- B. O-05-09, "Hydrogen Panel Alarm"
- C. N-01-08, "Cond Demin Panel Trouble"
- D. B-07-06, "H2 Sampling Panel A Trouble"

74. The following conditions exist:

- The plant has undergone a loss of adequate subcooling margin
- The situation deteriorated into an inadequate core cooling event
- Incore temperatures entered region 3.
- OTSG heat transfer and adequate subcooling margin have been recovered.
- Reactor Coolant Pumps (RCPs) are not running.

EOP-7, Inadequate Core Cooling, requires that, under these conditions, a $5^{\circ} \text{F}/\frac{1}{2} \text{ hr}$ cooldown rate be maintained.

Which one of the following is the basis for limiting the cooldown rate to less than $5^{\circ} \text{F}/\frac{1}{2} \text{ hr}$ cooldown rate?

- A. Aids in maintaining PTS limits on the reactor vessel head.
- B. Ensures secondary water sources are not depleted.
- C. Limits thermal stresses on the fuel assemblies.
- D. Prevents loss of natural circulation.

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75. A member of the plant security force calls the control room and reports a fire in the Cable Spreading Room.

Which of the following describes the actions, if any, required by the operating crew at this time?

- A. Enter AP-880, Fire Protection, only. Verify only one Halon bank has discharged.
- B. Enter AP-880, Fire Protection, only. Verify both Halon banks have discharged.
- C. Enter AP-880, Fire Protection, and AP-990, Shutdown from Outside the Control Room. Verify only one Halon bank has discharged.
- D. Enter AP-880, Fire Protection, and AP-990, Shutdown from Outside the Control Room. Verify both Halon banks have discharged.

EXAMINER COPY

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References Provided

Both Exams: Steam Tables

NRC EXAM		REQUIRED REFERENCES		RO
Question #	K/A	Reference	Title	
53	076AG2.2.22	ITS 3.4.15	RCS Specific Activity	
64	BW/E05EK1.2		RM-A12 Conversion Table (Simulator Version)	

NRC EXAM		REQUIRED REFERENCES		SRO
Question #	K/A	Reference	Title	
5	025AG2.1.25	OP-103H	RCS and SFP Decay Heat Tables & Figures (Enclosure 1 and Tables 5, 9, 16 only)	
8	029G2.1.23	EM-225A	Post Accident RB Hydrogen Control (Enclosures 7 and 10 only)	
15	067AG2.4.41	EM-202	Duties of the Emergency Coordinator (Pages 8 and 16 of Enclosure 1 only)	

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References Provided

Steam Tables

RO EXAM

RM-A12 Conversion Table (Simulator Version)

ITS 3.4.15

SRO EXAM

EM-202, Enclosure 1 (Partial)

EM-225A (Partial)

OP-103H (Partial)