

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

Applicant Information

Name:	Region: I / II / III / IV
Date:	Facility/Unit: PBNP
License Level: RO / SRO	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. The passing grade requires a final grade of at least 80.00 percent. Examination papers will be collected five 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

1. With the Unit 1 Reactor operating at 60% power and turbine in IMP IN, the following indications are observed:

- Rising steam generator pressures.
- Rising pressurizer pressure.
- TAVG greater than TREF and rising.
- Turbine Impulse Pressure constant.
- Rising NI Power.

Assuming no operator action, which of the following would initially explain the above indications ?

- A. Turbine runback.
- B. Main steam line leak.
- C. Inadvertent AFW actuation.
- D. Uncontrolled rod withdrawal.

2. Unit 1 Reactor Power was initially at 100% steady state with normal operating conditions. The Control Operator then noted the following indications:

- One rod bottom light (G-7) lit.
- Tavg/Tref deviation alarm lit.
- RCS pressure lowering.
- Power Range Nuclear Instrument(s) lowering.
- Control bank "D" rods fully withdrawn.

Based on these indications, which one of the following actions in accordance with the applicable procedure will the Control Operator be directed to perform first ?

- A. Trip the reactor.
- B. Disconnect the dropped RCCA.
- C. Perform a shutdown margin calculation.
- D. Place rod bank selector switch to manual.

3. A load reduction is being performed with rods in AUTO. If rod control became inoperable and the load reduction continued, which of the following answers describes the operational implication on axial flux ?

Axial Flux will move _____ due to _____.

- A. positive, Tcold decreasing.
- B. negative, Tcold increasing.
- C. positive, core Delta T decreasing.
- D. negative, core Delta T increasing.

4. Which of the following parameters are used to determine the entry conditions for CSP-C.1, "Response to Inadequate Core Cooling," in accordance with CSP-ST.0, "Critical Safety Function Status Trees?"

- A. Core exit thermocouple temperature and PZR pressure.
- B. RCS hot leg temperature (loop RTDs) and PZR pressure.
- C. Core exit thermocouple temperature and reactor vessel level.
- D. RCS hot leg temperature (loop RTDs) and reactor vessel level.

5. Given the following plant conditions:

- Unit 1 Safety Injection (SI) has occurred.
- Containment pressure is .5 psig (1/2 psig) and steady.
- RCS pressure is 1300 psig and slowly dropping.
- Auxiliary Building Radiation Levels are in ALERT on RMS.
- Letdown fails to isolate.
- All other equipment functions as designed.

Based on these conditions, with NO operator action, which one of the following statements is TRUE with regard to long-term plant response ?

- A. Containment sump recirculation will be unavailable.
- B. RWST level will be depleted in less than 30 minutes.
- C. PORVs will cycle as necessary to control RCS pressure.
- D. Containment spray will occur at 15 psig containment pressure.

6. Given the following plant conditions:

- A steamline break occurred in Unit 2 Containment.
- The control room team has progressed through the EOP set to EOP 1.1, "SI Termination" and have secured BOTH RHR and SI Pumps.
- Containment pressure is 30 psig and slowly lowering.
- Core exit thermocouples are 325°F and slowly rising.
- PZR level is 20% and slowly lowering.

Based on these conditions, the control operator reports RCS subcooling is 30°F and slowly lowering. Which of the following responses best describes the required course of action?

Manually start the Safety Injection pumps, as necessary, and _____

- A. continue in EOP 1.1, "SI Termination".
- B. transition to EOP 0, "Reactor Trip or Safety Injection".
- C. transition to EOP-2, "Faulted Steam Generator Isolation".
- D. transition to EOP-1, "Loss of Reactor or Secondary Coolant".

7. Unit 1 is operating at Full Power when the Control Operator notes the following alarms and indications:

- 1P-1A RCP Vibration Alarm (1CO4 1C 1-5)
- Reactor Coolant Loop "A" Flow Low (1CO4 1B 2-7)
- RCS Flow on 1FI-411, 412, and 413 reads 80% and is rapidly lowering
- Reactor Trip Breaker Indicators are RED on 1CO4.

Analyze these indications to determine which of the following choices is most correct.

- A. Neither RCS Pressure or DNBR safety limits are challenged and the reactor should not have tripped.
- B. Both RCS Pressure and DNBR safety limits could be challenged and the reactor should have tripped.
- C. Neither RCS Pressure or Peak Centerline Temperature safety limits are challenged but the reactor should have tripped.
- D. Both RCS Pressure and Peak Centerline Temperature safety limits could be challenged but the reactor should not have tripped.

8. It is desired to place the plant in cold shutdown utilizing EOP-0.2, "Natural Circulation Cooldown". What is the maximum allowed cooldown rate and why is this limit imposed?

- A. Less than 50 degrees per hour to prevent exceeding Technical Specification cooldown limits.
- B. Less than 50 degrees per hour to minimize the probability of creating a void in the reactor vessel.
- C. Less than 25 degrees per hour to minimize the probability of creating a void in the reactor vessel.
- D. Less than 25 degrees per hour to prevent exceeding Technical Specification cooldown limits.

9. Given the following Unit 1 plant conditions:

- A reactor trip has just occurred.
- Two (2) control rods are stuck out of the core following the trip.
- An emergency boration has been initiated by the reactor operator in accordance with EOP-0.1, "Reactor Trip Response".

Which of the following states the **MINIMUM** injected volume of boric acid necessary to satisfy the required amount of boration?

- A. 600 gallons.
- B. 1,200 gallons.
- C. 2,400 gallons.
- D. 3,000 gallons.

10. If an operator is unable to restore power to the safeguards buses from the control room during the performance of ECA-0.0, "Loss of All AC Power", the procedure directs the operator to isolate the RCP seals by locally shutting RCP seal injection throttle valves CV-300A/B.

Why are these valves shut ?

- A. To prevent RCS inventory loss to the PRT via the seal injection relief line.
- B. To prevent a thermal shock to the RCP seals/shaft upon start of a charging pump.
- C. To prevent a thermal shock to the RCP thermal barrier upon start of a charging pump.
- D. To protect against a thermal expansion induced RCS leak at the seal injection filter housing.

11. While in CSP-S.1, step 1, the Unit 1 Control Operator notes the following:

Rod Bottom Lights: OFF

Reactor Trip Breakers: CLOSED

Rod Bank Positions: SDA 225 Steps
SDB 225 Steps
CBA 225 Steps
CBB 225 Steps
CBC 225 Steps
CBD 220 Steps

Neutron Flux: 97%

Rod Control: AUTO and rods not moving

Which of the following choices provides the correct response for the operating crew to take in this situation?

- A. Proceed immediately to step 2.
- B. Manually drive the control rods IN and continue with step 2.
- C. Initiate boration of the RCS at maximum rate and continue with step 2.
- D. Direct the auxiliary operator to open the Reactor Trip Breakers and Reactor trip bypass breakers locally and proceed to step 2.

12. During a faulted steam generator event, why is feed flow isolated to the faulted steam generator (S/G) ?
- A. To maximize feedwater inventory to the non-faulted S/G and to limit RCS cooldown.
 - B. To prevent run out from occurring on the operating feed pump(s) and to limit RCS cooldown.
 - C. To limit the temperature stress in the faulted steam S/G and to prevent runout from occurring on the operating auxiliary feedwater pump(s).
 - D. To minimize the unmonitored release of the contents of the S/G to the environment and to minimize feedwater inventory to the non-faulted S/G.
13. A small break LOCA has occurred one hour ago. The Safety Injection pumps are currently running. The current RCS temperature is 250 °F and pressure is 1000 psig. Which one of the following statements **BEST** describes the actions that must be taken, according to CSP-P.1, "Response to Imminent Pressurized Thermal Shock Condition", to mitigate this condition?
- A. Safety Injection Accumulators must be made available by opening isolation valves.
 - B. The cooldown must be stopped and the reactor coolant system fully depressurized.
 - C. A Reactor Coolant pump should be started to allow control of RCS pressure with spray flow.
 - D. The RCS temperature must be stabilized for at least one hour before further cooldown is allowed.
14. Unit 1 is coming out of its annual refueling outage and is holding power at 28% for chemistry concerns. The 'A' condensate pump, 'A' main feed pump, and the 'A' circulating water pump are operating. The "A" circulating water pump circuit breaker trips open due to a ground fault. Assuming no operator action, what will occur ?
- A. Neither the turbine or reactor will trip.
 - B. The reactor will trip but not cause a turbine trip.
 - C. The turbine will trip but not cause a reactor trip.
 - D. The turbine will trip on low vacuum and cause a reactor trip.

15. The following plant conditions exist:

- Unit 1 has experienced a Loss of All AC Power due to severe weather conditions and failure of emergency diesel generators to start and supply safeguard buses.
- The operating crew is carrying out actions of ECA 0.0, "Loss of All AC Power".
- Immediate actions have been completed and steps to restore power are in progress.
- The operators are at a point where they are to commence cooldown and depressurization of the steam generators.

Based on these conditions, which of the following statements best describes the reason why a secondary depressurization is directed ?

- A. To ensure the reactor remains subcritical and does not result in a restart accident.
- B. To minimize RCS inventory loss through the RCP seals, which maximizes time to core uncover.
- C. To remove all the stored energy in the steam generators to prevent a secondary safety valve from lifting.
- D. To prevent a challenge to the core cooling critical safety function status tree which is being monitored for implementation.

16. The Unit 2 reactor has tripped due to a loss of offsite power. After stabilizing the plant, the operator notes the following conditions:

RCS

Th (WR)	590 °F and lowering
Tc (WR)	540 °F and lowering
RCS Pressure	1985 psig
PZR Level	20%

Reactor Core

Core exit TCs	591 °F and lowering
NR Vessel Level	>39 feet

Steam Generators

Pressures	950 psig and lowering
Levels	50%

Has natural circulation been verified?

- A. Yes, all the conditions are satisfied.
- B. No, adequate delta T does NOT exist.
- C. No, adequate subcooling does NOT exist.
- D. No, adequate vessel level does NOT exist.

17. Both units are at full power.

The YELLOW 120V VITAL Instrument Bus (1Y-04) is to be removed from service for emergency inspection due to imminent failure.

Using your knowledge of Vital AC Instrument Buses and with regard towards Engineering Safeguards, analyze automatic actions that will immediately occur as a result of premature failure of the YELLOW instrument bus. The following assumptions can be made:

- This is the only failure or abnormal event that occurs.
- Operators take manual control of Feedwater Flow to maintain S/G water level at programmed level.

A. "A" Steam Line Isolation will actuate.

B. Low Pressurizer Pressure Safety Injection will actuate.

C. No Engineered Safeguards Systems (ESFAS) will actuate.

D. 1P-29 Turbine Driven Auxiliary Feedwater Pump will actuate.

18. The following plant conditions exist:

- Both units are operating at full power.
- No plant evolutions are in progress.
- The Unit 1 service water discharge monitor (1RE-229) is in alert on the control room RMS.
- The control room team verifies this is a valid alarm per RMSASRB guidelines and an unscheduled release is in progress.

Which of the following choices best describes additional expected control room team actions and why ?

- A. Refer to Technical Specifications which directs the effluent release path be isolated to minimize site boundary exposure.
- B. Refer to AOP-4A, "High Effluent Activity" which allows discharge to continue due to the dilution effects of Lake Michigan.
- C. Refer to AOP-4A, "High Effluent Activity" which directs the effluent release path be isolated to minimize exposure to the public.
- D. Refer to "Radioactive Liquid Waste Permits" section of Release Accountability Manual (RAM 3.1) which provides release requirements after an accidental release has occurred.

19. Given the following plant conditions:

- Both Units are at Full Power.
- Service Water Header pressure is 40 psig and oscillating.
- Forebay Level is -11 ft and lowering.
- Condenser vacuum is lowering on both units.
- Various high temperature alarms are annunciating on both units.

Based on these indications, interpret which of the following is the most likely cause ?

- A. Frazil ice build-up on the intake crib.
- B. Loss of all running circulating pumps.
- C. Excessive fish on traveling water screens.
- D. Loss of all but one operating service water pump.

20. A fire is reported to the control room by an Office Assistant and verified by an Auxilliary Operator in the area of Unit Two Lube Oil Storage Room. According to NP 1.9.14, "Fire Protection Organization", following the plant fire alarm and gaitronics announcement, which of the following best describes a responsibility of the Duty Operating Supervisor (DOS), regarding fire emergency response guidelines ? The DOS should _____.

- A. relieve the third licensed control operator who will act as a fire brigade member.
- B. proceed to the scene to act as the fire brigade leader, after ensuring the DSS is in the control room.
- C. contact the Two Creeks Volunteer Fire Department for assistance as soon as fire magnitude is known.
- D. relieve the Duty Shift Superintendant (DSS), who will proceed to the scene of the fire to direct activities.

21. The following conditions exist:

Reactor Power:	Unit 1 and Unit 2 at Full Power
Control Room:	FIRE in progress
Offsite Power:	AVAILABLE

In accordance with AOP-10A, "Safe Shutdown-Local Control", which one of the following actions is **NOT** required to be completed prior to control room evacuation due to lack of control room habitability.

- A. Verify Unit 1 and Unit 2 tripped.
- B. Shut Unit 1 and Unit 2 PORV block valves.
- C. Place Unit 1 and Unit 2 Main Feedwater Pumps in PULL-OUT.
- D. Place Unit 1 and Unit 2 Atmospheric Steam Dump Controllers in manual and shut.

22. The following plant conditions exist:

- A LOCA has occurred inside containment.
- Containment Pressure is currently STABLE at 10 psig.
- Subsequently, a Loss of Containment Integrity on one penetration occurs.
- Leakrate is estimated at 100 SCFM.

Containment leakage will double if containment pressure reaches _____.

- A. 14 psig
- B. 20 psig
- C. 40 psig
- D. 80 psig

23. Based on the following plant conditions:

- Unit 1 has a confirmed 200 gpm RCS leak into containment.
- The operating crew decides to transition from AOP-1A, "Reactor Coolant Leak" to EOP-0, "Reactor Trip or Safety Injection".
- The reactor is manually tripped and SI/CI manually actuated due to containment pressure at 3 psig and slowly rising.
- Reactor Coolant Pumps are tripped per foldout page criteria.
- It is later discovered that SI Flow is indicating 0 gpm.
- RCS Pressure is approximately 1000 psig and slowly rising.
- NR Reactor Vessel Water level is 25 ft and slowly trending downward.
- Core Exit Thermocouple Temperature is approximately 550 degrees F and slowly rising.
- All other equipment is functioning normally.

If these plant conditions were to continue with no operator action, which of the following responses best describes the potential plant outcome ?

- A. Loss of Subcriticality.
- B. Degraded Core Cooling.
- C. Brittle Fracture of the RCS.
- D. Containment Overpressurization.

24. Which one of the following is the reason/basis for reducing T_{avg} to less than 500°F with high RCS activity, according to AOP-8A, "High Reactor Coolant Activity" ?

- A. Limit containment radiation levels in the event of a LOCA.
- B. Reduce potential increase of RCS activity from a crud burst.
- C. Minimize thermal stresses on the fuel cladding in the event of a faulted steam generator.
- D. Prevent lifting of steam generator relief valves in the event of a steam generator tube rupture.

25. A uncomplicated reactor trip has occurred. The immediate actions of EOP-0, "Reactor Trip or Safety Injection", have been completed and a transition to EOP 0.1, "Reactor Trip Response", has been made. Which of the following conditions would require a transition back to EOP-0, "Reactor Trip or Safety Injection".

- A. Pressurizer level lowered to 11% and is stable.
- B. Containment pressure cannot be maintained less than 5 psig.
- C. RCS cold leg temperature cannot be maintained greater than or equal to 540 degrees F.
- D. Total feedwater flow cannot be maintained greater than 200 gpm with BOTH S/G levels less than 29%.

26. The following plant conditions exist:

- Unit 2 is operating at full power.
- I & C testing is in progress.
- 2 - RC-430 (PORV) inadvertently opens and sticks in this position.
- A Unit 2 reactor/turbine trip and safety injection subsequently occur.
- Two additional minutes have elapsed with no operator action.

Based on these conditions, which of the following choices provides the most accurate indication of the following sensor/detector ?

(Assume answers correspond to the same order of the detector given)

Pressurizer Level (LT-427) is going _____, Pressurizer Pressure (PT-430) is going _____, and Pressurizer Temperature (TE-424) is going _____.

- A. up, up, up.
- B. up, down, down.
- C. down, down, up.
- D. down, up, down.

27. Given the following plant conditions:

- Unit 1 has tripped due to failure of the main turbine lubricating oil system.
- During the trip, a PORV fails open and cannot be isolated.
- The operators are currently working their way through EOP 1.2, "Small Break LOCA Cooldown and Depressurization."
- Neither RCP can be restarted due to problems with their oil lift pumps.
- All equipment and systems are functioning normally (with exception of PORV isolation and RCP oil lift pumps).

Which of the following statements accurately describes the operational implications of current plant conditions ?

- A. Decay heat cannot be removed, the core will heat up and likely exceed temperature limits.
- B. The RCS will continue to void and eventually decay heat will be removed by reflux cooling.
- C. The combination of SI/break flow, auxiliary feedwater, and/or steaming paths should be sufficient to remove decay heat.
- D. Natural circulation cooling cannot be verified and is the only method of removing decay heat under these conditions.

28. The control room team has transitioned to EOP-1.3, "Transfer to Containment Sump Recirculation", from EOP-0, "Reactor Trip or Safety Injection". Containment pressure is 28 psig and lowering.

When can containment spray be secured in accordance with EOP 1.3, "Transfer to Containment Sump Recirc"?

- A. Anytime containment pressure is < 15 psig.
- B. Never, Containment Spray is maintained throughout EOP 1.3.
- C. When suction is aligned to the RWST and RWST level is < 9%.
- D. Anytime 12% of the NAOH Tank has been added to the containment.

29. Given the following Unit 1 plant conditions:

- RCS Temperature: 530 degrees F.
- RCS Subcooling: 50 degrees F.
- Pressurizer level: 5%
- Containment pressure: 7 psig
- 1A05/1A06 voltage: 4380 volts powered from off-site
- P-23A, "Reactor Make-up Water Pump" is lined up for blender services.

Assuming all systems function as designed with no operator action, which one of the following statements is correct ?

- A. Automatic charging pump speed will reduce to minimum.
- B. The containment spray system will automatically actuate.
- C. Automatic makeup to the Volume Control Tank will be lost.
- D. The emergency diesel generators (G02 and G04) will automatically load onto their respective buses.

30. Given the following conditions:

- Unit 1 is in cold shutdown.
- RHR Train "A" is operating.
- RCS is SOLID at 250 psig and 180°F.
- Letdown has been established from RHR.
- 1P-2B, "Charging Pump" is running in manual.
- One RCP is running.
- A failure in the electric to pneumatic transducer (I/P) for PCV-135 (LP letdown line pressure control valve) causes PCV-135 to fully close.

Based on the plant conditions given, determine which one of the following choices is the expected plant response and why ?

- A. PZR safety valves may open to provide RCS overpressure protection.
- B. Charging pumps may trip on loss of letdown to maintain VCT inventory.
- C. PZR PORVs or RH-861C (RHR high capacity relief valve) may open to prevent RHR overpressurization.
- D. 1RH-700 and 1RH-701 (1P-10A & B RHR Pumps Suction Header MOVs) may close at 425 psig RCS pressure to protect RHR suction piping.

31. Given the following situation:

- Unit 2 is at Full Power.
- PT-431 (PZR Pressure) Controlling Blue Channel fails high.
- The CO notes RCS pressure dropping rapidly.
- The CO also notes both PZR Spray Valves full open and shuts them

(using chicken switches)

Given these conditions, which of the following statements best describes what will mitigate the RCS pressure drop on a short term basis once the spray valves are shut ?

- A. PZR insurge will occur causing a phase change from liquid to vapor.
- B. PZR outsurge will occur causing a phase change from liquid to vapor.
- C. PZR backup heaters need to be manually energized and hot PZR water flashes to steam.
- D. PZR backup heaters will automatically energize and hot PZR water flashes to steam.

32. Given the following plant conditions:

- Unit 1 is shutting down from full power.
- Reactor Power is currently at 6%.
- Intermediate Range Channel N35 fails high.

Which of the following statements best describes how this failure affects the reactor shutdown and subsequent operation of the Nuclear Instrumentation System ?

- A. The reactor will not trip, and the source range NIs will have to be manually reenergized.
- B. The reactor will not trip, and the source range NIs will reenergize when N36 reaches the proper setpoint.
- C. The reactor will trip on high IR flux, and the source range NIs will have to be manually reenergized.
- D. The reactor will trip on high IR flux, and the source range NIs will reenergize when N36 reaches the proper setpoint.

33. Given the following plant conditions:

- Unit 1 is at full operating power.
- A Loss of NI-35 (Intermediate Nuclear Range Channel) voltage occurs.
- The DSS/DOS directs that NI-35 be removed from service per ICP 10.2, "Routine Maintenance Procedure Removal of Safeguards or Protection Sensor from Service".

Which of the following actions must be performed per ICP 10.2 on the affected channel drawer, to prevent an automatic reactor trip from occurring ?

- A. Pull control power fuses.
- B. Pull instrument power fuses.
- C. Place level trip switch to "BYPASS".
- D. Place operation selector switch to " 10^{-9} ".

34. Given the following plant conditions:

- Unit 1 is operating at FULL Power.
- 1RE-231, "Steam Line "A" radiation" ALERT has just been received.

The Control Operator notes rising charging pump speed and a one (1) gpm rise in charging flow with no change in corresponding letdown flow.

Based on these indications, determine which of the following statements is TRUE:

- A. A steam generator tube leak in excess of TS limit is occurring which requires a plant shutdown.
- B. A steam generator tube leak less than the TS limit is occurring which requires a plant shutdown.
- C. A steam generator tube leak in excess of TS limit is occurring which does NOT require a plant shutdown.
- D. A steam generator tube leak less than the TS limit is occurring which does NOT require a plant shutdown.

35. Unit 1 has just been tripped based on the operators inability to maintain pressurizer level within the guidance provided by AOP-1A, "Reactor Coolant Leak". Additionally, the following indications are noted by the Control Room Team:

- SI/CI has actuated.
- Both MSIVs have automatically closed.
- "A" S/G Water Level is 40% and rising.
- "B" S/G Water Level is 25% and rising.
- Auxiliary Feedwater Flow is 200 gpm to each S/G.

Based on your analysis of these parameters, which S/G(s), if any, has the highest potential of being ruptured and what additional parameter would confirm your analysis ?

- A. "1B" S/G, Containment area high radiation alarm.
- B. "1A" S/G, Containment area high radiation alarm.
- C. "1B" S/G, S/G activity sample results indicating normal background.
- D. "1A" S/G, S/G sample results indicating boron higher than normal.

36. The following plant conditions exist on Unit 1:

- A Reactor trip occurred.
- A series of problems have occurred resulting in the lack of ability to provide feedwater addition to either S/G.
- S/G water levels are approximately 100 inches on wide range indication for each S/G.
- The control room team has just entered CSP-H.1, "Response to Loss of Secondary Heat Sink".
- RCS pressure has risen above the PORV setpoint due to the loss of a heat sink.

Which action must the control room team take and what is the reason for this action ?

- A. Raise charging pump flow to re-establish PZR level and maintain inventory.
- B. Establish Feed and Bleed to minimize core uncover and inadequate core cooling.
- C. Commence a primary system depressurization to prevent cycling of the PORV's and conserve inventory.
- D. Commence a secondary system depressurization to below the condensate pump shutoff head to allow condensate flow into the S/Gs.

37. What automatic function occurs in the Auxiliary Building Ventilation system when a high radiation alarm is received in the auxiliary building exhaust and why ?

- A. All PAB ventilation fans trip to isolate any potential release.
- B. The PAB cleanup fans auto start to minimize radioactive release to the outside environment.
- C. The charcoal filter inlet damper opens and the particulate filter damper closes to filter any potential release.
- D. PAB supply fan stops to create a negative pressure in the PAB to minimize radioactive release to the outside environment.

38. The following plant conditions exist:

- Both units are operating at full power.
- 2RE-107 (Seal Table Area Monitor) has gone into alert and then cleared several times during your shift.
- No plant evolutions or abnormalities are noted.

Based on these plant conditions, which of the following choices best represents the guidance that should be used and reason(s) for this guidance ?

(RMSASRB, "Radiation Monitoring System Alarm Setpoint and Response Book")
(RECM, "Radiation Effluent Control Manual")

- A. The RMSASRB guidance should be used to determine if random spiking or actual radiation is the cause.
- B. The RMSASRB guidance should be used to ensure 2RE-107's associated control functions have properly responded.
- C. The RECM guidance should be used to determine if random spiking or actual radiation is the cause.
- D. The RECM guidance should be used to ensure 2RE-107's associated control functions have properly responded.

39. The following Unit 1 conditions exist:

- A large break loss of coolant accident occurred about 15 minutes ago.
- During the initial phases of the accident, containment pressure and radiation peaked at 15 psig and $11E5$ R/hr.
- Containment pressure and containment radiation levels have just lowered to 4.5 psig and $8E4$ R/hr.

Select the correct response concerning the use of adverse numbers during this accident.

- A. The use of adverse containment numbers is still required until containment pressure is less than 5 psig.
 - B. The use of adverse containment numbers was never required because neither adverse containment criterion was exceeded.
 - C. The use of adverse containment numbers is still required until containment radiation integrated dose is verified to be less than $10E6$ R.
 - D. The use of adverse containment numbers was required initially but is no longer necessary because containment pressure and radiation are both below the adverse containment criteria.
40. A small break LOCA has occurred on Unit 2. The control room team is currently working their way through EOP-1, "Loss of Reactor or Secondary Coolant". They are currently at a step that establishes Instrument Air to the containment. According to EOP-1 background document, which of the following choices **BEST** describes the reason this action is being performed ?

- A. To establish a normal CVCS lineup to aid in meeting SI termination criteria.
- B. To provide an air supply to the spray valves which may be needed for pressure control.
- C. To provide a load on the instrument air compressors which were previously running unloaded.
- D. To establish redundancy between units since instrument air is one of PBNP's shared systems.

41. With the Pressurizer Level Control Selector Switch in the **NORMAL** position, a pressurizer level instrument failure caused the following **SEQUENTIAL** plant events:

1. Charging flow reduced to minimum.
2. Pressurizer level lowered.
3. Letdown flow secured and heaters turned off.
4. Pressurizer level went up until a high level trip occurred.

Which one of the following instrument failures occurred?

(Assume NO operator action)

- A. Pressurizer level channel 428 (blue) failed low.
- B. Pressurizer level channel 428 (blue) failed high.
- C. Pressurizer level channel 427 (white) failed low.
- D. Pressurizer level channel 427 (white) failed high.

42. Chapter 14 of the FSAR, provides an analysis of an off-loaded fuel assembly which is dropped onto the floor of the spent fuel pool. Which of the following choices best describes the outcome of this analysis ? (Assume that only the dropped fuel assembly is affected).

- A. Recriticality hazards would be presented and site boundary radiation levels could exceed 10 CFR 100 limits.
- B. No criticality hazard would be presented and site boundary radiation levels would not exceed 10 CFR 100 limits.
- C. No criticality hazard would be presented, however site boundary radiation levels could exceed 10 CFR 100 limits.
- D. Recriticality hazards would be presented, however site boundary radiation levels would not exceed 10 CFR 100 limits.

43. The reactor has tripped from 100% power due to a loss of offsite AC power. The EDGs are supplying the safeguards buses. Immediately after the transition to EOP-0.1, "Reactor Trip Response," the operator notes these indications:

<u>RCS</u>	<u>A</u>	<u>B</u>	<u>Units</u>	<u>Trend</u>
Th WR	584	585	°F	slowly rising
Tc WR	550	548	°F	stable
Core TC's	590	---	°F	slowly rising
RCPs	Off	Off	---	N/A
PZR Pressure	1737	---	psig	slowly lowering
PZR Level	10	---	%	slowly lowering
Subcooling	27	30	°F	slowly lowering

<u>Secondary</u>	<u>A</u>	<u>B</u>	<u>Units</u>	<u>Trend</u>
S/G Pressure	1010	1005	psig	stable
S/G Level	190	190	inches	slowly rising
AFW Flow	110	125	gpm	stable

What action should be taken ?

- A. Remain in EOP-0.1, "Reactor Trip Response," and maximize AFW flow.
- B. Manually initiate safety injection and go to EOP-0, "Reactor Trip or Safety Injection."
- C. Go to CSP-C.3, "Response to Saturated Core Cooling", and start a second charging pump.
- D. Go to CSP-H.2, "Response to Steam Generator Overpressure," and raise AFW flow.

44. - Unit 1 is at Full Power.
- Annunciator 1C04 1C 2-9, "Containment or Aux Building Ventilation System Air Flow Low" actuates.
- Upon investigation, the CO reports an amber light above 1W-3A/3B, "CRDM Cooling Fans" on the rear of 1C04.

Given these plant conditions, which of the following most accurately describes the course of action the CO should recommend to the DOS ?

- A. Immediately trip Unit 1 off line and cool down the RCS to < 500 degrees F per EOP-0.
- B. Continued operations is permissible because the amber light means the standby fan has automatically started.
- C. Continued operations is permissible as long as cooling is restored in 7 days per technical specifications.
- D. Attempt to start standby cooling fan and if unsuccessful ramp Unit 1 off line at 1%/min and cooldown RCS to < 350 degrees F per ARB.

45. The following conditions exist:

- Unit 2 is in a Hot Shutdown condition.
- Both Reactor Coolant Pumps are running.
- All Pressurizer Heaters are energized.
- One Reactor Coolant Pump is subsequently stopped.

To maintain stable RCS pressure, the spray valve in the operating loop will

-
- A. close slightly because core Delta P is higher.
 - B. open slightly because core Delta P is lower.
 - C. close slightly because spray temperature is higher.
 - D. open slightly because spray temperature is lower.

46. Following a reactor trip on Unit 1, the following plant conditions were observed:

- RCS pressure is 1985 psig and stable.
- Emergency boration valve, 1CV350, is out of service CLOSED.
- Boric acid flow control valve, 1CV110A, has just stuck in the CLOSED position.
- Two control rods are stuck in the core at 180 steps.

Which one of the following boration flow paths is immediately available to reestablish shutdown margin using approved procedures ?

- A. Borate using a charging pump and the RWST.
- B. Borate using the charging pumps and the blender.
- C. Borate using the safety injection pumps and normal pressurizer spray.
- D. Borate using the boric acid tanks, boric acid transfer pumps, and charging pumps.

47. Given the following plant conditions:

- Unit 1 is at full power.
- "A" S/G Steam Flow Transmitter "1FT 464" has pegged high.
- The crew is in the process of briefing ICP 10.2.

As a result of this condition which of the following statements made by the DOS during the brief would be correct with regard to impact on the Engineering Safety Features Actuation System (ESFAS) ?

- A. A Low Tav_g signal will cause both Main Steam Isolation Valves to shut.
- B. A Low Tav_g signal will cause "A" Main Steam Line Isolation Valve to shut.
- C. A Safety Injection signal will cause "A" Main Steam Line Isolation Valve to shut.
- D. A Safety Injection signal will cause both Main Steam Line Isolation Valves to shut.

48. You are performing a surveillance on Emergency Diesel Generator G-01. Prior to closing the output breaker for G01, your service water pump combination is A and D.

What pumps would you expect to have running after closing the output breaker ?

A. P-32A, B, C, D

B. P-32A, B, D, E

C. P-32A, B, D, F

D. P-32A, C, D, F

49. **According to Technical Specifications (TS's)**, if an IRPI is declared out-of-service, within eight hours, verify the position of the rods with the inoperable rod position indicators by using movable incore detectors **AND** once per shift _____.
(Assume 100% power)

A. verify that all IRPI's for the affected banks are operable.

B. verify that shutdown margin exceeds applicable value as per TS figure.

C. verify that the most withdrawn rod and least withdrawn rod are < 12 steps apart.

D. verify rod position by using excore detectors, or thermocouples, or movable incore detectors.

50. The following Unit 1 conditions exist:

- OP-3B, "Reactor Shutdown" is the procedure in effect.
- N-35 indicates 2E-11 amps.
- N-36 indicates 3E-9 amps.
- The RO depresses the Intermediate Range Permissive defeat buttons, which resulted in a SR HIGH FLUX reactor trip.

Which one of the following conditions for N-35 and N-36 would have caused this event ?

- A. N-35 is Over compensated, N-36 is Properly compensated.
- B. N-35 is Properly compensated, N-36 is Over compensated.
- C. N-35 is Properly compensated, N-36 is Under compensated.
- D. N-35 is Under compensated, N-36 is Properly compensated.

51. Power Range Nuclear Instrumentation Channel (N-41) is powered directly from which of the following power supplies ?

- A. 125 VDC red bus.
- B. 120 VAC red bus.
- C. 125 VDC white bus.
- D. 120 VAC white bus.

52. Given the following plant conditions:

- Unit 2 was operating at 100% power.
- The RTD inputs to subcooling monitors are OOS for I & C maintenance.
- A Reactor Trip occurs due to turbine trip.
- Fast Bus transfer did not occur.
- The control room team entered EOP-0, "Reactor Trip Safety Injection", and transitioned to EOP 0.1, "Reactor Trip Response".

Based on these conditions, which of the following most accurately reflects how a loss of all in-core temperature detectors would impact the crew's ability to verify natural circulation per EOP-0.1?

- A. Only RCS subcooling would not be available.
- B. There is no impact on verifying natural circulation.
- C. Only Core exit thermocouples would not be available.
- D. Core exit thermocouples and RCS subcooling would not be available.

53. Given the following plant conditions:

- A small break LOCA into Unit 1 containment occurred about an hour ago.
- The operators have had a series of failures which are preventing them from injecting SI into the core.
- 10 of the core exit thermocouples are reading 800 degrees F and slowly rising.
- RCS pressure is 850 psig and slowly rising.
- Reactor Vessel level is 23 feet and slowly lowering.
- No RCPs are running.

Based on these conditions, determine which of the following statements is correct:

- A. Core damage is imminent, core exit thermocouples are reliable and CSP-C.1, "Response to Inadequate Core Cooling", should be entered.
- B. Core damage is not imminent, core exit thermocouples are reliable and CSP-C.1, "Response to Inadequate Core Cooling", should not be entered.
- C. Core damage is imminent, core exit thermocouples are not reliable and CSP-C.1, "Response to Inadequate Core Cooling", should be entered.
- D. Core damage is not imminent, core exit thermocouples are not reliable and CSP-C.1, "Response to Inadequate Core Cooling", should not be entered.

54. Assuming the Containment Spray System is in its normal AUTO standby mode:

Upon actuation of a containment spray signal, the containment spray system will respond by _____

- A. immediately having both containment spray pumps start, followed 10 seconds later by the spray pump discharge MOVs opening (SI-860 A, B, C & D) and two minutes later the sodium hydroxide addition AOVs opening (SI-836 A & B).
- B. immediately having the spray pump discharge MOVs open (SI-860 A, B, C & D), followed 10 seconds later by both containment spray pumps starting and two minutes later the sodium hydroxide addition AOVs opening (SI-836 A & B).
- C. immediately having the sodium hydroxide addition valves opening (SI-836A & B), followed 10 seconds later by both containment spray pumps starting and two minutes later by the spray pump discharge MOVs opening (SI-860 A, B, C & D).
- D. immediately having both containment spray pumps start, followed 10 seconds later by the sodium hydroxide addition valves opening (S-836 A & B) and two minutes later by the spray pump discharge MOVs opening (SI-860 A, B, C & D).

55. According to Chapter 14 of the PBNP FSAR and based on the following plant conditions:

- Unit 1 Reactor/Turbine trip occurred on Low PZR Pressure.
- A design basis LOCA has occurred.
- Subcooling Margin is less than 0 degrees F.
- 1A05 indicates 0 volts.
- PZR level indicates 0%.
- The control room team have completed immediate actions of EOP-0, "Reactor Trip or Safety Injection".
- Assume all other equipment is functioning normally.

Which of the following statements is true ?

- A. It is unlikely adverse containment conditions exist.
- B. Containment pressure will remain less than 25 psig and Critical Safety Procedures will not have to be entered.
- C. Containment pressure will peak between 45 to 60 psig and Critical Safety Procedures may need to be entered.
- D. Containment pressure will exceed 60 psig and CSP-Z.1, "Response to High Containment Pressure" will mitigate this situation.

56. Given the following plant conditions:

- OP-1C, "Low Power to Normal Power Operation", is in progress on Unit 2.
- Reactor power is currently at 28%.
- All Heater Drain Tank Pumps (P-27A, B, C) are secured.
- P-25A, ("A" Condensate Pump) is running.
- P-25B ("B" Condensate Pump) is secured with its control switch in the green flagged position.

If P-25A tripped due to motor overload, which of the following best describes the impact on the condensate system ?

- A. A pressure switch downstream of the 4A & 4B low pressure feedwater heaters will sense low pressure and send a start signal to P-25B.
- B. A differential pressure switch downstream of the air ejector condenser will sense a low differential pressure and sends a signal to shut the mini-recirculation valve (CV-2252).
- C. A temperature detector located in the exhaust trunk of each low pressure turbine senses high temperature and shuts the exhaust hood spray valves (CV-2109/CV-2114).
- D. A level detector located in each condenser hotwell senses a high level and opens the condensate reject valve (CV-2130) dumping excess condensate to the condensate storage tank.

57. The following plant conditions exist:

- Both Units are operating at Full Power.
- The Control Room Team notes alarms and a green and white light above 2P-28A (Main Feedwater Pump) control switch in the control room.
- S/G water levels are 35% and lowering.

Based on these indications, knowledge of plant impact, and Operation Managers expectations, which of the following course of actions would be acceptable ?

- A. Trip Unit 2 and enter EOP-0, "Reactor Trip or Safety Injection".
- B. Restart the tripped Main Feedwater Pump per Alarm Response Book.
- C. Commence a load reduction at 10%/minute to 70 % per AOP-17A, Rapid Power Reduction.
- D. Commence a load reduction at 5 %/minute to 80 % power and start Auxiliary Feedwater per AOP-2B, "Feedwater System Malfunction".

58. Given the following plant conditions:

- P-38A, "Electric Driven AFW Pump" is aligned to fill Unit 1 "A" Steam Generator (S/G) during a refueling outage at 200 gpm from the CST.
- T24A, CST level is indicating 10 ft. on C01.
- T24B, (CST) is drained and isolated for maintenance.
- Unit 2 is operating at 100% power.

Using the Tank Level Book data provided, determine the maximum amount of time the auxiliary feedwater pump could continue filling the S/G before reaching a technical specification limit.

- A. 0 minutes.
- B. 30 minutes.
- C. 60 minutes.
- D. 90 minutes.

59. On November 3, 2000, it was discovered that the last monthly surveillance for the safety related batteries was performed on October 1, 2000. When is this surveillance **REQUIRED** to be performed ?

- A. Immediately.
- B. Within 8 hours.
- C. Within 24 hours.
- D. November 7, 2000.

60. Which one of the following events will occur on a high alarm on RE-223, "Waste Distillate Discharge Liquid Process Monitor" ?

- A. Indication only - no automatic actions, manual action is required.
- B. RCV-018, "Waste Liquid Overboard Valve" receives a CLOSE signal.
- C. FCV-LW-15, "Waste Distillate Overboard Valve" receives a CLOSE signal.
- D. FCV-LW-15, "Waste Distillate Overboard Valve" AND RCV-018, "Waste Liquid Overboard Valve" receive a CLOSE signal.

61. Which of the following Radioactive Gaseous Waste Effluent Monitors has an automatic control function associated with its design to isolate a waste gas release when high noble gas activity is sensed ?

- A. RE-221, "Drumming Area Ventilation".
- B. RE-224, "Gas Stripper Building Exhaust".
- C. RE-225, "Combined Air Ejector Low Range".
- D. RE-214, "Auxiliary Building Exhaust Ventilation"

62. The following Plant Conditions exist:

- Unit 2 is at rated power 100 days after a refueling shutdown.
- The 3rd RO on watch is performing trip testing with RP on RMS.
- 2RE-222, "S/G B/D Tank Area Monitor" is currently being tested.
- Unit 2 CO is not being informed of the testing status.

Based on these conditions, which of the following answers accurately reflects how trip testing will effect Unit 2 CO control board indications ?

- A. Only S/G Blowdown Tank Outlet Valve (2MS-2040) will have a green light indication.
- B. Only S/G Blowdown Valves (2MS-5958 and 5959) will have a green light indication .
- C. S/G Blowdown Valves (2MS-5958 and 5959) will have a red light indication .
- D. Both A & B above.

63. The Unit 1 Reactor is currently operating at 50% Power with all control systems in AUTO and on setpoint.

What are the expected conditions for Reactor Coolant System parameters?

- A. Average Temperature 570 degrees F, Pressure 2200 psig, Pressurizer Level 46%.
- B. Average Temperature 558 degrees F, Pressure 1985 psig, Pressurizer Level 46%.
- C. Average Temperature 558 degrees F, Pressure 1985 psig, Pressurizer Level 33%.
- D. Average Temperature 570 degrees F, Pressure 1985 psig, Pressurizer Level 33%.

64. Given the following plant conditions:

- Both units are operating at full power.
- 1T-34A (SI Accumulator) level has been slowly rising over the past three weeks.
- SI Accumulator Boron Concentration prior to the level rise was 2800 ppm.
- The DSS directs the CO, to lower 1T-34A tank level by 10% in accordance with OI-100, "Adjusting SI Accumulator level and pressure".

Based on these conditions, predict what effects the above sequence of events will have on 1T-34A boron concentration.

- A. Boron concentration has not and will not change.
- B. Boron concentration currently is and will remain lower than 2800 ppm.
- C. Boron concentration currently is 2800 ppm and will remain so until the CO lowers accumulator level.
- D. Boron concentration currently is higher than 2800 ppm and will remain so until the CO lowers accumulator level.

65. What is the purpose of maintaining continuous trickle bypass spray flow (1 gpm nominal) when the Spray Valve(s) is(are) closed ?

- A. Reduce Pressurizer Spray Nozzle thermal stresses.
- B. Provide adequate loop seal for PORV discharge line.
- C. Reduce Spray Valve differential pressure for proper valve operation.
- D. Allow operation of the Proportional Pressurizer Heaters at about 50%.

66. A transient in the Secondary System has resulted in a rise in Reactor Coolant System Temperature sufficient to produce an associated Pressurizer Level change in excess of 5%.

What is the expected response of the Pressurizer System ?

- A. Pressurizer insurge energizes all back-up Heaters.
- B. Pressurizer outsurge energizes all back-up Heaters.
- C. Pressurizer insurge de-energizes all back-up Heaters.
- D. Pressurizer outsurge de-energizes all back-up Heaters.

67. Assume the reactor is being started up from a source range count of 10 cps.

Choose the answer, which matches the order in which the tasks listed below are performed.

1. Verify "Power Above P6" light energized.
2. Manually block power range low setpoint high flux trip.
3. Manually block source range level trip.
4. Verify "Power Above P10" light energized.

- A. 1, 3, 2, 4.
- B. 1, 3, 4, 2.
- C. 3, 1, 2, 4.
- D. 3, 1, 4, 2.

68. The following conditions exist on Unit 1:

- Reactor trip and safety injection occurred.
- S/G levels prior to the Rx Trip were 85%.
- Tavg has returned to no-load condition.
- S/G levels are currently at 40%.

The reactor operator desires to restore feed to the S/Gs using the FW Regulating bypass valves.

Which one of the following conditions have to be met to OPEN the FW Regulating Bypass valves ?

- A. FW isolation would have to be reset.
- B. Reactor Trip breakers would have to be re-closed and FW isolation would have to be reset.
- C. Reactor Trip breakers would have to be re-closed and MFP discharge MOV re-opened.
- D. The Safety Injection signal would have to be reset followed by the resetting of the FW isolation.

69. The following plant conditions exist:

- The control room team is working their way through EOP 1.2, " Small Break LOCA Cooldown and Depressurization".
- During Critical Safety Function Monitoring, the STA reports a yellow path condition in Inventory and notes that Hydrogen Concentration in Unit 1 containment is 1.75 % and slowly rising.
- Since the Hydrogen Recombiner is not on site, the DOS decides to enter CSP-I.3, "Response to Voids in Reactor Vessel".
- The DOS requests that the OS perform Attachment B of CSP-I.3 "Determination of Maximum Venting Time".
- RCS Pressure is stable at 500 psig.

Using Attachment "B", Figure 2 and 3 of CSP-I.3, which of the following choices best represents the MAXIMUM venting time that the OS correctly calculated ?

- A. 8 minutes.
- B. 9 minutes.
- C. 10 minutes.
- D. 11 minutes.

70. While in cold shutdown, the DSS directs the Containment Purge and Exhaust System be placed in service in accordance with Attachment "C" of OP-9C, "Containment Venting and Purging".

What interlock must be met for the purge SUPPLY and EXHAUST system to become operational ?

- A. In order to start the purge SUPPLY fan, the purge EXHAUST fan must be running and EXHAUST valves must be open.
- B. In order to start the purge EXHAUST fan, the purge SUPPLY fan must be running and SUPPLY valves must be open.
- C. In order to start the purge EXHAUST fan, the purge SUPPLY fan must be running and the EXHAUST and SUPPLY valves must be open.
- D. In order to start the purge SUPPLY fan, the purge EXHAUST fan must be running and the EXHAUST and SUPPLY valves must be open.

71. The following plant conditions exist on Unit 1:

- RHR has just been placed in service.
- The Control Operator (CO) reports unstable RHR flow and discharge pressure.
- The Duty Operating Supervisor (DOS) enters SEP-1, "Degraded RHR System Capability" and directs RHR pumps secured.
- The DOS also directs the CO to have the PAB Operator reflood the RHR suction line.

Using the provided Figure 1 of SEP-1, analyze and choose which of the following valves and water sources will be used to perform RHR suction line reflood ?

- A. The RWST outlet valve (1SI-856A) from the RWST.
- B. The SI Accumulator valve (1SI-841A) from a SI accumulator.
- C. The SFP to RHR valve (1SF-819) from the spent fuel pool cooling system.
- D. The Reactor Vessel Injection valve (1SI-852A) from the safety injection system.

72. **Which one of the following items may be temporarily suspended during core alterations ?**

- A. Residual heat removal flow in the core.
- B. Neutron flux monitoring in the control room.
- C. Radiation monitoring in the fuel handling area.
- D. Direct communications between the fuel handling area and the control room.

73. The following plant conditions exist on Unit 1 which is at End of Life after a 400 day run:

- The control room team has entered CSP-S.1, "Response to Nuclear Power Generation/ATWS" due to the inability to trip the reactor from the control room.
- Reactor trip breakers have just been reported opened locally by the AO.
- The Control Operator notes "A" S/G pressure and level is trending rapidly downward.
- He also reports RCS temperature is trending downward.

Given these plant conditions which of the following statements is TRUE ?

- A. Positive reactivity is being added due partially to a positive moderator temperature coefficient.
- B. Negative reactivity is being added due partially to a positive moderator temperature coefficient.
- C. Positive reactivity is being added due partially to a negative moderator temperature coefficient.
- D. Negative reactivity is being added due partially to a negative moderator temperature coefficient.

74. Given the following plant conditions:

- Unit 1 is operating at full power.
- A normal plant shutdown in accordance with OP-3A, "Normal Power Operation to Low Power Operation" is directed by the DSS.
- The Control Operator inadvertently closes HC-2085 (MSR Control Valve Controller).

Which of the following choices best describes the expected initial steam generator (S/G) response ?

- A. S/G pressure goes up, S/G water level goes up.
- B. S/G pressure goes up, S/G water level goes down.
- C. S/G pressure goes down, S/G water level goes up.
- D. S/G pressure goes down, S/G water level goes down.

75. Given the following plant conditions:

- Unit 2 has been operating at full power for 200 days. Unit 1 is shutdown.
- The Auxiliary Operator (AO) is directed to tag out Unit 1 air ejectors, but inadvertently removes Unit 2 air ejectors from service.

Which of the following choices describes a potential alarm that will INITIALLY be received in the control room as a result of this action ?

- A. "Condenser Vacuum Low " annunciator (2CO3 F1-8).
- B. "Condenser DELTA T High" annunciator (2CO3 F1-7).
- C. "Service Air Header Pressure Low" annunciator (C01 D1-1).
- D. "Vacuum Control Tank Vacuum Low " annunciator (2CO3 F1-6).

76. Given the following plant conditions:

- Both units initially at full power with a normal electric plant line-up.
- A subsequent Bus Lockout occurs on 1A05
- All equipment operates as designed.

Based on these plant conditions and your knowledge of AC Electrical Distribution, which of the following statements best explains the status of 480 VAC bus 1B03 ?

- A. 1B03 is automatically re-energized after a 10 second time delay from alternate source 1B01.
- B. 1B03 is automatically re-energized after a 10 second time delay from alternate source 1B04.
- C. 1B03 is de-energized but can be manually re-energized from alternate source 1B02.
- D. 1B03 is de-energized but can be manually re-energized from alternate source 1B01.

77. Given the following plant conditions:

- Unit 2 is at 100 % power following a 20 day refueling outage.
- The control room team has received several annunciators related to Instrument Air on C01.
- AOP-5B, "Loss of Instrument Air" has been entered.
- All service air and instrument air compressors are running.
- Instrument air header pressure is stable at 78 psig.
- All systems operate automatically as designed.

What is the expected alignment of the service air and instrument air systems ?

- A. Only the Instrument air back-up valves (IA-3079/3014) opened.
- B. Only the Instrument air dryer bypass valve(s) (IA-3094-S/3000-S) opened.
- C. Instrument air back-up valves (IA-3079/3014) and dryer bypass valve(s) (IA-3094-S/3000-S) have opened.
- D. Instrument air back-up valves (IA-3079/3014) and dryer bypass valve(s) (IA-3094-S/3000-S) have NOT opened.

78. Given the following:

- A Halon smoke detector in Group "B" in Zone 2 is de-energized for maintenance.
- The detector group is removed from service and appropriate compensatory actions taken.

Using the diagram provided, determine what the Halon Fire Protection System response would be if a fire occurred in the area of the de-energized smoke detector.

- A. The Halon system will not actuate automatically and no fire alarm will actuate.
- B. The Halon system will actuate on a Zone 2 thermal detector (HAD) and the control room fire alarm will NOT actuate.
- C. The Halon system will NOT actuate and the control room fire alarm will actuate on a Zone 2 thermal detector (HAD).
- D. The Halon system will actuate on a Zone 2 thermal detector (HAD) and the control room fire alarm will actuate on another smoke detector.

79. Given the following plant conditions:

- Unit 1 is operating at full power.
- I & C testing is in progress
- C01 B 2-5 (Unit 1 Containment Isolation) annunciates.
- All of the Unit 1 lights on the Containment Isolation (CI) panel on C01 illuminate solid white.
- Assume no immediate operator actions occur.

Based only on these plant conditions, which of the following choices best predicts a plant outcome and appropriate procedure that should be used to mitigate this situation ?

(EOP-0, "Reactor Trip or Safety Injection")

(AOP-9B, "Component Cooling System Malfunctions")

- A. Letdown line isolation occurs and EOP-0 should be entered.
- B. Safety Injection actuation occurs and EOP-0 should be entered.
- C. Seal injection isolation to RCPs occurs and AOP-9B should be entered.
- D. Component cooling water isolation to radwaste components occurs and AOP-9B should be entered.

80. Given the following conditions on Unit 1:

- An RCS cooldown is in progress.
- RHR has been placed in service for shutdown cooling.
- RCS wide range temperature (hot leg) is 340 degrees F and slowly lowering.
- Flow controller RHR-626 is in automatic at 10% open.

If the RHR return header flow transmitter (FT626) failed LOW, which one of the following would correctly describe the plant's response ?

- A. RHR Heat Exchanger flow control valves (1RH-624/625) will automatically close to attempt to prevent exceeding RCS cooldown rate of 100 F/Hr.
- B. RHR Heat Exchanger bypass valve (1RH-626) will position full open to attempt to maintain RHR desired system flow rate and RCS cooldown will change.
- C. RHR Heat Exchanger bypass valve (1RH-626) will position full close to attempt to maintain RHR desired system flow rate and RCS cooldown will change.
- D. RHR Heat Exchanger flow control valves (1RH-624/625) will automatically open to attempt to maintain desired system flow rate, and cooldown will be faster.

81. With Unit 2 at normal operating pressure, a PORV opens and cannot be isolated. The PRT pressure will initially peak at _____, then stabilize eventually at _____.
- A. 5 psig, 0 psig.
 - B. 100 psig, 100 psig.
 - C. 5 psig, containment pressure.
 - D. 100 psig, containment pressure.

82. Given the following plant conditions:

- Unit 2 is at Full Power.
- 2P-11B, CCW pump is running with 2P-11A in standby.
- A breaker malfunction occurs which results in 0 volts indicated on 2B04.

Assuming no operator action taken unless specified in the response, what is the effect of this transient and what procedure(s) will you direct as DOS to correct this situation ?

(AOP-9B, "Component Cooling Water Malfunction")

(AOP-18B, "Train "B" Equipment Operations")

- A. 2P-11A will start on low pressure and 2P-11B will automatically restart when power is restored to the buses, only AOP-9B should be entered.
- B. 2P-11A will start on the UV on 2B04 and the breaker for 2P-11B will trip open and remain that way until reset by operators, only AOP-18B should be entered.
- C. 2P-11A will start on low pressure and 2P-11B will automatically restart when power is restored to the buses, both AOP-9B and AOP-18B should be entered.
- D. 2P-11A will start on the UV on 2B04 and the breaker for 2P-11B will trip open and remain that way until reset by operators, both AOP-9B and AOP-18B should be entered.

83. Given the following:

- Unit 1 is at 100 % Power.
- 1PT-486, "HP first stage turbine pressure transmitter", has stuck at its 100% power value (~550 psig).
- An inadvertent turbine trip occurs due to personal error during the performance of TS-3A, "Turbine Trip Test (Monthly)."

What is the effect of the failure of 1PT-486 on the response of the condenser steam dump system ?

Assume that no operator action is taken and Steam Dump Selector is in AUTO.

- A. All of the condenser steam dumps will fully open and remain open.
- B. The condenser steam dump valves remain closed but have a demand signal.
- C. The condenser steam dump valves will maintain RCS average temperature at 554.5 degrees F.
- D. The condenser steam dumps will operate as designed to lower RCS average temperature to 547 degrees F.

84. Due to plant conditions requiring prompt actions to mitigate damage to the RCPs, an emergent temporary change is being considered to the EOP in use.

At a minimum, which of the following requirements must be met ?

- A. An SRO must approve the actions and the DCS notified. The action, time they were performed, and the reason for the temp change must be logged, and a one hour notification to the NRC must be made.
- B. Cognizant group supervisor and an SRO must approve the actions. The action cannot violate the intent of the procedure. The actions taken and the reason for the actions must be logged. A Condition Report must be generated documenting the actions as soon as possible.
- C. The DCS and an SRO must approve the actions. The action cannot violate the intent of the procedure. The action taken and the reason must be logged, and a one hour notification to the NRC must be made.
- D. An SRO must direct the actions taken. The actions are then logged with a reason given, approval by the DSS and a procedure feed back submitted as soon as possible for consideration of a permanent change to the procedure

85. A reactor trip has occurred for undetermined reasons. The operator is carrying out the immediate actions of EOP-0, "Reactor Trip or Safety Injection". While performing step 3, "Verify safeguards buses energized", the operator notes the following safeguards bus indications:

- 1A05 is DE-ENERGIZED.
- 1A06 is DE-ENERGIZED.
- 1B03 is DE-ENERGIZED.
- 1B04 is DE-ENERGIZED.

"Unit 1 4.16KV Bus Lockout" C03D 3-4 is lit.

Which one of the following actions is required in accordance with the immediate actions of EOP-0 ?

- A. Immediately transition to ECA-0.0, "Loss of All AC Power".
- B. Attempt to restore power to 1B03 or 1B04 by closing any supply breaker. If unsuccessful, transition to ECA-0.0, "Loss of All AC Power".
- C. Attempt to restore power to 1A05 or 1A06 by fast starting and loading either G01 or G02. If unsuccessful, transition to ECA-0.0, "Loss of All AC Power".
- D. Continue on to step 4, "Check if SI is Actuated", once immediate actions are complete, concurrently enter AOP-18/19 series to restore power to a safeguards bus.

86. The following plant conditions exist:

- Unit 1 has tripped.
- 1 "A" S/G pressure is 0 psig.
- 1 "B" S/G pressure is 350 psig and slowly lowering.
- Containment Pressure is 30 psig and slowly lowering.
- No Containment Radiation Alarms exist.
- No other abnormal conditions exist and all equipment is functioning as designed.

What is the expected flow path through the emergency procedures to mitigate the consequences of this accident ?

- A. EOP-0, "Reactor Trip or Safety Injection" to EOP-2, "Faulted Steam Generator Isolation" to EOP-0.1, "Reactor Trip Response"
- B. EOP-0, "Reactor Trip or Safety Injection" to EOP-2, "Faulted Steam Generator Isolation" to EOP-1, "Loss of Reactor or Secondary Coolant" to EOP-1.1, "SI Termination"
- C. EOP-0, "Reactor Trip or Safety Injection" to EOP-1, "Loss of Reactor or Secondary Coolant" to EOP-2, "Faulted Steam Generator Isolation"
- D. EOP-0, "Reactor Trip or Safety Injection" to EOP-1, "Loss of Reactor or Secondary Coolant" to EOP-1.1, "SI Termination" to EOP-0.1, "Reactor Trip Response"

87. Given the following plant conditions:

- A LOCA has occurred on Unit 1.
- The control room team has just entered EOP-0, "Reactor Trip or Safety Injection."
- Immediate actions are complete and foldout page criteria has just been read by the DOS.
- The DOS notes that a RED PATH condition for INTEGRITY has been met on the SAS computer.

In accordance with OM-3.7, "AOP and EOP Procedure Sets Use and Adherence", the proper action to take in this situation is to _____.

- A. continue with EOP-0 until status tree monitoring is required.
- B. continue with EOP-0 since CSP-P.1 does not apply to large break LOCA conditions.
- C. perform the actions of CSP-P.1, "Response to Imminent PTS Condition" in parallel with EOP-0.
- D. suspend performance of EOP-0 and transition to CSP-P.1, "Response to Imminent PTS Condition."

88. Plant conditions are as follows:

- The plant is operating at 75% power when a loss of "A" MFP occurred.
- S/G water level control system is in AUTO.
- Rod control is in AUTO.
- Normal AUTO makeup to the VCT has just been completed.
- The crew is taking the required corrective actions IAW AOP-17A, "Rapid Power Reduction", and AOP-2B, "Feedwater System Malfunction".
- Tavg-Tref mismatch is + 3 degrees F and Tavg is rising.
- CB "D" ROD INSERTION LIMIT. BANK D LOW and LOW-LOW annunciators have just alarmed.

Which ONE of the following actions caused the alarms, and what is the appropriate corrective action ?

- A. The operator has lowered turbine load too far and should borate to clear the alarm.
- B. The operator has caused the steam dumps to open and should lower the rod insertion rate.
- C. The operator has lowered the boron concentration too much and should withdraw rods to clear the alarm.
- D. The operator has driven rods in too far for the existing boron concentration and should borate from the RWST.

89. Given the following conditions:

- Unit 1 and Unit 2 are operating at power.
- Unit 1 is shutting down due to small steam leak in Containment.
- Unit 1 Containment Cooling Fans are operating with SW outlet valves, 1SW-2907 and 2908 open.
- Service Water Pump P-32F is OOS for maintenance.

Which Technical Specification LCO applies ?

- A. Restore P-32F to operable status within 7 days or place both Units in hot shutdown within 6 hours and cold shutdown within 36 hours. Close 1SW-2907 and 2908 within 72 hours or place Unit 2 in hot shutdown within 6 hours and cold shutdown within 36 hours.
- B. Restore P-32F to operable status within 7 days or enter T.S. 15.3.0.A and place both Units in hot shutdown within 7 hours and cold shutdown within 37 hours. Close 1SW-2907 and 2908 within 72 hours or place Unit 2 in hot shutdown within 6 hours and cold shutdown within 36 hours.
- C. Enter T.S. 15.3.0.B and place Unit 2 in hot shutdown within 7 hours and cold shutdown within 37 hours or shut 1SW-2907 and 2908. Restore P-32F to operable status within 7 days.
- D. Enter T.S. 15.3.0.B and place both Units in hot shutdown within 7 hours and cold shutdown within 37 hours or shut 1SW-2907 and 2908. Restore P-32F to operable status within 7 days.

90. Assume that Unit 2 is in a refueling outage with fuel movement about to commence.

The following plant conditions exist:

- RCS boron is 1910 ppm
- RCS temperature is 115°F
- "A" RHR pump is running
- "B" RHR pump is OOS (maintenance)

Based on the given conditions, should the DSS allow refueling operations to begin ? Why or why not ?

- A. Yes, plant conditions for refueling are met.
- B. No, both RHR pumps need to be operating.
- C. No, boron is NOT within the limits for refueling.
- D. No, temperature is NOT within the limits for refueling.

91. Given the following information for an operator:

- Age - 25
- Total lifetime exposure - 15,000 mrem TEDE
- Current year exposure- 1,200 mrem TEDE

A Site Emergency has been declared due to a LOCA outside containment, with limited make-up to the RWST available. The above operator volunteers to make an emergency entry into the penetration area to attempt leak isolation. This action would result in saving a maintenance workers life. The action has all required approvals.

Of the following choices, what is the MAXIMUM exposure the operator may receive while performing this action ?

- A. 4,000 mrem TEDE
- B. 10,000 mrem TEDE
- C. 15,000 mrem TEDE
- D. 25,000 mrem TEDE

92. A newly qualified AO has just been assigned to your crew and her first task is to assist in a filter (F-1) changeout. During the pre-job brief, she informed the job lead that prior to working at PBNP, she had been a contractor with Framatone and had already received 2750 mrem during this calendar year. Based on surveys at the job site, you expect her to receive 25 mrem during this job.

Assuming the new AO has received 0 mrem at PBNP to date, can she be allowed to perform this assignment according to NP 4.2.14, "Administrative Dose Levels/Dose Level Extension Procedure and why or why not ?

- A. Yes, assign her the job because 2750 mrem is the average dose for AOs.
- B. No, we should reassign her to a low dose job because she exceeded her Federal Limit at her previous job.
- C. No, we should remove her access from the RCA because she has exceeded her admin limit of 2000 mrem.
- D. Yes, assign her the job because the admin dose limit and work group leveling is only applicable for doses received at PBNP as long as total dose is < 4000 mrem/yr.

93. You are exiting the Radiation Control Area (RCA) after completing a plant tour. The PCM-1B Personnel Contamination Monitor alarms and indicates contamination on your left shoe. You exit the PCM-1B and perform a frisk using a hand held frisker. No contamination is detected during the frisk.

In this situation, which one of the following is the proper method for you to exit the RCA ?

- A. Proceed directly to the Portal Monitors.
- B. Exit the RCA, bypassing the Portal Monitors.
- C. Perform one additional PCM-1B recount, if no PCM-1B alarm is received, proceed to the Portal Monitors.
- D. Perform two additional PCM-1B recounts, if no PCM-1B alarm is received, proceed to the Portal Monitors.

94. - Both Units are at Full Power.
- 1RE-214, "Noble Gas-Auxiliary Building Vent Stack" was previously removed from service.
 - The noble gas air ejector monitor on Unit 1 (1RE-215) is being taken out of service for maintenance while operating at full power.

Using the given reference from the Radiological Effluent Control Manual (RECM), which of the following statements describes the impact on effluent releases via this pathway ?

(Assume all other radioactive gaseous effluent monitoring instruments are available other than those mentioned above).

- A. There are no actions necessary.
 - B. Releases may continue provided grab samples are collected at least once per 12 hours.
 - C. Releases may continue provided grab samples are collected at least once per 24 hours.
 - D. Releases may continue provided samples are continuously collected with auxiliary equipment.
95. According to HP 2.6, "High Radiation Area Access Control", what is the **DIFFERENCE** between a high radiation area with levels of 900 mrem/hr and one with levels of 1300 mrem/hr ?
- A. The 1300 mrem/hr area requires posting as an "Extremely High Radiation Area"; the 900 mrem/hr area does not.
 - B. The 1300 mrem/hr area requires key-locked doors to prevent unauthorized entry; the 900 mrem/hr area does not.
 - C. The 1300 mrem/hr area requires that an individual entering take an audible dosimeter; the 900 mrem/hr area does not.
 - D. The 1300 mrem/hr area requires that an individual entering have an accompanying RP representative; the 900 mrem/hr area does not.

96. Given the following plant conditions:

- A malfunction of the CCW system occurred forcing operators to trip the reactor and reactor coolant pumps.
- The control room team has entered EOP-0.2, "Natural Circulation Cooldown" and have commenced cooling down.
- Sometime after commencing cooldown, the CO notes and reports a +.1 SUR on source range meters and source range count rate is slowly rising.

Based on these plant conditions, which of the following choices best describes the actions the crew should take ?

- A. Continue in EOP-0.2, "Natural Circulation Cooldown" and use spray to create an insurge into the pressurizer.
- B. Continue in EOP-0.2, "Natural Circulation Cooldown" with the cooldown, these are normal expected indications.
- C. Transition to CSP-S.1, "Response to Nuclear Power Generation/ATWS" and complete required actions.
- D. Transition to CSP-S.2, "Response to Loss of Core Shutdown" and borate to ensure adequate shutdown margin.

97. The Shift Technical Advisor (STA) must report to the control room after being notified of an "off-normal" event _____ ?

- A. Immediately.
- B. within 5 minutes.
- C. within 10 minutes.
- D. within 20 minutes.

98. EOP-3, "Steam generator Tube Rupture", contains the following caution statement;

"DO NOT COMMENCE COOLDOWN until ruptured S/G is identified and isolated."

Which of the following choices best describes the operational implications/basis of this caution according to EOP-3 background document ?

- A. If cooldown were to occur without isolation, it would be impossible to diagnose which S/G is ruptured.
- B. If cooldown were to occur without isolation, radiological releases would not be minimized and equalization would be difficult.
- C. If cooldown were to occur without isolation, adequate shutdown margin may not be available and result in a potential recriticality event.
- D. If cooldown were to occur without isolation, nitrogen from the SI accumulators could be injected into the RCS and impede heat transfer.

99. Given the following plant conditions:

- Unit 1 automatically tripped from 100% power due to a confirmed Steam Line Break into Containment.
- The operating crew enters EOP-0, "Reactor Trip or Safety Injection".
- Numerous control room annunciators are coming in and being master acknowledged by the Control Operators.
- One of these annunciators is "Condenser Vacuum Low" on 1CO3.

According to OM 1.1, "Conduct of Operations", what is the standard and expectation for alarm response to this alarm during this situation ?

- A. Prompt verbalization of this alarm not required and should not interfere with EOP response.
- B. Prompt verbalization of the unexpected alarm, state reason if known, communicate to DOS and reference ARB.
- C. Prompt verbalization of the expected alarm, state reason if known, and reference ARB when mitigating action is expected.
- D. Prompt verbalization of the critical alarm, state reason if known, obtain DOS acknowledgment, and reference ARB's while stabilizing the plant.

100. Assume a complete two train actuation of Unit 1 Safety Injection (SI) has occurred. Determine the status of the Service Water Pumps one minute after SI actuation occurred and any necessary operator actions.
- A. P-32 A, B, and F running; operators would need to start a fourth pump to ensure sufficient cooling.
 - B. P-32 A, B, C, D, E, and F pumps running; operators would NOT need to take any further action.
 - C. P-32 A, B, C, D, E and F pumps running; operators would need to secure a pump to minimize electrical loading.
 - D. Only previously operating pumps running; operators would NOT need to start additional pumps to ensure sufficient cooling.

EQUATIONS AND CONVERSIONS HANDOUT SHEET

EQUATIONS

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

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

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

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

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

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

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

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

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

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

$$\ell \cdot = 1 \times 10^{-4} \text{ seconds}$$

$$\lambda_{\text{eff}} = 0.1 \text{ seconds}^{-1}$$

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

$$\text{Leakage} \propto \sqrt{\Delta P}$$

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

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

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

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

$$CR_1(1 - K_{\text{eff}1}) = CR_2(1 - K_{\text{eff}2})$$

$$1/M = CR_1/CR_x$$

$$A = \pi r^2$$

$$F = PA$$

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

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

$$E = IR$$

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

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

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

CONVERSIONS

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

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

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

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

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

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

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

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

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

TABLE 3-2
 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

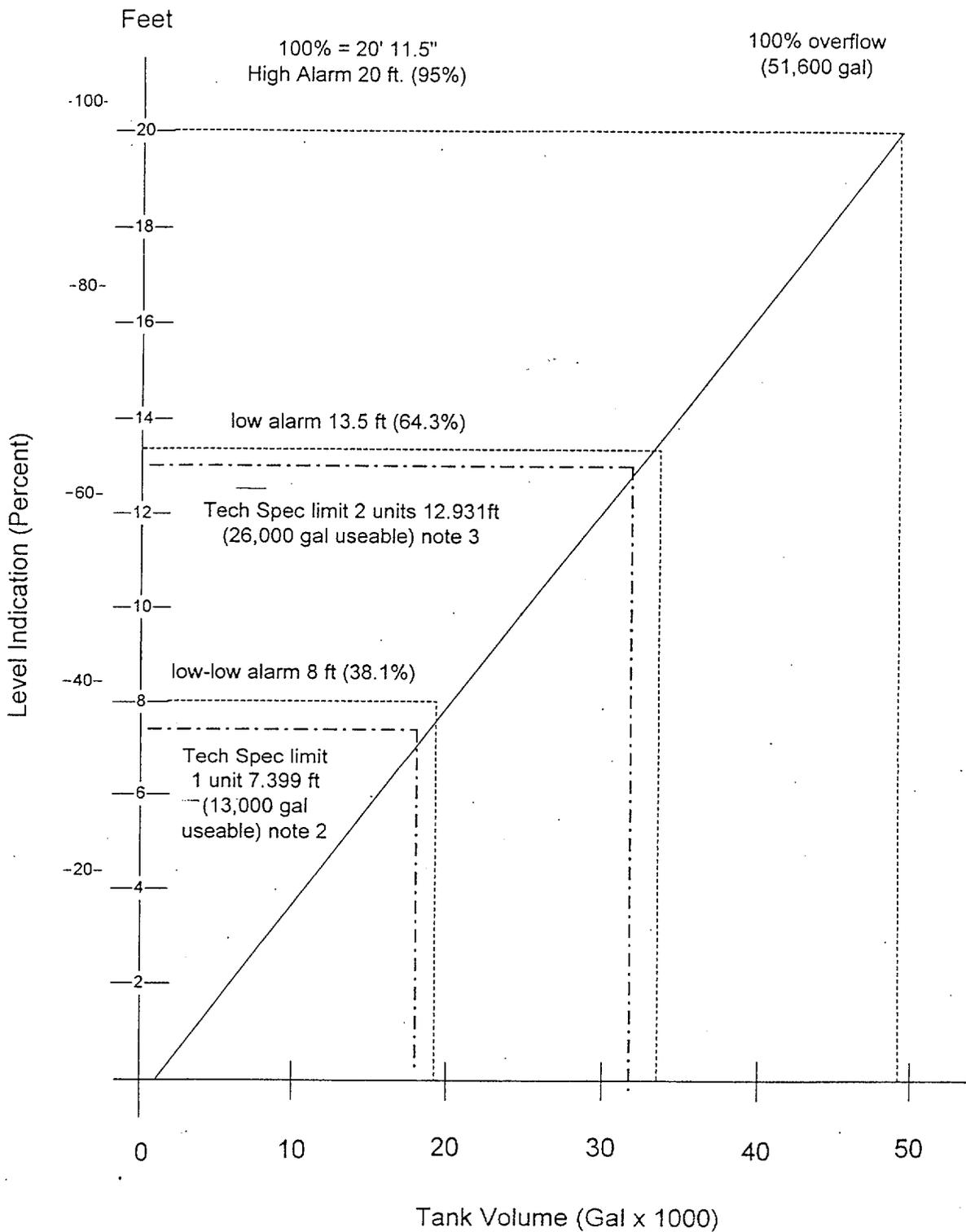
<u>Instrument</u>	<u>Minimum Channels Operable</u>	<u>Action</u>
1. Gas Decay Tank System		
a. RE-214, Noble Gas (Auxiliary Building Vent Stack), or RE-315 Noble Gas (Auxiliary Building Vent SPING)	1	Note 1
b. Gas Decay Tank Flow Measuring Meter	1	Note 4
2. Auxiliary Building Ventilation System		
a. RE-214, Noble Gas (Auxiliary Building Vent Stack) or Re-315, Noble Gas (Auxiliary Building Vent SPING)	1	Note 6
b. Isokinetic Iodine and Particulate - Continuous Air Sampling System or SPING 23	1	Note 5
3. Condenser Air Ejector System		
a. RE-225, Noble Gas (Combined Air Ejector Discharge Monitor); or RE-215, Noble gas (Air Ejector Monitors - 1 per unit); or RE-214, Noble Gas (Auxiliary Building Vent Stack); or RE-315, Noble Gas (Auxiliary Building Vent SPING)	1	Note 6
b. Flow Rate Monitor - Air Ejectors	1	Note 9

NOTATIONS FOR TABLES 3-1 AND 3-2

- Note 1: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided that prior to initiating a release, two separate samples are analyzed by two technically qualified people in accordance with the applicable part of Tables 6-1 and 6-2 and the release rate is reviewed by two technically qualified people.
- Note 2: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided grab samples are analyzed for gamma radioactivity in accordance with Table 6-1 at least once every 24 hours when the secondary coolant specific activity is less than 0.01 $\mu\text{Ci/cc}$ dose equivalent I-131 or once every 12 hours when the activity is greater than 0.01 $\mu\text{Ci/cc}$ dose equivalent I-131.
- Note 3: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided that at least once every 12 hours grab samples are collected and analyzed in accordance with Table 6-1.
- Note 4: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided the flow rate is estimated at least once every four hours during actual gaseous or liquid batch releases.
- Note 5: If the number of channels operable is fewer than the minimum required, effluent releases via the affected pathway may continue provided samples are continuously collected with auxiliary sampling equipment, (e.g., any low volume sampler which meets the requirements of Table 6-2).
- Note 6: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided grab samples are collected at least once per 12 hours and are analyzed in accordance with Table 6-2.
- Note 7: If the number of channels operable is fewer than the minimum required, addition of waste gas to the Waste Gas Holdup System may continue for up to 14 days, provided grab samples are taken from the on-service gas decay tank and analyzed either daily during normal operations or every four hours when the primary system is being degassed (other than normal gas stripping of the letdown flow). If the monitoring system is out of service for greater than 14 days, in addition to the above sampling, a report of the cause and corrective action for failure and repair of the gas monitor shall be included in the Annual Monitoring Report.
- Note 8: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided grab samples are collected twice per week and analyzed in accordance with Table 6-1.
- Note 9: If the number of channels operable is fewer than the minimum required, effluent releases via this pathway may continue provided the flow is estimated or determined with auxiliary indication at least once every 24 hours.

CONDENSATE STORAGE TANK (T-24 A/B)

CONDENSATE STORAGE TANK



CONDENSATE STORAGE TANK (T-24 A/B)

ID GRAVER M21-014 (L23944)(W-3827)
T-24 A/B

1. Approximately 2,350 gal/ft
2. Reference Calculation - N97-155, PBNP-IC-42

NOTE 1: Volume discontinuity due to transmitter tap at approximately 1 foot height of tank.

NOTE 2: Technical Specification requirement is 13,000 gallons of useable water for one unit. This is represented as the lowest CST indicated level which maintains 13,000 gallons above the CST level where the AFW pump could trip on low suction pressure (including all uncertainties).

$$\begin{aligned}\text{CST Technical Specification Level} &= 13,000 \text{ gal} / 2350 \text{ gal/ft} + \text{CST trip level} \\ &= 5.532 \text{ ft} + 1.867 \text{ ft} = 7.399 \text{ ft}\end{aligned}$$

NOTE 3: Technical Specification requirement is 26,000 gallons of useable water for two units. This is represented as a CST indicated level which maintains 26,000 gallons above the CST level where the AFW pump could trip on low suction pressure (including all uncertainties).

$$\begin{aligned}\text{CST Technical Specification Level} &= 26,000 \text{ gal} / 2350 \text{ gal/ft} + \text{CST trip level} \\ &= 11.064 \text{ ft} + 1.867 \text{ ft} = 12.931 \text{ ft}\end{aligned}$$

ATTACHMENT B
(Page 1 of 1)
DETERMINATION OF MAXIMUM VENTING TIME

B1 Record "A", maximum hydrogen that can be vented per FIGURE 2.

• "A" = _____

B2 Determine "B", hydrogen flow rate as a function of RCS pressure per FIGURE 3.

• "B" = _____

B3 Calculate "C", maximum vent time (in minutes) equal to "A" divided by "B".

• "C" = A/B = _____

-END-

RESPONSE TO VOIDS IN REACTOR VESSEL

FIGURE 3

RCS HEAD VENT SYSTEM HYDROGEN FLOW RATE

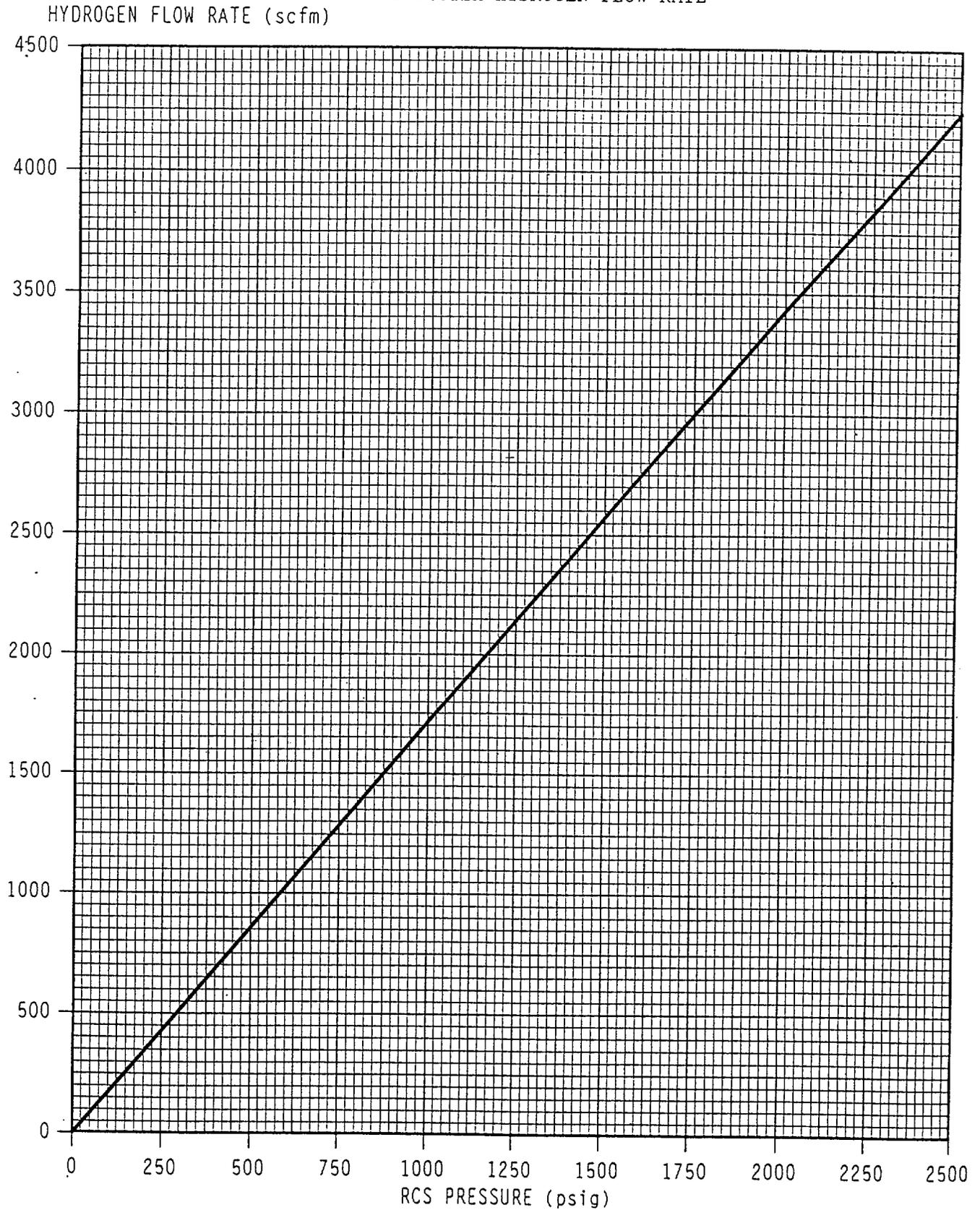
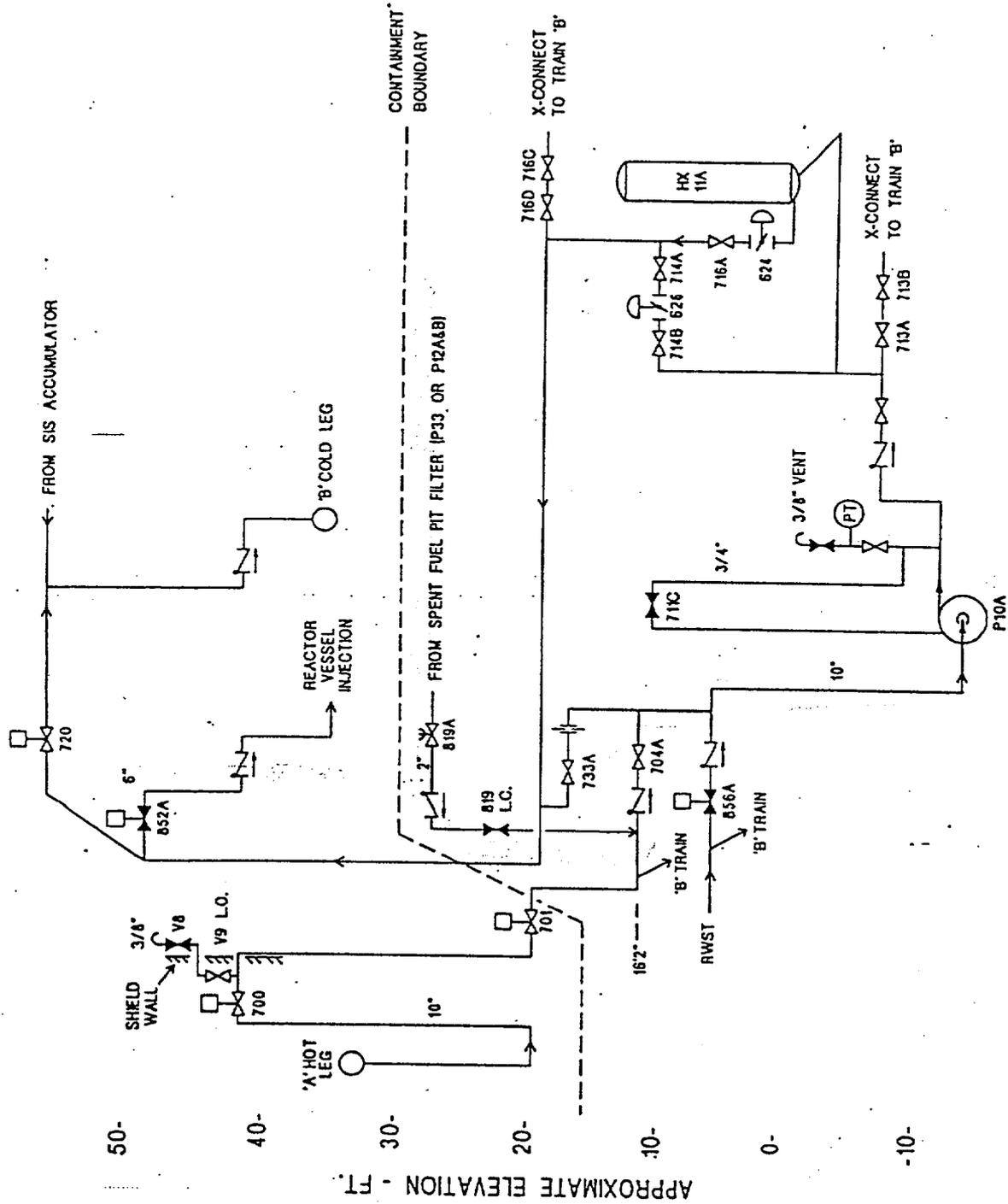




Figure 1

Page 1 of 1

"RHR System Elevations"



RHR PUMP, PIPING & INTERCONNECTIONS
RELATIVE ELEVATIONS (APPROXIMATE)

D. Service Water System

1. A reactor shall not be made critical unless the following conditions are met:
 - a. Six service water pumps are operable.
 - b. All necessary valves, interlocks and piping required for the functioning of the Service Water System during accident conditions for the unit which is to be made critical are also operable.

2. During power operation, the requirements of 15.3.3.D-1 may be modified to allow the following conditions. If the system is not restored to meet the conditions of 15.3.3.D-1 within the time period specified, the affected reactor(s) will be placed in the hot shutdown condition within six hours and in cold shutdown within 36 hours.
 - a. One of the six required service water pumps may be out of service provided a pump is restored to operable status within 7 days. A second service water pump may be out of service provided a pump is restored to operable status within 72 hours. A third service water pump may be out of service provided two pumps are restored to operable status within 72 hours.
 - b. The service water ring header continuous flowpath may be out of service for a period of 7 days. If less than four service water pumps are operable, service water system flow shall be evaluated within 24 hours of less than four service water pumps being operable. If it is determined that any equipment will not receive sufficient flow, the applicable LCOs for the affected equipment shall be entered. The LCOs can be exited if system realignment is completed to achieve the required flow rates for the affected equipment.
 - c. Any or all automatic isolation valves required during accident conditions may be out of service for up to 72 hours provided at least four service water pumps are operable. This LCO can be exited provided the lines are isolated with a seismically qualified isolation valve or the valves are restored to operable status.
 - d. The containment fan cooler outlet motor operated valves may be open for up to 72 hours provided at least five service water pumps are operable. This LCO can be exited provided the valves are returned to the closed position or the flowpath is isolated.

Basis

The normal procedure for starting the reactor is, first, to heat the reactor coolant to near operating temperature, by running the reactor coolant pumps. The reactor is then made critical by withdrawing control rods and/or diluting boron in the coolant.⁽¹⁾ With this mode of start-up, the energy stored in the reactor coolant during the approach to criticality is substantially equal to that during power operation and therefore to be conservative most engineered safety system components and auxiliary cooling systems, shall be fully operable. During low temperature physics tests there is a negligible amount of stored energy in the reactor coolant, therefore an accident comparable in severity to the Design Basis Accident is not possible, and the engineered safety systems are not required.

A total of six service water pumps are installed, only three of which are required to operate during the injection and recirculation phases of a postulated loss-of-coolant accident,⁽⁶⁾ in one unit together with a hot shutdown or normal operation condition in the other unit. For either reactor to be critical, six service water pumps must be operable.

The allowed outage time for a single service water pump is 7 days. The allowed outage time for two or three service water pumps is 72 hours. If more than one service water pump is inoperable, the 7 day allowed outage time starts when the first pump is declared inoperable and the 72 hour allowed outage time for the second and third pumps is cumulative starting from the time the second pump is declared inoperable. Therefore, the total time that two or three pumps are inoperable during the period that LCO 15.3.3.D.2.a is in effect must not exceed 72 hours. All pumps must be restored to operable status within 7 days of the first pump being declared inoperable. Specifications 15.3.3.D.2.c requires four and 15.3.3.D.2.d required five service water pumps to be operable to provide sufficient flow for accident mitigation when these specifications are in effect.

The service water ring header continuous flowpath LCO requirement (TS 15.3.3.D.2.b) applies anytime continuity of the flowpath in the service water ring header is interrupted. This includes isolation of any part of the ring header. This LCO recognizes that one aspect of redundancy in the service water system is the ability to isolate a break in the system and still maintain ability to provide required flow to supported equipment. This capability is impaired anytime the continuous flowpath of the ring header is blocked. The 7 day allowed outage time is based on the fact that a piping failure must occur to cause a subsequent problem with system operability. Piping failures are not considered as the single failure for system functionality during an accident.

TS 15.3.3.D.2.b requires that service water system flow is evaluated within 24 hours if less than four service water pumps are operable. This is necessary to ensure that all required equipment will receive sufficient flow in this condition. If it is determined that any equipment will not receive sufficient flow, the applicable LCOs for the affected equipment shall be entered. These LCOs can be exited if system realignment is completed to achieve the required flow rates for the affected equipment.

15.3 Limiting Conditions for Operation

15.3.0 General Considerations

A. Many of the Limiting Conditions for Operation (LCO) presented in these specifications provide a temporary relaxation of the single failure criterion, which is consistent with overall reliability considerations, to allow time periods during which corrective action may be taken to restore the system to full operability. If the situation has not been corrected within the specified time period, and the LCO prescribes no other specific action, action shall be initiated within one hour to place the affected unit in:

1. Hot shutdown within seven hours of entering this specification: AND
2. Cold shutdown within 37 hours of entering this specification.

This specification is applicable during power operation, low power operation, and shutdown with temperature $\geq 200^{\circ}\text{F}$.

B. In the event an LCO cannot be satisfied because of equipment failures or limitations beyond those specified in the permissible conditions of the LCO, action shall be initiated within one hour to place the affected unit in:

1. Hot shutdown within seven hours of entering this specification; AND
2. Cold shutdown within 37 hours of entering this specification.

This specification is applicable during power operation, low power operation, and shutdown with temperature $\geq 200^{\circ}\text{F}$.

C. Upon discovery of a Limiting Condition for Operation, the actions delineated in the specification shall be performed. If the requirements of the Limiting Condition for Operation are met or are no longer applicable prior to the expiration of the times delineated in the specification, completion of the specified actions is not required, unless otherwise stated.

D. When a system, subsystem, train, component or device is determined to be inoperable solely because its emergency power source is inoperable, or solely because its normal power source is inoperable, the system, subsystem, train, component or device may be considered operable for the purpose of satisfying the requirements of the applicable LCO, provided:

1. The available power source (normal or emergency) is operable; AND
2. All required redundant system(s), subsystem(s), train(s), components(s) and device(s) are operable.

If either 15.3.0.D.1 or 15.3.0.D.2 cannot be met, specifications 15.3.0.A and 15.3.0.B become applicable. This specification is not applicable during cold shutdown or refueling shutdown conditions.

E. A momentary loss of normal or emergency power resulting in prompt corrective or required action in accordance with Table 15.3.5-2, i.e., placing associated channels into the trip condition or shutdown of the unit, shall not be interpreted as causing a violation of the specification with respect to minimum operable channels, unless said loss is the result of personnel error or procedural violation.

F. Equipment removed from service or declared inoperable to comply with required actions may be returned to service solely to perform testing required to demonstrate its operability or the operability of other equipment.

Bases

Specifications 15.3.0.A and 15.3.0.B delineate the actions to be taken for circumstances not directly provided for in the action statements of a Limiting Condition for Operation (LCO) and whose occurrence would violate the intent of the specification. These specifications delineate the time limits for placing the unit(s) in a safe condition when operation cannot be maintained within the limits for safe operation as defined by the LCO and its associated action statements. It is not intended to be used as an operational convenience that permits routine, voluntary removal of redundant systems or components from service in lieu of other alternatives