

Final Submittal
(Blue Paper)

FINAL ~~S~~RO

WRITTEN EXAMINATION, *ANSWER KEY*
AND REFERENCES

RO Answer Key

1	C	
2	B	
3	A	
4	A	
5	B	
6	B	
7	D	
8	A	
9	D	
10	D	
11	C	
12	B	
13	C	
14	B	
15	C	
16	B	
17	D	
18	A	
19	A	
20	B	
21	A	
22	D	
23	C	
24	D	
25	C	
26	D	
27	B	

28	B	
29	D	
30	C	
31	D	
32	A	
33	C	
34	A	
35	D	
36	A	
37	D	
38	A	
39	B	
40	D	
41	D	
42	D	
43	D	
44	C	
45	C	
46	C	
47	D	
48	B	
49	C	
50	B	
51	B	
52	B	
53	C	
54	B	
55	C	

56	C	
57	C	
58	B	
59	D	
60	B	
61	C	
62	B	
63	B	
64	A	
65	A	
66	A	
67	D	
68	B	
69	D	
70	C	
71	B	
72	B	
73	C	
74	A	
75	D	

U.S. Nuclear Regulatory Commission
Site-Specific RO Written Examination**Applicant Information****Name:****Date:** August 15th, 2007**Facility/Unit:** Alvin W. Vogtle Units 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** _____ **75** **Points****Applicant's Score** _____ **Points****Applicant's Grade** _____ **Percent**

1. Given the following:

- The reactor trips from 100% power.
- One reactor trip breaker fails to open.
- The BPLP C-7 status light is illuminated.

Which **ONE** of the following would be **CORRECT** regarding RCS Tave control assuming no operator action and all other systems function as designed?

- A. If Rx. Trip Breaker "A" failed to open, ARVs control Tave at 562 degrees F.
- B. If Rx. Trip Breaker "B" failed to open, ARVs control Tave at 562 degrees F.
- C. If Rx. Trip Breaker "A" failed to open, steam dumps control Tave at 557 degrees F.
- D. If Rx. Trip Breaker "B" failed to open, steam dumps control Tave at 557 degrees F.

2. Given the following conditions / events:

- Plant was at 100%.
- A rod drops in CBD, crew enters AOP-18003-C, "Rod Control System Malfunction".
- Crew is preparing to realign the dropped rod to the other rods in CBD.
- All lift coils have been disconnected for the unaffected rods in CBD.
- Bank selector switch is selected to CBD.
- ROD CONTROL URGENT FAILURE annunciator illuminates at the start of rod pull and the RO acknowledges the alarm.

Which **ONE** of the following is **CORRECT** concerning the "ROD CONTROL URGENT FAILURE" annunciator and actions the crew should take in accordance with 18003-C?

- A. EXPECTED alarm, continue the rod pull. A multiplexing failure occurs due to the lift coils of all the other rods in the bank being disconnected.
- B. EXPECTED alarm, continue the rod pull. A regulation failure occurs due to the lift coils of all the other rods in the bank being disconnected.
- C. UNEXPECTED alarm, stop the rod pull. A multiplexing failure occurs due to the lift coils of all the other rods in the bank being disconnected.
- D. UNEXPECTED alarm, stop the rod pull. A regulation failure occurs due to the lift coils of all the other rods in the bank being disconnected.

3. The unit is at 100% power:

- RCP # 3 trips due to an operator error on the QMCB .
- The crew verifies reactor trip.

Which **ONE** of the following would be **CORRECT** regarding the affected loop # 3 SG level and RCS delta T **INITIAL** responses following the RCP trip?

- A. SG level would shrink lower than the other SGs immediately after the RCP trips. RCS loop delta T would be lower than the other RCS loop delta T's.
- B. SG level would swell higher than the other SGs immediately after the RCP trips. RCS loop delta T would be lower than the other RCS loop delta T's.
- C. SG level would swell higher than the other SGs immediately after the RCP trips. RCS loop delta T would be higher than the other RCS loop delta T's.
- D. SG level would shrink lower than the other SGs immediately after the RCP trips. RCS loop delta T would be higher than the other RCS loop delta T's.

4. Given the following:

- The plant is at 40% power with 120 gpm letdown in service.
- VCT level transmitter, LT-112 fails HIGH.
- At the time of failure VCT level transmitter LT-185 reads 50%.

What **ONE** of the following is **CORRECT** if **NO** operator action is taken ?

VCT level lowers.....

- A. until charging pumps lose suction and start to cavitate.
- B. faster than auto makeup input and charging suction shifts to the RWST.
- C. with NO auto makeup capability and charging suction shifts to the RWST.
- D. until auto makeup starts and maintains VCT level between 30% and 50%.

5. Given the following Unit 1 conditions:

- Two RCPs are in service
- Both Trains of RHR are in service
- HV-606 and HV-607 (RHR Hx outlets) are 50% open.
- RHR flow is 3000 gpm per train.
- PRZR level is being maintained at 25%.
- RCS is stable at 180 degrees F and 340 psig.
- All mode 4 entry requirements have been completed.

The Shift Supervisor has directed an RCS heatup to 330 degrees F to begin.

Which **ONE** of the following describes the **CORRECT** actions to take to commence the MAXIMUM heatup rate allowed in accordance with UOP 12001-C "Unit Heatup to Hot Shutdown (Mode 5 to Mode 4)"?

- A. Adjust FV-0618 / FV-619 to establish a heatup rate not to exceed the procedural limit of 50 F per hour.
- B. Adjust HV-606 / HV-607 to establish a heatup rate not to exceed the procedural limit of 100 F per hour.
- C. Adjust HV-606 / HV-607 to establish a heatup rate not to exceed the procedural limit of 50 F per hour.
- D. Adjust FV-618 / FV-619 to establish a heatup rate not to exceed the procedural limit of 100 F per hour.

6. Given the following conditions:

- Unit 1 at 100% power.

The following alarm status exists on the Unit 1 QEAB.

- ALB34 window E06 for STARTER 1CD1I5N TROUBLE is illuminated.
- ALB34 window F06 for INVERTER 1CD1I5 TROUBLE is illuminated.
- ALB34 window E07 for STARTER 1DD1I6N TROUBLE is extinguished.
- ALB34 window F07 for INVERTER 1DD1I6 TROUBLE is extinguished.

Which **ONE** of the following is **CORRECT** regarding the status of the RHR pump loop suction valve power supplies ?

- A. Train "A" RHR pump loop suction power status is correct, the valve is energized.
- B. Train "A" RHR pump loop suction power status is correct, the valve is de-energized.
- C. Train "B" RHR pump loop suction power status is correct, the valve is energized.
- D. Train "B" RHR pump loop suction power status is correct, the valve is de-energized.

7. Given the following sequence of events:

- An SI occurs on Unit 1
- The crew enters 19011-C, "SI Termination"
- SI is reset and the ECCS pumps shut down
- The Rx. Trip Breakers were cycled to defeat the P-4 seal in.
- Containment Sump to RHR Pump Suction valves HV-8811A and HV-8811B are shut
- RWST level over time lowers to less than 39%

Which **ONE** of the following is **CORRECT** regarding the status of HV-8811A / B valve positions and the RWST auto swapover function?

- A. Automatically open, this function is always active and cannot be defeated.
- B. Remain closed, this function is defeated by resetting the SI actuation signal.
- C. Remain closed, this function was defeated by the cycling of the trip breakers.
- D. Automatically open, this function is defeated by the RWST SI reset handswitches.

8. Given the following conditions:

- The plant is at 360 degrees F with a cooldown in progress for a refueling outage.
- SI pump A has been declared INOPERABLE due to pump seizure.

Based on the above conditions, which ONE of the following would be CORRECT and why?

- A. Mode 4 entry is allowed. The minimum requirements of one high head subsystem and one RHR subsystem is available.
- B. Mode 4 entry is allowed. The minimum requirements of one high head subsystem, one SI subsystem and one RHR subsystem is available.
- C. Mode 4 entry is not allowed. The minimum requirements of two high head subsystems and two SI subsystems is not available.
- D. Mode 4 entry is not allowed. The minimum requirements of two high head subsystems, two SI subsystems and two RHR subsystems is not available.

9. Which **ONE** of the following is a **CORRECT** method to cooldown the PRT in accordance with 13004-1/2, "Pressurizer Relief Tank Operation"?
- A. Drain the PRT to the CNMT sump while making up to the PRT from the RMWST.
 - B. Drain the PRT to the CNMT sump while making up to the PRT from Demin Water.
 - C. Recirculate the PRT through the RCDT using NSCW to cool the heat exchanger.
 - D. Recirculate the PRT through the RCDT using ACCW to cool the heat exchanger.

10. Regarding the CCW and ACCW system heat exchangers:

Which **ONE** of the following is **CORRECT** regarding when you need **both** of either systems heat exchangers in service?

- A. ACCW - to provide necessary cooling to both Diesel Generators during an LOSP event on both RATs.
- B. CCW - to provide necessary cooling to both RHR pump seal water heat exchangers during the ECCS injection phase of a DBA LOCA.
- C. ACCW - to provide necessary cooling to all RCPs during a small break LOCA event.
- D. CCW - to provide necessary cooling to the Spent Fuel Pool Cooling System to maintain SFP temperature < 120 degrees F during a full core offload.

11. Given the following:

- Unit 2 is at 30% power.
- ACCW pump # 1 is tagged out.
- At 0115, ACCW pump # 2 trips
- The RCP temperatures and vibrations are being monitored.
- The current time is 0130.

Which **ONE** of the following is **CORRECT** regarding operation of the RCPs?

- A. Trip the reactor, trip any RCP with shaft vibration in excess of 5 mils.
- B. Trip the reactor, trip any RCP that has # 1 seal leakoff greater than 5 gpm.
- C. Trip the reactor, trip all Reactor Coolant Pump due to total loss of ACCW.
- D. Trip the reactor, trip any RCP if stator temperature exceeds 230 degrees F.

12. Which **ONE** of the following describes **reflux cooling** flow following a small break LOCA?

- A. Liquid heated by the core is subsequently cooled inside the steam generator tubes and returned to the core via gravity counterflow along the bottom of each partially filled hot leg pipe.
- B. Steam produced inside the core is condensed in the steam generator tubes and returned to the core via gravity counterflow along the bottom of each partially filled hot leg pipe.
- C. Steam produced inside the core is condensed in the steam generator tubes and returned to the core via natural circulation flow along the bottom of each partially filled cold leg pipe.
- D. Liquid heated by the core is subsequently cooled inside the steam generator tubes and returned to the core via natural circulation flow along the bottom of each partially filled cold leg pipe.

13. Given the following conditions and events on Unit 1:

- The unit is at 100% power.
- Pressurizer pressure control is selected to the 457 / 456 position.
- PRZR pressure is 2235 psig.
- 1PT-457 fails high

Which **ONE** of the following is the **CORRECT** plant / system response?

- A. PORV 1PV-455 opens, both spray valves remain closed and all PRZR heaters will energize. Pressure will stabilize near 2185 psig.
- B. PORV 1PV-456 opens, both spray valves remain closed and all PRZR heaters will energize. Pressure will stabilize near 2185 psig.
- C. PORV 1PV-455 opens, both spray valves open and all PRZR heaters turn off. Pressure will continue to decrease causing a reactor trip and safety injection.
- D. PORV 1PV-456 opens, both spray valves open and all PRZR heaters turn off. Pressure will continue to decrease causing a reactor trip and safety injection.

14. Given the following conditions:

- A large break LOCA occurred.
- Operators have just completed 19013-C, "Transfer to Cold Leg Recirculation".
- A loss of offsite power occurs, the diesel generators start and load the class 1E 4160 buses.

Which **ONE** of the following describes the actions required for this condition in accordance with 19010-C, Loss of Reactor or Secondary Coolant?

- A. Ensure all ECCS pumps are started by the blackout sequencer.
- B. Manually start the RHR pumps, then manually start the SIPs as needed.
- C. Place in Pull to Lock the SIPs and CCPs until the RHR pumps are started by the blackout sequencer.
- D. Ensure both RHR pumps are started by the blackout sequencer, then manually start CCPs and SIPs as needed.

15. Given the following conditions:

- Plant at 100% power, all systems in normal alignment.
- LOSP occurs when RAT 1A and RAT 1B trip open during a severe thunderstorm.
- Several minutes later a reactor trip occurs.
- DG1B trips on low lube oil pressure just after the reactor trip.

Which **ONE** of the following is **CORRECT** regarding the charging pumps status?

- A. NCP - running, CCP "A", running, CCP "B" stopped.
- B. NCP - stopped, CCP "A" stopped, CCP "B" running.
- C. NCP - stopped, CCP "A" running, CCP "B" stopped.
- D. NCP - running, "CCP "A", stopped, CCP "B" running.

16. Given the following:

The following annunciator windows illuminate.

- ALB06 window A06 for CNMT HI-1 PRESS ALERT ADVERSE CNMT
- ALB06 window B06 for CNMT HI-2 PRESS ALERT
- ALB06 window C06 for CNMT HI-3 PRESS ALERT
- The HI-1, HI-2, and HI-3 MLBs for PI-0934 are all illuminated.
- Containment Pressure Recorder PR-0934 reads 40 psig.
- QMCB meter for PI-0934 reads 40 psig.

The following annunciator windows are extinguished.

- ALB06 window D06 for CNMT SPRAY ACTUATION
- ALB09 window D06 for HI CNMT PRESS SI RX TRIP ADVERSE CNMT (first out)
- The HI-1, HI-2, and HI-3 MLBs for PI-0935, PI-0936, and PI-0937 are extinguished.
- QMCB meters for PI-0935, PI-0936, and PI-0937 all read 2.5 psig.

Which **ONE** of the following operator actions would be **CORRECT**?

- A. Actuate Containment Spray since containment pressure is > 21.5 psig.
- B. Perform a "crew briefing" to inform the crew of the failed pressure channel.
- C. Perform a "crew briefing" to inform the crew to use "Adverse CNMT" values.
- D. Manually start / align Containment Spray using the pump and valve handswitches.

17. Which **ONE** of the following **correctly** describes the **Over Power Delta T** reactor trip?

- A. The setpoint will adjust on change in Tave, Pressurizer Pressure, and Delta I. Protects against DNB.
- B. The setpoint will adjust on change in Tave, rate of change of Tave, and Delta I. Protects against power density (KW / ft).
- C. The setpoint will adjust on change in Tave, Pressurizer Pressure, the Delta I input is zeroed out. Protects against DNB.
- D. The setpoint will adjust on change in Tave, rate of change of Tave, the Delta I input is zeroed out. Protects against power density (KW / ft).

18. Given the following:

- Both Units are at 3565 MWt with all systems in their normal alignment.
- Unit 1 annunciator windows for INTMD RADIATION ALARM and HIGH RADIATION are illuminated.
- The SRDC shows Control Room Air Intake Rad Monitor 1RE-12116 yellow and red indication lights are illuminated.
- Unit 2 has NO alarms associated with radiation monitors.

Which **ONE** of the following describes the **CORRECT** Control Room HVAC response?

- A. Only Unit 1 Train B CREF unit starts and both ESF chillers start.
- B. Unit 1 Train A and B CREF units start and both ESF chillers start.
- C. Both Unit 1 CREF units start and only the Train B ESF Chiller Starts.
- D. Both Units Train B CREF units start, both Trains of ESF chillers start on both units.

19. The RO withdraws control bank C rods to establish conditions for a dilution to criticality.

Prior to the rod withdrawal the following conditions existed:

DRPI: 42 steps

Group 1 Step Counter: 42 steps

Group 2 Step Counter: 41 steps

After the rod withdrawal the following conditions exist:

DRPI: 42 steps

Group 1 Step Counter: 56 steps

Group 2 Step Counter: 55 steps

Based on these indications, which **ONE** of the following **CORRECTLY** describes the status of the "ROD DEV" and "ROD BANK LO-LO LIMIT" annunciators?

REFERENCE PROVIDED

- A. The "ROD DEV" annunciator alarms and the "ROD BANK LO-LO LIMIT" annunciator clears.
- B. The "ROD DEV" annunciator alarms and the "ROD BANK LO-LO LIMIT" annunciator remain illuminated.
- C. The "ROD DEV" annunciator does not alarm and the "ROD BANK LO-LO LIMIT" annunciator remains illuminated.
- D. The "ROD DEV" annunciator does not alarm and the "ROD BANK LO-LO LIMIT" annunciator clears.

20. Given the following:

- RCS LOCA in progress.
- RCP Immediate Trip Criteria was met
- The RCPs were all stopped.
- Later, procedure directs restart of an RCP.

Which **ONE** of the following is **CORRECT** regarding the method to stop / start the RCPs using the QMCB handswitches?

- A. Open the non-1E handswitches first when stopping the pumps.
Close the non-1E handswitches first when starting the pumps.
- B. Open the non-1E handswitches first when stopping the pumps.
Close the 1E handswitches first when starting the pumps.
- C. Open the 1E handswitches first when stopping the pumps.
Close the non-1E handswitches first when starting the pumps.
- D. Open the 1E handswitches first when stopping the pumps.
Close the non-1E handswitches first when starting the pumps.

21. Given the following conditions:

- Unit 1 is at 100% power.
- All control systems are in normal alignment.
- All SG level, steam flow and feed flow instruments controlling channel selector switches EXCEPT ONE are positioned pointing to the Channel I direction.
- Controlling channel for SG # 4 steam flow is pointing to the Channel II direction.
- Channel II SG pressure instrument for SG # 4 fails low.

As the control systems respond to the above conditions, which **ONE** of the following would be **CORRECT** regarding the feedwater flow and steam flow recorder indications for SG # 4?

- A. Recorder feed and steam flow indications would both lower.
- B. Recorder feed flow indication would lower, steam flow indication would rise.
- C. Recorder feed flow indication would rise, steam flow indication would lower.
- D. Recorder feed and steam flow indications would both rise.

22. Which **ONE** of the following is the **CORRECT** indication representation if 5 core exit TC's are failed due to an **OPEN** circuit?

- A. The Core Exit Temperature indications will be **HIGHER** than actual.
RCS Subcooling will indicate **MORE** subcooling than actual.
- B. The Core Exit Temperature indications will be **HIGHER** than actual.
RCS Subcooling will indicate **LESS** subcooling than actual.
- C. Core Exit Temperature indications will indicate **LOWER** than actual.
RCS Subcooling will indicate **MORE** subcooling than actual.
- D. Core Exit Temperature indications will indicate the **SAME** as actual.
RCS Subcooling will indicate the **SAME** as actual.

23. Given the following conditions:

- Main steamline break has occurred inside Containment.
- The crew is performing Initial Operator Actions of E-0, Reactor Trip or SI.
- The RO reports the Containment Coolers are running in FAST speed.

Which **ONE** of the following describes the **CORRECT** required action (if any) and the reason for the decision?

- A. Allow the coolers to continue running in FAST speed to assist in the prevention of explosive hydrogen pockets.
- B. Shift the coolers to SLOW speed to reduce the electrical load on AB04 and BB06 1E electrical buses in the event of an LOSP.
- C. Shift the coolers to SLOW speed to prevent fan motor overcurrent due to the more dense containment atmospheric conditions.
- D. Allow the coolers to continue running in FAST speed to offset the loss of NSCW flow to the Reactor Cavity Coolers and Auxiliary Coolers.

24. Given the following conditions:

- Reactor power is at 100%.
- ALB07 window A05 for **REGEN HX LETDN HI TEMP** alarm lit.
- ALB07 window B06 for **CHARGING LINE HI / LO FLOW** alarm lit.
- ALB07 window D03 **LETDN HX OUTLET HI TEMP** alarm lit.
- ALB08 window F06 for **RCP SEAL WATER INJ LO FLOW** alarm lit.
- All other plant conditions are normal.

Which **ONE** of the following **CORRECTLY** explains the given conditions?

- A. PRZR level would be rising, HV-0182 seal flow control valve has failed shut.
- B. PRZR level would be lowering, HV-0182 seal flow control valve has failed open.
- C. PRZR level would be rising, FV-0121 charging flow control valve has failed open.
- D. PRZR level would be lowering, FV-0121 charging flow control valve has failed shut.

25. The unit is at 100% when the following occurs:

- ALB01, window F05 for CNMT HI TEMP illuminates.

The BOP operator starts additional Containment Coolers per the ARP guidance. Later in the shift:

- ALB01, window F06 for CNMT HI MSTR illuminates.
- ALB62, window E05 for CNMT CLR COND LEAK illuminates.
- Containment relative humidity and temperatures are slowly rising.
- No other alarms are present.
- Containment pressure has risen from 0.1 psig to 0.6 psig and is **rising**.
- PRZR level and pressure and RCS Tavg have remained stable.

Which **ONE** of the following is **CORRECT** regarding these indications?

- A. NSCW leak, perform a CNMT Cooler Condensate Collection Calculation.
- B. RCS leak, perform a leak rate and enter AOP-18004 for RCS Leakage
- C. Feedwater leak, enter AOP-18008 for Secondary Leakage
- D. Steam leak, enter AOP-18008 for Secondary Leakage

26. To prevent challenging containment design pressure and rendering equipment inoperable due to high moisture (humidity), the Containment Spray System_____

- A. suction valves have to be manually opened following a manual spray actuation.
- B. discharge valves have to be manually opened following a manual spray actuation.
- C. relays are "de-energize to actuate" preventing inadvertent actuation during testing.
- D. actuation requires operation of 2 of 2 handswitches at either control board location.

27. The following conditions exist for Unit 1 Train "A" CCW system:

- CCW pumps # 1 and # 3 are running.
- CCW pump # 5 handswitch is in AUTO.

A single CCW level transmitter on the Train "A" surge tank fails LOW.

Which **ONE** of the following describes a **CORRECT** system response to the failure?

- A. One of the running CCW pumps trip, the standby CCW pump starts.
The reactor makeup water valve to the CCW surge tank auto opens.
- B. One of the running CCW pumps trip, the standby CCW pump starts.
The demin water makeup valve to the CCW surge tank remains shut.
- C. Both the running CCW pumps trip, the standby CCW pump starts and trips.
The demin water makeup valve to the CCW surge tank auto opens.
- D. Both the running CCW pumps trip, the standby CCW pump starts and trips.
The reactor makeup water valve to the CCW surge tank remains shut.

28. Given the following plant conditions:

- The plant is at 100% power.
- PRZR Pressure Channel control selected to the 455 / 456 position.
- PRZR Pressure transmitter PT-455 fails high.
- PRZR Master Controller output is reading 100%.
- Control selector switch has been placed to the 457 / 456 position.

Which **ONE** of the following actions is **CORRECT** per 18001-C, "Primary Instrumentation Malfunction"?

- A. Leave Master Controller output at 100%, select recorder to channel 457.
- B. Take Master Controller output to 25% in manual, select recorder to channel 457.
- C. Leave Master Controller output at 100%, select recorder to channel 456.
- D. Take Master Controller output to 25% in manual, select recorder to channel 456.

29. The plant is operating at 50% power with all control systems in automatic, except for Rod Control.

- A leak on the **REFERENCE LEG** of a pressurizer level transmitter occurs.
- The Letdown System remains in service for the duration of the event.

Which **ONE** of the following is a **CORRECT** description of the failure where letdown would remain in service indefinitely? (assuming no operator actions are taken)

- A. **LI-459** has failed **LOW** with the control selector switch in the **461 / 460** position.
- B. **LI-460** has failed **LOW** with the control selector switch in the **459 / 461** position.
- C. **LI-459** has failed **HIGH** with the control selector switch in the **459 / 460** position.
- D. **LI-460** has failed **HIGH** with the control selector switch in the **461 / 460** position.

30. Given the following timeline:

- 0200 on 08-16-2007 HP / Chemistry samples the containment atmosphere for a mini-purge relief.
- 0300 on 08-16-2007 Shift Supervisor approves the release permit.

Due to manpower shortage on day shift, the mini-purge relief is not performed.

- 0330 on 08-17-2007 Control Room operators are ready to initiate the mini-purge relief.

Which **ONE** of the following is **CORRECT** regarding the mini-purge relief evolution?

- A. The relief can be started immediately.
- B. The relief can be started at any time.
- C. The relief cannot be started since more than 24 hours have passed from the containment air sample.
- D. The relief cannot be started since more than 24 hours have passed since the approval of the permit.

31. The following plant conditions exist:

- Unit 2 has experienced an Anticipated Transient Without Trip (ATWT) and has implemented FRP-19211, Response to Nuclear Power Generation ATWT.
- A Charging Pump is running.
- Boric Acid Transfer Pump # 1 is tagged out.
- Boric Acid Transfer Pump # 2 trips on start.
- SI has **NOT** actuated at this time.
- The SS has directed the RO to establish Emergency Boration in accordance with SOP-13009, "CVCS Reactor Makeup Control System".

Which **ONE** of the following actions would establish a **CORRECT** emergency boration flow path in accordance with the SOP? (Assume 12 gpm seal return flow)

- A. 1) Open HV-8104 EMERGENCY BORATE Valve.
- 2) Adjust charging flow controller FIC-0121 to obtain > 42 gpm flow through the Normal Charging flow path.
- B. 1) Open LV-0112D and LV-0112E RWST TO CHARGING PUMP SUCT valves.
- 2) Adjust charging flow controller FIC-0121 to obtain > 42 gpm flow through the Normal Charging flow path.
- C. 1) Open FV-110A BA to Blender and FV-110B BLENDER OUTLET TO CHARGING PUMPS SUCT.
- 2) Adjust charging flow controller FIC-0121 to obtain > 100 gpm flow through the Normal Charging Path.
- D. 1) Open LV-0112D and LV-0112E RWST TO CHARGING PUMP SUCT valves and HV-8801A and HV-8801B BIT DISCHARGE ISOLATION valves.
- 2) Verify BIT flow (FI-0917A), plus total seal injection flow, minus total seal return flow is > 100 gpm.

32. Given the following conditions:

- Reactor Startup in progress.
- Startup is on hold due to a problem with SR N-31.
- SR N-32 indicates 1000 cps.
- SR N-31 is in Level Trip Bypass

Which **ONE** of the following will occur if the control power fuse for SR N-31 blows?

- A. A reactor trip will occur on SR Hi Flux.
- B. Rod withdrawal is blocked in automatic or manual.
- C. SR indication for N-31 is lost on the QMCB and NIS cabinets
- D. Rod withdrawal is blocked in automatic only.

33. Given the following conditions:

- Unit 1 refueling outage in progress.
- A total loss of CCW has occurred.
- Per AOP-18030-1, Loss of Spent Fuel Pool Cooling", the SS has directed that "Feed and Bleed" be initiated.

Which **ONE** of the following is **CORRECT** regarding temperature control during the feed and bleed evolution?

- A. Train A is the preferred train, simultaneous feed and bleed can be performed, SFP temperature is controlled using an auto Temperature Control Valve (TCV).
- B. Either Train A or Train B allows for simultaneous feed and bleed to be performed, SFP temperature is controlled using an auto Temperature Control Valve (TCV).
- C. Train B is the preferred train, simultaneous feed and bleed can be performed, SFP temperature is controlled using manually throttled valves, no auto TCV exists.
- D. Either Train A or Train B allows for simultaneous feed and bleed to be performed, SFP temperature is controlled using manually throttled valves, no auto TCV exists.

34. A reactor trip has occurred and the plant has entered Mode 3.

- Steam dump valve 1PV-507C is stuck open and cannot be shut.
- All SG Pressures and PT-507 Steam Header Pressure are lowering.
- The BOP operator actuates SLI using the Train "A" SLI handswitch only.

Which **ONE** of the following is **CORRECT** regarding the plant response?

- A. BOTH Trains MSIVs and Bypasses close.
Steam Generator Pressures will stabilize or rise.
- B. ONLY Train "A" MSIVs and Bypasses close.
Steam Generator Pressures will continue to lower.
- C. BOTH Trains MSIVs and Bypasses close.
Steam Header Pressure read on PT-507 will stabilize or rise.
- D. ONLY Train "A" MSIVs and Bypasses close.
Steam Header Pressure read on PT-507 will continue to lower.

35. Given the following conditions with Unit 2 at 100% power:

The RCS Leak Rate surveillance indicates the following:

- Total RCS leakage is 9.2 gpm
- Leakage to the PRT is 5.9 gpm
- Leakage to the RCDT is 2.0 gpm

Primary to Secondary Leakage is as follows:

- S/G # 1 = 0.08 gpm
- S/G # 2 = 0.09 gpm
- S/G # 3 = 0.10 gpm
- S/G # 4 = 0.11 gpm

Which **ONE** of the following would be **CORRECT** regarding RCS Leakage limits in accordance with Tech Specs?

- A. No RCS leakage limits have been exceeded.
- B. The RCS Unidentified leakage limit has been exceeded.
- C. The Total Primary-to-Secondary leakage limit of 500 gpd has been exceeded.
- D. The Primary-to-Secondary leakage limit through any ONE S/G has been exceeded.

36. A Steam Generator Tube Rupture (SGTR) is in progress on Unit 1.

- The crew is performing steps of 19030-C, "Steam Generator Tube Rupture" to "minimize secondary system and environmental contamination".

In accordance with 19030-C, which **ONE** of the following is the **CORRECT** plant personnel to notify prior to performing this procedurally driven evolution?

- A. HP, notify prior to draining potentially contaminated water to the TB sumps.
- B. Chemistry, notify prior to resetting CIA and repositioning valves in the plant.
- C. HP, notify prior to draining potentially contaminated Hotwell water to the CSTs.
- D. Chemistry, notify upon relief of ruptured steam generator ARV.

37. Given the following conditions:

- Unit 1 at 30% power, Turbine has just been synchronized to the grid.
- Steam flow suddenly increases on the BOP panel.
- Plant personnel report a steam leak in the Turbine Building.
- The RO trips the reactor, the turbine auto trips.
- The MSIVs and Bypasses are still open.
- The steam leak appears to have stopped.

Which **ONE** of the following would be **CORRECT** regarding the indications above?

- A. Break on the main steam cross-tie header line.
- B. Break on the steam supply line to the Auxiliary Steam Header.
- C. Break on the steam supply lines to the Main Feed Pump Turbines.
- D. Break on the lines between the stop valves and the Main Turbine.

38. Which **ONE** of the following conditions would require an LCO entry per Technical Specifications?

- A. Failure of PT-505 while in Mode 1.
- B. Failure of C-16 in Mode 1 greater than P-9.
- C. Failure of Main Turbine Vibration Instrumentation.
- D. Failure of Main Turbine Overspeed Test in Mode 2 with MSIVs closed.

39. Given the following:

- Plant is at 77% with all systems in normal alignment.
- MFPT "A" trips due to a hydraulic oil pressure leak.
- MFPT "B" rpms are increasing with discharge pressure reading 0 psig.
- ALB15 window B05 for MFPT LOW DISHCH HDR PRESSURE is lit.
- Steam Generator Flow Mismatch Annunciators are present for all S/Gs.
- S/G levels are rapidly lowering.
- No actions have yet been taken by the operating crew.

Which **ONE** of the following is the **first CORRECT** action(s) for the crew to perform?

- A. Verify rapid insertion of control rods to match Tavg and Tref.
- B. Trip the reactor and go to 19000-C, "E-0, Reactor Trip or Safety Injection".
- C. Reduce Turbine Load as necessary, IF SG NR levels cannot be maintained greater than 40%, trip the reactor, go to E-0, Reactor Trip or Safety Injection.
- D. Press the "Start Setback" pushbutton and ensure the generator output reduces to less than 850 MWe, start the third condensate pump, raise running MFPT speed.

40. Unit 2 has tripped and a Loss of All AC power event is in progress.

The battery chargers to the 125V DC buses have been de-energized for approximately one hour. It is estimated another 4 hours until AC power is restored. DC bus loads are consistent with design bases.

From this point on, operators can expect the 125V DC bus voltages to drop _____ at first, then later drop _____.

- A. slowly, faster due to high load.
- B. quickly, more slowly due to battery depletion
- C. quickly, more slowly due to low load.
- D. slowly, faster due to battery depletion.

41. The following conditions exist:

- A plant startup is in progress.
- Reactor power is currently 12% and rising.
- All control systems are in normal alignment.
- A loss of 120V AC Vital instrument bus 2AY1A occurs.

Which **ONE** (1) of the following describes the effect on the plant?

- A. Reactor automatically trips due to loss of one Intermediate Range instrument.
- B. Rapid Control Rod insertion due to loss of Turbine Impulse Pressure instrument.
- C. Manual reactor trip by Reactor Operator performing Immediate Operator Actions.
- D. Letdown isolates due to failure of the controlling Pressurizer Level instrumentation.

42. Given the following:

- DG1B running for the monthly surveillance.
- A loss of 125V DC 1E bus 1BD1 occurs.
- The Shift Supervisor directs you to shutdown DG1B.

Which **ONE** of the following is the **CORRECT** action to shutdown DG1B?

- A. Depress the normal stop pushbutton on the QEAB.
- B. Depress BOTH Emergency Stop pushbuttons on the QEAB.
- C. Depress the Emergency Stop pushbutton on the local Diesel Control Panel.
- D. Depress the Pull to Run / Push to Stop pushbutton at the DG front standard area.

43. A reactor trip with no safety injection has occurred from 30% power.

- RCS Tavg is 560 degrees F and stable.
- Both Reactor Trip breakers are open.
- The Shift Supervisor directs you to **"verify feedwater isolation"** (FWI).

Which **ONE** of the following identifies the locations where the operator would verify FWI?

- A. MFIVs and BFIVs on the QMCB handswitches.
MFRVs and BFRVs on the QMCB Hagen controllers.
- B. MFIVs and BFIVs on the QMCB RO panel MLBs.
MFRVs and BFRVs on the QMCB RO panel ZLBs.
- C. MFIVs and BFIVs on the QMCB RO panel MLBs.
MFRVs and BFRVs on the QMCB RO panel MLBs.
- D. MFIVs and BFIVs on the QMCB handswitches.
MFRVs and BFRVs on the QMCB BOP panel ZLBs.

44. Given the following conditions:

- The plant is at 100% power with all systems in automatic.
- The RO has recently performed a small dilution for Tavg control.

The following indications are observed in the control room.

- Power Range NI's are rising.
- Tavg is lowering.
- Steam flow and feed flow are stable.
- Reactor power is 101% and rising slowly.

Which **ONE** of the following is the **CORRECT** event in progress and required/preferred action in accordance with AOP-18016-C, "Condensate Feedwater Malfunction"?

- A. Inadvertent RCS dilution, reduce power by reducing turbine load as necessary.
- B. Inadvertent RCS dilution, reduce power and Tavg by inserting control rods.
- C. Loss of Feed Water heating, reduce power by reducing turbine load as necessary.
- D. Loss of Feed Water heating, reduce power and Tavg by inserting control rods.

45. Following a reactor trip with no SI required, the crew has transitioned to 19001, Reactor Trip Response.

Step 3c AER says "**Check SGs NR level - ONE GREATER THAN 10%**".

- 1) If yes, AER says "**throttle total AFW flow as necessary**".
- 2) If no, RNO says "**Verify total AFW flow greater than 570 gpm**".

Which **ONE** of the following is **CORRECT** regarding the basis for the Step 3 actions?

- A. 1) To limit runout of the AFW pumps.
2) Ensures adequate AFW flow for decay heat removal.
- B. 1) To limit runout of the AFW pumps.
2) Ensures enough flow for AFW pump protection.
- C. 1) To limit overcooling of the RCS.
2) Ensures adequate AFW flow for decay heat removal.
- D. 1) To limit overcooling of the RCS.
2) Ensures enough flow for AFW pump protection.

46. Given the following sequence of events:

- Train "A" NSCW is drained and tagged out for leak repair.
- Train "A" DG has been emergency tripped per the AOP.
- Train "A" components placed in PTL and / or stop per the AOP.
- A reactor trip and SI occur due to an RCS LOCA.
- LOSP occurs on Train "B" and DG1B reloads bus 1BA03.

While performing the RO Initial Operator Actions of E-0 the RO points out to the crew that NSCW Train "B" has failed to automatically start.

Which **ONE** of the following is the **CORRECT** action for the crew to take?

- A. Trip all reactor coolant pumps and isolate letdown.
- B. Place all Train "B" components in PTL and / or stop as necessary.
- C. Manually start two Train "B" NSCW pumps, ensure tower basin return is in auto.
- D. Emergency trip DG1B using the QEAB pushbuttons, go to Loss of All AC power.

47. Given the following:

- An SI has occurred and is **NOT** reset.
- An LOSP occurs a few minutes later.
- 1AA02 is powered from DG1A
- 1BA03 is powered from DG1B

While the DG's are operating, an electrical perturbation results in the following;

- DG1A 186A lockout relay energizes (Generator Differential)
- DG1B 186B lockout relay energizes (Phase Overcurrent)

Which **ONE** of the following is **CORRECT** with respect to the status of power to the 4160 1E Emergency Buses at this time?

- A. Both 4160 1E emergency buses would be energized.
- B. Both 4160 1E emergency buses would be de-energized.
- C. 1AA02 would be energized, 1BA03 would be de-energized.
- D. 1BA03 would be energized, 1AA02 would be de-energized.

48. While at 100% power, the following annunciator illuminates.

- ALB35, window D01 for 125V DC SWGR AD1 TROUBLE
- The Control Building Operator (CBO) has been dispatched to investigate and reports a ground.

Which **ONE** of the following is **CORRECT** regarding indications / actions to take if a **GROUND** has occurred?

- A. There are no bus ground detection targets associated with AD1, de-energize all loads on AD1M, AD11, and AD12 one at a time until the alarm clears.
- B. A bus ground detection target would be dropped on AD1, de-energize selected loads on AD1M, AD11, and AD12 one at a time to locate the source of the ground.
- C. There are no local ground detection targets associated with AD1, the CBO would have no indications of a ground, maintenance would have to determine the cause.
- D. A bus ground detection target would be dropped on AD1, de-energize panels AD1M, AD11, and AD12 one at a time to locate the panel with the ground.

49. Given the following conditions:

- DG1A is running, an extra licensed operator is dispatched to monitor and observes the green **"LOSS OF OFFSITE PWR OR SAFETY INJ SIGNAL"** lamp is lit.
- The operator checks the status of the red **"SHUTDOWN SYSTEM ACTIVE"** lamp.

Which **ONE** of the following is **CORRECT** regarding the status of the SHUTDOWN SYSTEM ACTIVE lamp ?

The SHUTDOWN SYSTEM STATUS lamp should be _____

- A. Extinguished, indicating the DG Normal trips are active.
- B. Illuminated, indicating the DG Emergency trips are active.
- C. Extinguished, indicating the DG Normal trips are bypassed.
- D. Illuminated, indicating the DG Emergency trips are bypassed.

50. Which ONE of the following valves will fail CLOSED on a loss of instrument air?

- A. Main Feed Pump Miniflow (FV-5201)
- B. Main Feed Regulating Valve (FV-540)
- C. RHR Heat Exchanger Outlet (HV-606)
- D. Charging Flow Control Valve (FV-121)

51. Evacuation of the Control Room is required due to a Control Room fire.

- Personnel safety is NOT in jeopardy.

The actions of AOP-18038-1, "Operation From Remote Shutdown Panels", prior to evacuating the control room, include which ONE of the following?

- A. Trip all reactor coolant pumps (RCPs) to minimize heat input.
- B. Trip both main feedwater pumps (MFPTs) to limit RCS cooldown.
- C. Place the pressurizer (PZR) pressure control in MANUAL to prevent inadvertent heater and spray actuations.
- D. Ensure CCP suction aligned to the VCT with makeup in AUTO to ensure adequate NPSH to the charging pumps.

52. Given the following:

- Unit 2 refueling outage in progress with several systems draining in progress.
- The Auxiliary Building Clean Water Sump is being pumped to the Turbine Building Drain system to the Waste Water Retention Basins.
- A misalignment drains a radioactive system into the Aux. Building Clean Water Sump.
- A **HIGH** radiation alarm is received for RE-0848, "Turbine Building Drain" rad monitor.

Which **ONE** of the following describes how the release would automatically terminate?

- A. The Aux. Building Clean Water sump pumps automatically trip.
- B. The Turbine Building Drain System re-aligns to the TB Dirty Drain Tank.
- C. The Turbine Building Drain System sump pumps automatically trip.
- D. The Aux. Building Clean Water sump pumps re-align to the Floor Drain Tank.

53. Which **ONE** of the following would provide the **earliest** indication of a gross fuel failure in the control room?

- A. RE-12442 Main Plant Vent Radiogas Hi Range monitor
- B. Reactor Coolant Dose Equivalent I-131 sample
- C. RE-48000 CVCS Letdown radiation monitor
- D. Reactor Coolant E-Bar calculation

54. Given the following:

- Train "A" NSCW is Danger Tagged out under a clearance for maintenance.
- A catastrophic leak occurs on NSCW Train "B".
- The crew enters 18021-C, "Loss of Nuclear Service Cooling Water".

Which **ONE** of the following is the **first** action required by the operating crew?

- A. Place Train "B" NSCW in single pump operation and initiate a unit shutdown.
- B. Place all 3 Train "B" NSCW pumps in pull-to-lock (PTL).
- C. Depress both DG1B QEAB "Emergency Stop" pushbuttons to disable DG1B.
- D. Place Train "B" equipment cooled by NSCW into PTL for equipment protection.

55. Given the following:

- Unit 1 is at 100% power.
- NSCW pumps 1, 2, 5, and 6 are in service.
- NSCW pump 3 and 4 handswitches are in AUTO.
- A fault on RAT 1A result in an LOSP to 1AA02.
- DG1A starts and re-energizes 1AA02.
- Two minutes later an SI signal occurs due to low PRZR pressure.

Which **ONE** of the following is the **CORRECT** response of the NSCW pumps?

- A. All six NSCW pumps operating.
- B. Only two NSCW pumps operating per train.
- C. Two Train A NSCW pumps operating, three Train B NSCW pumps operating.
- D. Three Train A NSCW pumps operating, two Train B NSCW pumps operating.

56. Given the following conditions:

- Unit 1 is at 100% power.
- RATs 1A and 1B are de-energized due to an LOSP.
- Both DGs start and re-energize 1AA02 and 1BA03.
- A reactor trip has NOT occurred.
- Swing air compressor (AC) # 4 was aligned to Unit 1

Which **ONE** of the following is **CORRECT** regarding the Swing AC # 4 power supply ?

- A. AC # 4 was de-energized and remains de-energized.
- B. AC # 4 was briefly de-energized and then re-energized.
- C. AC # 4 is energized and will be de-energized if a Unit 1 reactor trip occurs.
- D. AC # 4 is energized and will remain energized if a Unit 1 reactor trip occurs.

57. The Fire Protection System is in normal alignment with virtually no system leakage.

- The Pre-action sprinkler system has actuated at the Diesel Generator Building on Unit 1.
- The Fire Water header system pressure has LOWERED to 88 psig.

Which **ONE** of the following describes the **AUTOMATIC** response of the Fire Protection System to ensure adequate system pressure is maintained?

- A. ONLY the Electric Fire Water Pump STARTS.
- B. ONLY the Standby Jockey Water Pump STARTS.
- C. The Electric Fire Pump and Diesel Fire Pump # 1 both START.
- D. The Standby Jockey Water Pump and the Electric Fire Pump both START.

58. Given the following plant conditions:

- The plant is in Mode 1 with all systems in normal alignment.
- Containment pressure is 1.9 psig and slowly rising due to a small air leak.
- Containment temperature is 122 degrees F and slowly rising.
- 4 containment coolers are currently running.

Which **ONE** of the following is **CORRECT** regarding containment pressure and temperature and the actions to take to comply with Tech Specs?

- A. Pressure is within Tech Spec limits, use mini-purge to allow containment to vent.
- B. Pressure exceeds Tech Spec limits, use mini-purge to allow containment to vent.
- C. Temperature is within Tech Spec limits, start additional coolers in slow speed.
- D. Temperature exceeds Tech Spec limits, start additional coolers in slow speed.

59. Given the following conditions:

- A prolonged loss of All AC power has occurred, 19100-C, "Loss of All AC Power" is in effect.
- Power is restored to an emergency bus and the crew is preparing to transition to 19102-C, "Loss of All AC Power Recovery With SI Required".
- The person monitoring the CSFSTs points out an ORANGE path on CORE COOLING exists.
- The SS announces entry into FRP 19222-C, "Response to Degraded Core Cooling".

Which **ONE** of the following conditions would require the RO to dispute this course of action by the SS (I.E., prevents transition to the ORANGE path)?

- A. Transition should not be made unless a RED path FRP exists during performance of the Loss of All AC series of procedures.
- B. Transition should not be made until the 19102-C attachment for performing the first 16 steps of E-0 has been completed.
- C. Transition should not be made until completion of 19102-C directs return to another optimal recovery procedure.
- D. Transition should not be made until the step where 19102-C directs implementation of the FRPs is appropriate.

60. Given the following:

- Unit 1 is at 100% power with all systems in normal alignment.

Which **ONE** of the following would provide a method for verifying accumulator valve positions in the main control room?

- A. Using the QMCB handswitches.
- B. Using the QMCB monitor light boards (MLBs).
- C. Using the PSMS - Plant Safety Monitoring System.
- D. Using the ACCUM TANK VALVE FULL OPEN annunciator

61. Which **ONE** of the following is **CORRECT** regarding an OPERATING PERMIT TAG present on a component per NMP-AD-003 "Equipment Clearance and Tagging"?

- A. Component position can NOT be changed - The equipment is isolated for maintenance or testing.
- B. Component position can NOT be changed - The equipment is operating for maintenance or testing.
- C. Component position can be changed - The equipment is under the control of a Tagout Holder for the purpose of position alignment, testing, or maintenance.
- D. Component position can be changed - The equipment has been Danger Tagged but can be manipulated for the purpose of alignment, testing, or maintenance.

62. Which **ONE** of the following sets of conditions represents a violation of a Technical Specification Safety Limit and the required action?

(REFERENCE PROVIDED)

- A. Power = 10%, Pressure = 2400 psig, Tavg = 655 degrees F
Restore to within limits OR be in Mode 3 within 1 hour.
- B. Power = 80%, Pressure = 2250 psig, Tavg = 640 degrees F
Restore to within limits AND be in Mode 3 within 1 hour.
- C. Power = 10%, Pressure = 2400 psig, Tavg = 655 degrees F
Restore to within limits in 2 hours OR be in Mode 3 in 6 hours.
- D. Power = 80%, Pressure = 2250 psig, Tavg = 640 degrees F
Restore to within limits in 2 hours OR be in Mode 3 in 2 hours.

63. Given the following conditions:

- Unit 1 refueling outage in progress.
- The SRO Fuel Handling Supervisor (FHS) and refueling crew are in containment.
- Control rod latching and verification is in progress.
- The RO notices a significant increase in Source Range (SR) counts during a 10 foot control rod withdrawal for latching verification.

Which **ONE** of the following would be the **CORRECT** action for the RO to take?

- A. Allow rod withdrawal to continue, this is an expected response.
- B. Suspend refueling operations on his own authority due to the SR indications.
- C. Allow rod withdrawal to continue, the RO should suspend the operation only if the SR Hi Flux at Shutdown Alarm is received.
- D. Notify the FHS and SS of the SR count indications, FHS or SS authority is required to suspend control rod withdrawal during latching.

64. An individual received the following radiation dose at Plant Vogtle during the first half of the calendar year:

Committed Dose Equivalent (CDE):	85 mrem
Deep Dose Equivalent (DDE):	55 mrem
Shallow Dose Equivalent (SDE), skin of Whole Body:	75 mrem
Committed Effective Dose Equivalent (CEDE):	55 mrem

Which **ONE** of the following **CORRECTLY** states the individual's total whole body occupational dose for the first half of the calendar year?

- A. 110 mrem
- B. 130 mrem
- C. 140 mrem
- D. 195 mrem

65. A job must be performed under the following conditions:

Dose rate at the job is 80 mrem / hr.

Airborne Radioactivity Area due to noble gasses present.

- Total Internal dose for the job if respirator is worn is 0 mrem.
- Total Internal dose for the job if no respirator is worn is 72 mrem.
- Time to complete job while wearing a respirator is 3.25 hours.
- Time to complete job without wearing a respirator is 2.25 hours.

Which **ONE** of the following describes whether a respirator will be worn, and why?

- A. No, wearing a respirator will raise total exposure.
- B. Yes, wearing a respirator will lower total exposure.
- C. No, wearing a respirator will result in the same exposure.
- D. Yes, respirators are required anytime airborne radiation is present.

66. Given the following plant conditions:

- Charging flow at 100 gpm
- Letdown flow at 75 gpm
- Total seal leakoff flow at 12 gpm
- PRZR level and pressure are stable.
- 2RE-0724 "rate of change" (ROC) has remained stable at 75 gpd / hr for 21 minutes.
- 2RE-12839, 2RE-0019, and 2RE-0021 exhibit an increasing trend of higher than normal readings.
- The crew has entered AOP-18009-C, "Steam Generator Tube Leakage"

Based on the above indications, which **ONE** of the following would be the **CORRECT** response for the crew to take?

- A. Shutdown the plant to Mode 3 within one (1) hour using AOP-18013-C, Rapid Power Reduction".
- B. Continue plant operations and monitor the SG tube leak for increasing indications above the administrative limits.
- C. Shutdown the plant to Mode 3 within six (6) hours using UOP-12004, "Power Operation (Mode 1) section 4.2 for Power Descent.
- D. Shutdown the plant to < 50% power within one (1) hour using AOP-18013-C, Rapid Power Reduction", be in Mode 3 within the next two (2) hours.

67. Given the following conditions:

- Large break LOCA has resulted in Unit 1 Reactor trip and Safety Injection.
- RWST level is 36% and lowering.
- The crew is performing the actions of 19013-C, "Transfer to Cold Leg Recirculation".
- Critical Safety Function Status Trees (CSFSTs) are as follows:

Subcriticality - Green
Core Cooling - Orange
Heat Sink - Yellow
RCS Integrity - Yellow
Containment - Red
Inventory - Yellow

Which **ONE** of the following is the **CORRECT** crew response and why?

- A. Immediately exit 19013-C and transition to the RED path for Containment to verify containment isolation and heat removal.
- B. Immediately exit 19013-C and transition to the ORANGE path for Core Cooling to verify Safety Injection is established to the RCS.
- C. Simultaneously perform 19013-C and the RED path for Containment to ensure suction to ECCS pumps and to verify containment isolation and heat removal.
- D. Remain in 19013-C and establish a flow path from CNMT sumps to RCS Cold Legs to ensure suction to ECCS pumps and coolant flow to the core is maintained.

68. Given the following:

- Unit 1 is at 100% power.
- Annunciator ALB13 window D01 for STM GEN 1 HI / LO LVL DEVIATION alarm is illuminated.
- Only S/G # 1 level is rising.
- Both MFPTs speeds are rising.

Which **ONE** of the following describes the (1) cause, (2) required action, (3) direct consequence of an operator failing to take action?

- A. (1) # 1 S/G FRV is opening, (2) stabilize # 1 S/G at the new level, (3) Turbine Runback Initiated.
- B. (1) # 1 S/G FRV is opening, (2) return # 1 S/G level to program, (3) Feedwater Isolation Initiated.
- C. (1) MFP master controller failing high, (2) control MFP speed in manual, (3) Auto Turbine Trip initiated.
- D. (1) MFP master controller failing high, (2) manually trip the turbine, (3) Feedwater Isolation initiated.

69. Given the following:

- The crew is performing 19112-C, LOCA Outside Containment".
- The LOCA is successfully isolated.
- Crew transitions to 19010-C, "Response to Loss of Primary or Secondary Coolant".
- Crew then transitions to 19012-C, "Post LOCA Cooldown and Depressurization".
- The crew is at the step to use the tables to determine if CCPs and SIPs can be stopped based on the subcooling criteria.
- Subcooling criteria is met.
- CCP "A" has been stopped.

Which **ONE** of the following is the **CORRECT** method for stopping the ECCS pumps based on subcooling criteria?

- A. Subcooling criteria is not required to be checked again before stopping another pump, more subcooling is required if RCPs are running.
- B. Subcooling criteria is not required to be checked again before stopping another pump, more subcooling is required if RCPs are stopped.
- C. Subcooling criteria is required to be checked again before stopping another pump, more subcooling is required if RCPs are running.
- D. Subcooling criteria is required to be checked again before stopping another pump, more subcooling is required if RCPs are stopped.

70. The crew has entered 19231-C, "Response to Loss of Secondary Heat Sink" due to no feedwater capability to the steam generators and have initiated RCS "bleed and feed".

Which **ONE** of the following describes the sequence of actions required to establish an **adequate** RCS bleed and feed heat removal flow path in accordance with 19231-C?

- A. "Feed" is established first by initiating SI flow, then "Bleed" is established by opening at least one Pressurizer PORV and a Reactor Vessel Head Vent.
- B. "Bleed" is established first by opening at least one Pressurizer PORV and opening the Reactor Vessel Head Vents, then "Feed" is established by initiating SI flow.
- C. "Feed" is established first by initiating SI flow, then "Bleed" is established by opening both Pressurizer PORVs.
- D. "Bleed" is established first by opening both Pressurizer PORVs, then "Feed" is established by initiating SI flow.

71. A reactor trip has occurred with an LOSP. Power will not be restored for at least 8 hours and a Natural Circulation Cooldown is desired.

- RCS Tavg is currently 557 degrees F
- Only one (1) CRDM fan is operable and running.

Which **ONE** of the following are **CORRECT** procedural actions to mitigate the event in accordance with 19002-C, "Natural Circulation Cooldown"?

- A. The upper head cannot be prevented from voiding with only 1 CRDM fan, transition to 19003-C, "Natural Circulation Cooldown with Voids with RVLIS".
- B. Maintain greater minimum subcooling during RCS cooldown and depressurization, and the upper head cooldown rate will be less.
- C. Raise the RCS cooldown rate from 50 degrees F to 100 degrees F to facilitate a faster cooldown and depressurization of the upper head area.
- D. Continue at the initial required subcooling margin and cooldown rate, heat removal from a CRDM fan is insignificant compared to steaming the secondary plant.

72. Given the following:

- RCS LOCA is in progress.
- 19111-C, Loss of Emergency Coolant Recirculation in effect.
- Containment pressure at 18 psig and rising slowly.
- The crew is at the step to initiate a cooldown to Cold Shutdown conditions.

What method will the crew use to establish this cooldown?

- A. Dumping steam to the main condenser using the steam dumps.
- B. Dumping steam to atmosphere using the Atmospheric Relief Valves (ARVS).
- C. Reducing RCS pressure using the PRZR PORVs to increase ECCS pump injection.
- D. Feeding the Steam Generators at maximum rate using Auxiliary Feedwater pumps.

73. Given the following plant conditions:

- Reactor trip and Safety Injection have occurred.
- 19121-C, ECA-2.1 Uncontrolled Depressurization of All Steam Generators is in effect.
- All Steam Generator Pressures (SG) are lowering uncontrollably.
- Containment pressure is 8 psig and rising.
- AFW flow to each SG has been throttled to 30 gpm to limit the RCS cooldown.

Which **ONE** of the following conditions would require increasing AFW flow to more than 30 gpm per SG in accordance with 19121-C?

- A. All SG levels are less than 10% NR.
- B. SG # 3 level is less than 9% WR.
- C. RCS hot leg temperatures are increasing.
- D. Source of SG depressurization has been identified.

74. Given the following conditions:

- A large steam break has occurred inside containment.
- During performance of E-0, the crew discovered containment pressure to be 22 psig.
- Proper operation of the Containment Spray System was verified.
- The crew has transitioned to 19020-C, "E-2 Faulted Steam Generator Isolation".
- Containment pressure is now 26 psig and slowly lowering.

The crew should **immediately** transition to 19251-C, "FR-Z.1 Response to High Containment Pressure"_____.

- A. if pressure rises to > 52 psig.
- B. since pressure has remained > 21.5 psig
- C. to verify proper alignment of the NSCW system.
- D. to verify proper operation of the Containment Coolers.

75. Given the following conditions:

- A small break LOCA has occurred on Unit 1.
- 19010-C, "Loss of Reactor or Secondary Coolant" is in progress.
- RCS pressure is 1635 psig with CETCs reading 540 degrees F.
- Containment Emergency Sump levels are 17" and slowly rising.
- Containment Low Range Radiation Monitors RE-002 and 003 read 795 MR / HR.
- SG # 3 pressure is 1190 psig and stable, the ARV is non-functional and one (1) code safety appears to be open.
- The person monitoring Critical Safety Functions announces an entry criteria for a YELLOW path procedure.

Based on the indications above, which **ONE** of the following procedures should be implemented at SS discretion?

- A. 19252-C, "Response to Containment Flooding".
- B. 19223-C, "Response to Saturated Core Cooling".
- C. 19232-C, "Response to Steam Generator Overpressure".
- D. 19253-C, "Response to High Containment Radiation Level".

GENERIC FUNDAMENTALS EXAMINATION
EQUATIONS AND CONVERSIONS HANDOUT SHEET

EQUATIONS

$$\dot{Q} = \dot{m}c_p\Delta T$$

$$\dot{Q} = \dot{m}\Delta h$$

$$\dot{Q} = UA\Delta T$$

$$\dot{Q} \propto \dot{m}_{\text{Nat Circ}}^3$$

$$\Delta T \propto \dot{m}_{\text{Nat Circ}}^2$$

$$K_{\text{eff}} = 1/(1 - \rho)$$

$$\rho = (K_{\text{eff}} - 1)/K_{\text{eff}}$$

$$\text{SUR} = 26.06/\tau$$

$$\tau = \frac{\bar{\beta} - \rho}{\lambda_{\text{eff}} \rho}$$

$$\rho = \frac{\ell^*}{\tau} + \frac{\bar{\beta}}{1 + \lambda_{\text{eff}}\tau}$$

$$\ell^* = 1 \times 10^{-4} \text{ sec}$$

$$\lambda_{\text{eff}} = 0.1 \text{ sec}^{-1} \text{ (for small positive } \rho \text{)}$$

$$\text{DRW} \propto \phi_{\text{tip}}^2 / \phi_{\text{avg}}^2$$

$$P = P_o 10^{\text{SUR}(t)}$$

$$P = P_o e^{(t/\tau)}$$

$$A = A_o e^{-\lambda t}$$

$$\text{CR}_{\text{S/D}} = S/(1 - K_{\text{eff}})$$

$$\text{CR}_1(1 - K_{\text{eff}1}) = \text{CR}_2(1 - K_{\text{eff}2})$$

$$1/M = \text{CR}_1/\text{CR}_X$$

$$A = \pi r^2$$

$$F = PA$$

$$\dot{m} = \rho A \bar{v}$$

$$\dot{W}_{\text{pump}} = \dot{m} \Delta P_v$$

$$E = IR$$

$$\text{Eff.} = \text{Net Work Out/Energy In}$$

$$v(P_2 - P_1) + \frac{(\bar{v}_2^2 - \bar{v}_1^2)}{2g_c} + \frac{g(z_2 - z_1)}{g_c} = 0$$

$$g_c = 32.2 \text{ lbm-ft/lbf-sec}^2$$

CONVERSIONS

$$1 \text{ Mw} = 3.41 \times 10^6 \text{ Btu/hr}$$

$$1 \text{ hp} = 2.54 \times 10^3 \text{ Btu/hr}$$

$$1 \text{ Btu} = 778 \text{ ft-lbf}$$

$$^{\circ}\text{C} = (5/9)(^{\circ}\text{F} - 32)$$

$$^{\circ}\text{F} = (9/5)(^{\circ}\text{C}) + 32$$

$$1 \text{ Curie} = 3.7 \times 10^{10} \text{ dps}$$

$$1 \text{ kg} = 2.21 \text{ lbm}$$

$$1 \text{ gal}_{\text{water}} = 8.35 \text{ lbm}$$

$$1 \text{ ft}^3_{\text{water}} = 7.48 \text{ gal}$$

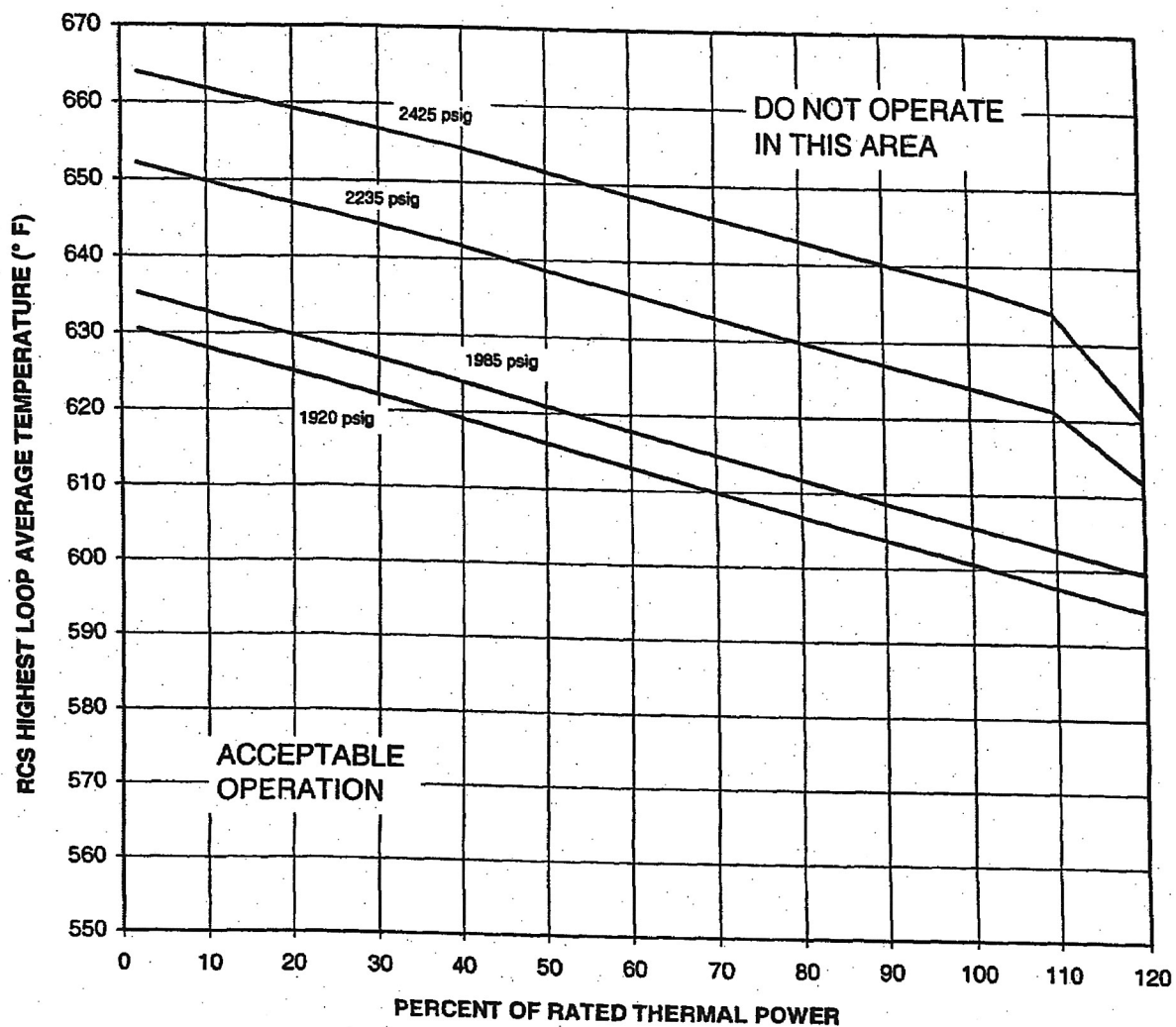
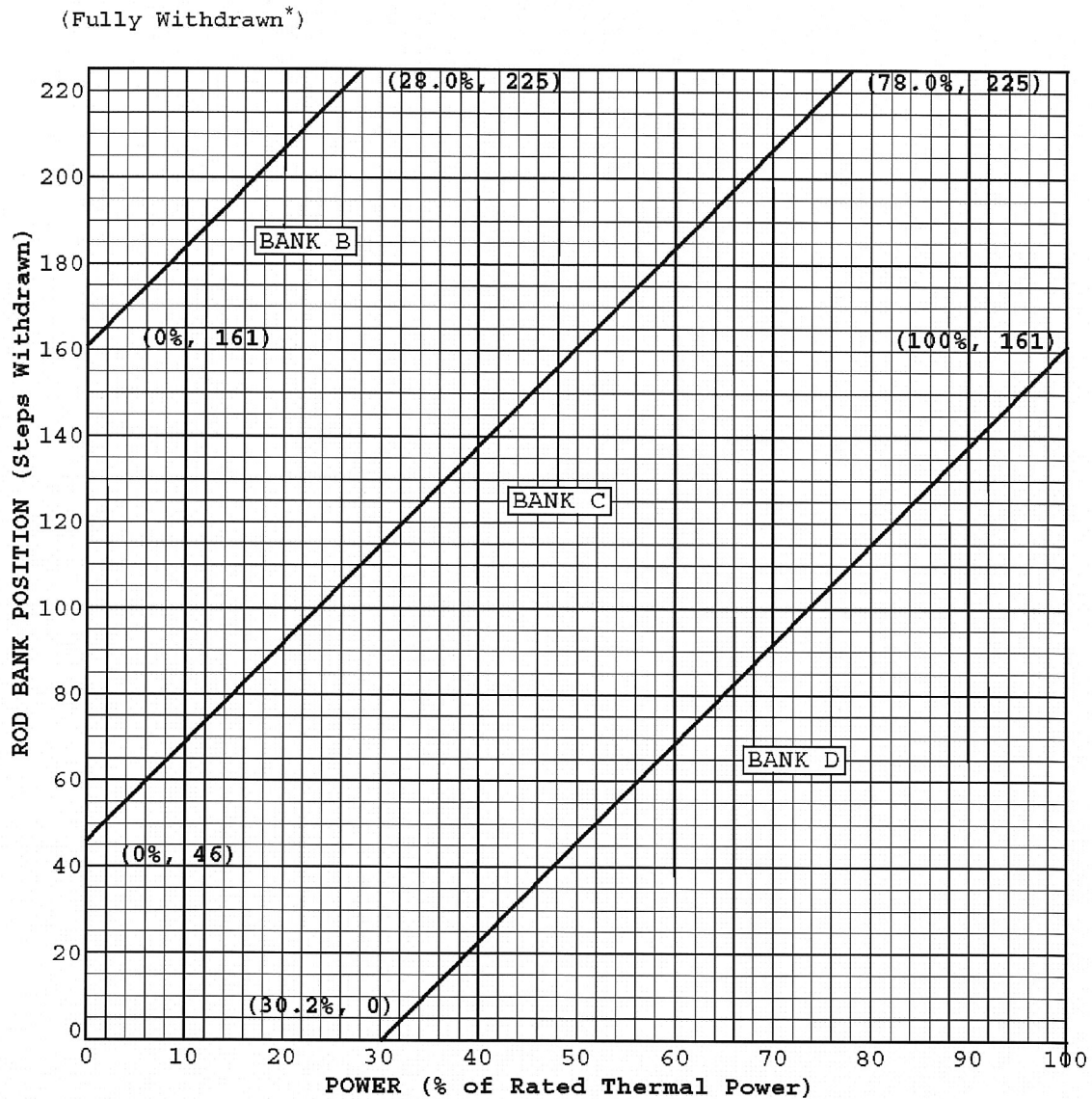


Figure 2.1.1-1
Reactor Core Safety Limits

COLR for VEGP UNIT 1 CYCLE 14



*Fully withdrawn shall be the condition where control rods are at a position within the interval ≥ 225 and ≤ 231 steps withdrawn.

NOTE: The Rod Bank Insertion Limits are based on the control bank withdrawal sequence A, B, C, D and a control bank tip-to-tip distance of 115 steps.

FIGURE 3

ROD BANK INSERTION LIMITS VERSUS % OF RATED THERMAL POWER

Answers

#	0
1	C
2	B
3	A
4	A
5	B
6	B
7	D
8	A
9	D
10	D
11	C
12	B
13	C
14	B
15	C
16	B
17	D
18	A
19	A
20	B
21	A
22	D
23	C
24	D
25	C
26	D
27	B
28	B
29	D
30	C
31	D
32	A
33	C
34	A
35	D
36	A
37	D
38	A
39	B
40	D
41	D
42	D
43	D
44	C
45	C
46	C
47	D
48	B

Answers

#	0
49	C
50	B
51	B
52	B
53	C
54	B
55	C
56	C
57	C
58	B
59	D
60	B
61	C
62	B
63	B
64	A
65	A
66	A
67	D
68	B
69	D
70	C
71	B
72	B
73	C
74	A
75	D

SECTION 1 (75 items)
