The following SRO questions were part of the initial 10 question pre-submittal and have had minor changes made.

80. 024AA2.06 -

Restated the first part of the stem and put in a timeline based on validator comments that the sequence of events was confusing. No change of content or intent.

84. 054AA2.01 -

Modified the second part of distracters B and D from a LOCA event to a Steam Generator Tube Rupture event – based on comments during the 10 question pre-submittal review.

Also added the title of TS 3.7.3 in the stem of the question. It was not previously included.

One KA needs changed, per our discussion.

On Feb 7, 2013 we discussed changing KA 028G2.1.1 Hydrogen Recombiner and Purge Control System (HRPS) Knowledge of conduct of operations requirements to 029 Containment Purge System. The 028 was too hard to write to and we agreed to write a question to the ctmt purge KA. This was approved and needs to be changed on the sample plan or we need authorization to put this on FORM 401-4 Record of Rejected KAs.

76. 001A2.17 076

Unit 1 is at 98% power.

The OATC pulls Control Rods 2 steps and the following indications occur:

- Control Bank D Group Step Counters indicate 227 steps.
- On DRPI, Control Bank D, rod P8 drops to 144 steps.
- On DRPI, all other Control Bank D rods indicate 228 steps.
- Other Control Room parameters indicate Control Rod P8 has dropped to 144 steps.

Which one of the following completes the statements below?

__(1)__ , will come into alarm due to the rod malfunction.

Per the BASES of Tech Spec 3.1.4, Rod Group Alignment Limits, a power reduction to ≤ 75% power is required to ensure __(2)__ .

A. 1) FF5, COMP ALARM ROD SEQ/DEV OR PR FLUX TILT

2) total available rod worth is within safety analyses limits

B. 1) FE2, CONT ROD BANK POSITION LO-LO

2) total available rod worth is within safety analyses limits

C.✓ 1) FF5, COMP ALARM ROD SEQ/DEV OR PR FLUX TILT

2) the local Linear Heat Rate increases will not exceed core design criteria

D. 1) FE2, CONT ROD BANK POSITION LO-LO

2) the local Linear Heat Rate increases will not exceed core design criteria

A. Incorrect 1) Correct, FF5 will come into alarm due to Control Rod P8 being misaligned by >12 steps.

2) Incorrect, since total available rod worth has not changed. Plausible because a candidate may make a judgment that the control rod that is misaligned is not OPERABLE as described in TS bases 3.1.4, and has to be assumed unavailable for shutdown margin. In actuality, as long as the control rod is trippable it is available for shutdown margin (no information is given in the stem that indicates the control rod is untrippable). A ramp down to a lower power level will require less negative reactivity for a reactor shutdown (and less negative reactivity from total available rod worth) and a candidate may assume this is required by the TS Bases and safety analyses.

B. Incorrect 1) Incorrect, plausible because a single rod is below the Lo-Lo Control Rod insertion limit. If a candidate thought the Rod Insertion limit was calculated from DRPI, this would be a plausible choice. The Rod Insertion limit is actually calculated from the P/A Converter input (in the Rod Control Logic cabinet) providing rod position and median delta T providing Reactor power. DRPI has no input.

2) Incorrect, see A.2.

C. Correct 1) Correct, see A.1.

2) Correct, the TS Bases reason for reducing Reactor power to <75% is to ensure Linear Heat Rate increases on the fuel assemblies outside of the dropped rod area are within limits to ensure fuel integrity.

D. Incorrect 1) Incorrect, see B.1.

2) Correct, see C.2.

-

K/A: 001A2.17 Control Rod Drive System
A2 Ability to (a) predict the impacts of the following malfunction or operations on the CRDS- and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:
(CFR: 41.5/43.5/45.3/45.13)
A2.17 Rod-misalignment alarm 3.3 3.8

Importance Rating: 3.3 3.8

Technical Reference: FNP-1-ARP-1.6, v70
FNP-1-AOP-19.0, v29

References provided:	None
Learning Objective:	DETERMINE AND APPLY the information from the LCO BASES sections: BACKGROUND, APPLICABLE SAFETY ANALYSIS, ACTIONS, SURVEILLENCE REQUIREMENTS, for any Technical Specifications or TRM requirements associated with AOP-19, Malfunction of Rod Control System, components and attendant equipment. (OPS-62520S01) 10CFR55.43 (b) 2
Question History:	New question
Basis for meeting K/A:	A Control Rod misalignment has occurred during a rod movement. The candidate has to predict the alarm that will be received due to the rod misalignment, based on the plant conditions. Using Tech Spec Bases information, the candidate has to determine why a ramp to < 75% power is required as a result of the misaligned rod.
SRO justification:	Facility operating limitations in the TS and their bases. [10 CFR 55.43(b)(2)] • Knowledge of TS bases that is required to analyze TS required actions and terminology. The candidate has to apply knowledge of the reason for the ramp to < 75% power due to the Tech Spec action to be <75% within two hours. .

2013 NRC exam

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(2) :

1) can NOT be answered by knowing less than 1 hour Tech Specs.
2) can NOT be answered by knowing information listed "above-the-line".
3) can NOT be answered by knowing the TS Safety Limits or their bases.
4) Does involve one or more of the following for TS, TRM or ODCM:

- Knowledge of TS bases that is required to analyze TS required actions and terminology

LOCATION FE2

E2
CONT ROD BANK POSITION LO-LO

SETPOINT: Variable with Reactor Power as measured by ΔT and TAVG.

ORIGIN: Rod Insertion Limit Computer

Input is not from DRPI

PROBABLE CAUSE

NOTE:
- **Zinc Addition System injection will result in a continuous RCS dilution of as much as 1.7 gph, which may result in a reduction in shutdown margin if compensated for by inward rod motion instead of boration.** ☐
- **This annunciator has REFLASH capability.** ☐

1. Reactor Coolant System Boric Acid Concentration too low to ensure Reactor Protection under Accident conditions due to;
   A. Plant Transient
   B. Xenon Transient
   C. Dilution of RCS

AUTOMATIC ACTION

NONE

OPERATOR ACTION

1. Check indications and determine that actual control bank rod position is at the low-low insertion limit. ☐
   1.1 Click on Rod Supervision button on Applications Menu. ☐
   1.2 Click on Rod Insertion Limits button. ☐
   1.3 Determine if low-low insertion limit exceeded. ☐
2. Emergency borate the reactor coolant system in accordance with FNP-1-AOP-27.0, EMERGENCY BORATION. **{CMTs 0008555, 0008900}** ☐
3. IF a plant transient is in progress, THEN place turbine load on "HOLD". ☐
4. Refer to FNP-1-UOP-3.1, POWER OPERATIONS. ☐
5. Refer to the Technical Specifications section on Reactivity Control. ☐

References: A-177100, Sh. 292; U-260610; U266647 PLS Document; Technical Specifications; DCP 93-1-8587; **{CMT 0008887}**

3.1 REACTIVITY CONTROL SYSTEMS

3.1.4 Rod Group Alignment Limits

LCO 3.1.4 All shutdown and control rods shall be OPERABLE, with all individual indicated rod positions within 12 steps of their group step counter demand position.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more rod(s) untrippable.	A.1.1 Verify SDM to be within the limits provided in the COLR. OR A.1.2 Initiate boration to restore SDM to within limit. AND A.2 Be in MODE 3.	1 hour 1 hour 6 hours
B. One rod not within alignment limits.	B.1 Restore rod to within alignment limits. OR B.2.1.1 Verify SDM to be within the limits provided in the COLR. OR	1 hour 1 hour (continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. (continued)	B.2.1.2	Initiate boration to restore SDM to within limit.	1 hour
	AND		
	B.2.2	Reduce THERMAL POWER to ≤ 75% RTP.	2 hours
	AND		
	B.2.3	Verify SDM to be within the limits provided in the COLR.	Once per 12 hours
	AND		
	B.2.4	Perform SR 3.2.1.1.	72 hours
	AND		
	B.2.5	Perform SR 3.2.2.1.	72 hours
	AND		
	B.2.6	Re-evaluate safety analyses and confirm results remain valid for duration of operation under these conditions.	5 days
C. Required Action and associated Completion Time of Condition B not met.	C.1	Be in MODE 3.	6 hours

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. More than one rod not within alignment limit.	D.1.1	Verify SDM to be within the limits provided in the COLR.	1 hour
	<u>OR</u>		
	D.1.2	Initiate boration to restore required SDM to within limit.	1 hour
	<u>AND</u>		
	D.2	Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.4.1	Verify individual rod positions within alignment limit.	In accordance with the Surveillance Frequency Control Program
SR 3.1.4.2	Verify rod freedom of movement (trippability) by moving each rod not fully inserted in the core $\geq$ 10 steps in either direction.	In accordance with the Surveillance Frequency Control Program
SR 3.1.4.3	Verify rod drop time of each rod, from the fully withdrawn position, is $\leq$ 2.7 seconds from the beginning of decay of stationary gripper coil voltage to dashpot entry, with: a. $T_{avg} \geq 541°F$; and b. All reactor coolant pumps operating.	Prior to reactor criticality after each removal of the reactor head

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.4 Rod Group Alignment Limits

BASES

BACKGROUND

The OPERABILITY (e.g., trippability) of the shutdown and control rods is an initial assumption in all safety analyses that assume rod insertion upon reactor trip. Maximum rod misalignment is an initial assumption in the safety analysis that directly affects core power distributions and assumptions of available SDM.

The applicable criteria for these reactivity and power distribution design requirements are 10 CFR 50, Appendix A, GDC 10, "Reactor Design," GDC 26, "Reactivity Control System Redundancy and Protection" (Ref. 1), and 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Plants" (Ref. 2).

The Bases states that there may be a reduction in total available rod worth - but this is for a situation with an INOPERABLE control rod, not a misaligned control rod. This lends plausibility for the distracter "a power reduction to ≤ 75% power is required to ensure total available rod worth is within safety analyses limits".

Mechanical or electrical failures may cause a control rod to become inoperable or to become misaligned from its group. Control rod inoperability or misalignment may cause increased power peaking, due to the asymmetric reactivity distribution and a reduction in the total available rod worth for reactor shutdown. Therefore, control rod alignment and OPERABILITY are related to core operation in design power peaking limits and the core design requirement of a minimum SDM.

Limits on control rod alignment have been established, and all rod positions are monitored and controlled during power operation to ensure that the power distribution and reactivity limits defined by the design power peaking and SDM limits are preserved.

Rod cluster control assemblies (RCCAs), or rods, are moved by their control rod drive mechanisms (CRDMs). Each CRDM moves its RCCA one step (approximately 5/8 inch) at a time, but at varying rates (steps per minute) depending on the signal output from the Rod Control System.

The RCCAs are divided among control banks and shutdown banks. Each bank may be further subdivided into two groups to provide for precise reactivity control. A group consists of two or more RCCAs that are electrically paralleled to step simultaneously. A bank

(continued)

BACKGROUND (continued)

of RCCAs consists of two groups that are moved in a staggered fashion, but always within one step of each other. There are four control banks and two shutdown banks. All control banks and shutdown banks contain two rod groups.

The shutdown banks are maintained either in the fully inserted or fully withdrawn position. The control banks are moved in an overlap pattern, using the following withdrawal sequence: When control bank A reaches a predetermined height in the core, control bank B begins to move out with control bank A. Control bank A stops at the position of maximum withdrawal, and control bank B continues to move out. When control bank B reaches a predetermined height, control bank C begins to move out with control bank B. This sequence continues until control banks A, B, and C are at the fully withdrawn position, and control bank D is approximately halfway withdrawn. The insertion sequence is the opposite of the withdrawal sequence. The control rods are arranged in a radially symmetric pattern, so that control bank motion does not introduce radial asymmetries in the core power distributions.

The axial position of shutdown rods and control rods is indicated by two separate and independent systems, which are the Bank Demand Position Indication System (commonly called group step counters) and the Digital Rod Position Indication (DRPI) System.

The Bank Demand Position Indication System counts the pulses from the rod control system that moves the rods. There is one step counter for each group of rods. Individual rods in a group all receive the same signal to move and should, therefore, all be at the same position indicated by the group step counter for that group. The Bank Demand Position Indication System is considered highly precise (± 1 step or ± 5/8 inch). If a rod does not move one step for each demand pulse, the step counter will still count the pulse and incorrectly reflect the position of the rod.

The DRPI System provides a highly accurate indication of actual control rod position, but at a lower precision than the step counters. This system is based on inductive analog signals from a series of coils spaced along a hollow tube with a center to center distance of 3.75 inches, which is six steps. To increase the reliability of the system, the inductive coils are connected alternately to data system A or B. Thus, if one system fails, the DRPI will go on half accuracy with

(continued)

BACKGROUND (continued)

an effective coil spacing of 7.5 inches, which is 12 steps. Therefore, the normal indication accuracy of the DRPI System is ± 4 steps (all coils operable and 1 step added for manufacturing and temperature tolerances), and the maximum uncertainty is ± 10 steps (only one data system A or B coils operable). With an indicated deviation of 12 steps between the group step counter and DRPI, the maximum deviation between actual rod position and the demand position could be 22 steps.

APPLICABLE SAFETY ANALYSES

Control rod misalignment accidents are analyzed in the safety analysis (Ref. 3). The acceptance criteria for addressing control rod inoperability or misalignment are that:

a. There be no violations of:

    1. specified acceptable fuel design limits, or
    2. Reactor Coolant System (RCS) pressure boundary integrity; and

b. The core remains subcritical after accident transients that result in a reactor trip, except for the MSLB.

Two types of misalignment are distinguished. During movement of a control rod group, one rod may stop moving, while the other rods in the group continue. This condition may cause excessive power peaking. The second type of misalignment occurs if one rod fails to insert upon a reactor trip and remains stuck fully withdrawn. This condition requires an evaluation to determine that sufficient reactivity worth is held in the control rods to meet the SDM requirement, with the maximum worth rod stuck fully withdrawn.

Two types of analysis are performed in regard to static rod misalignment (Ref. 4). With control banks at their insertion limits, one type of analysis considers the case when any one rod is completely inserted into the core. The second type of analysis considers the case of a completely withdrawn single rod from a bank inserted to its insertion limit. Satisfying limits on departure from nucleate boiling ratio in both of these cases bounds the situation when a rod is misaligned from its group by 12 steps.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

Another type of misalignment occurs if one RCCA fails to insert upon a reactor trip and remains stuck fully withdrawn. This condition is assumed in the evaluation to determine that the required SDM is met with the maximum worth RCCA also fully withdrawn.

The Required Actions in this LCO ensure that either deviations from the alignment limits will be corrected or that THERMAL POWER will be adjusted so that excessive local linear heat rates (LHRs) will not occur, and that the requirements on SDM and ejected rod worth are preserved.

Continued operation of the reactor with a misaligned control rod is allowed if the heat flux hot channel factor ($F_Q(Z)$) and the nuclear enthalpy hot channel factor ($F^N_{\Delta H}$) are verified to be within their limits in the COLR and the safety analysis is verified to remain valid. When a control rod is misaligned, the assumptions that are used to determine the rod insertion limits, AFD limits, and quadrant power tilt limits are not preserved. Therefore, the limits may not preserve the design peaking factors, and $F_Q(Z)$ and $F^N_{\Delta H}$ must be verified directly by incore mapping. Bases Section 3.2 (Power Distribution Limits) contains more complete discussions of the relation of $F_Q(Z)$ and $F^N_{\Delta H}$ to the operating limits.

Shutdown and control rod OPERABILITY and alignment are directly related to power distributions and SDM, which are initial conditions assumed in safety analyses. Therefore they satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The limits on shutdown or control rod alignments ensure that the assumptions in the safety analysis will remain valid. The requirements on OPERABILITY ensure that upon reactor trip, the assumed reactivity will be available and will be inserted. The OPERABILITY requirements also ensure that the RCCAs and banks maintain the correct power distribution and rod alignment.

The requirement to maintain the rod alignment to within plus or minus 12 steps is conservative. The minimum misalignment assumed in safety analysis is 24 steps (15 inches), and in some cases a total misalignment from fully withdrawn to fully inserted is assumed.

Maintaining rods within the limits of the TS ensures that the safety analyses remains valid, outside the limits, the safety analyses are no longer valid.

(continued)

BASES

LCO (continued)

Failure to meet the requirements of this LCO may produce unacceptable power peaking factors and LHRs, or unacceptable SDMs, all of which may constitute initial conditions inconsistent with the safety analysis.

APPLICABILITY

The requirements on RCCA OPERABILITY and alignment are applicable in MODES 1 and 2 because these are the only MODES in which a self-sustaining chain reaction occurs, and the OPERABILITY (i.e., trippability) and alignment of rods have the potential to affect the safety of the plant. In MODES 3, 4, 5, and 6, the alignment limits do not apply because the control rods are fully inserted and the reactor is shut down, with no self-sustaining chain reaction. In the shutdown MODES, the OPERABILITY of the shutdown and control rods has the potential to affect the required SDM, but this effect can be compensated for by an increase in the boron concentration of the RCS. See LCO 3.1.1, "SHUTDOWN MARGIN (SDM), " for SDM in MODES 3, 4, and 5 and LCO 3.9.1, "Boron Concentration," for boron concentration requirements during refueling.

ACTIONS

A.1.1 and A.1.2

When one or more rods are untrippable, there is a possibility that the required SDM may be adversely affected. Under these conditions, it is important to determine the SDM, and if it is less than the required value, initiate boration until the required SDM is recovered. The Completion Time of 1 hour is adequate for determining SDM and, if necessary, for initiating emergency boration and restoring SDM.

In this situation, SDM verification must account for the absence of the negative reactivity of the untrippable rod(s), as well as a rod of maximum worth.

A.2

If the untrippable rod(s) cannot be restored to OPERABLE status, the plant must be brought to a MODE or condition in which the LCO requirements are not applicable. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours.

(continued)

ACTIONS

A.2 (continued)

The allowed Completion Time is reasonable, based on operating experience, for reaching MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

B.1

When a rod becomes misaligned, it can usually be moved and is still trippable. If the rod can be realigned within the Completion Time of 1 hour, local xenon redistribution during this short interval will not be significant, and operation may proceed without further restriction.

An alternative to realigning a single misaligned RCCA to the group average position is to align the remainder of the group to the position of the misaligned RCCA. However, this must be done without violating the bank sequence, overlap, and insertion limits specified in LCO 3.1.5, "Shutdown Bank Insertion Limits," and LCO 3.1.6, "Control Bank Insertion Limits." The Completion Time of 1 hour gives the operator sufficient time to adjust the rod positions in an orderly manner.

B.2.1.1 and B.2.1.2

With a misaligned rod, SDM must be verified to be within limit or boration must be initiated to restore SDM to within limit.

In many cases, realigning the remainder of the group to the misaligned rod may not be desirable. For example, realigning control bank B to a rod that is misaligned 15 steps from the top of the core would require a significant power reduction, since control bank D must be moved fully in and control bank C must be moved in to below 90 steps.

Power operation may continue with one RCCA trippable but misaligned, provided that SDM is verified within 1 hour. The Completion Time of 1 hour represents the time necessary for determining the actual unit SDM and, if necessary, aligning and starting the necessary systems and components to initiate boration.

(continued)

ACTIONS
(continued)

B.2.2, B.2.3, B.2.4, B.2.5, and B.2.6

For continued operation with a misaligned rod, RTP must be reduced, SDM must periodically be verified within limits, hot channel factors ($F_Q(Z)$ and $F^N_{\Delta H}$) must be verified within limits, and the safety analyses must be re-evaluated to confirm continued operation is permissible.

Reduction of power to 75% RTP ensures that local LHR increases due to a misaligned RCCA will not cause the core design criteria to be exceeded. The Completion Time of 2 hours gives the operator sufficient time to accomplish an orderly power reduction without challenging the Reactor Protection System.

When a rod is known to be misaligned, there is a potential to impact the SDM. Since the core conditions can change with time, periodic verification of SDM is required. A Frequency of 12 hours is sufficient to ensure this requirement continues to be met.

Verifying that $F_Q(Z)$ and $F^N_{\Delta H}$ are within the required limits ensures that current operation at 75% RTP with a rod misaligned is not resulting in power distributions that may invalidate safety analysis assumptions at full power. The Completion Time of 72 hours allows sufficient time to obtain flux maps of the core power distribution using the incore flux mapping system and to calculate $F_Q(Z)$ and $F^N_{\Delta H}$.

Once current conditions have been verified acceptable, time is available to perform evaluations of accident analysis to determine that core limits will not be exceeded during a Design Basis Event for the duration of operation under these conditions. A Completion Time of 5 days is sufficient time to obtain the required input data and to perform the analysis.

The following accident analyses are required to be reevaluated:

1. Rod Cluster Control Assembly Insertion Characteristics;

2. Rod Cluster Control Assembly Misalignment;

3. Loss Of Reactor Coolant From Small Ruptured Pipes or From Cracks In Large Pipes Which Actuates The Emergency Core Cooling System;

(continued)

ACTIONS

B.2.2, B.2.3, B.2.4, B.2.5, and B.2.6 (continued)

4. Single Rod Cluster Control Assembly Withdrawal At Full Power;

5. Major Reactor Coolant System Pipe Ruptures (Loss Of Coolant Accident);

6. Major Secondary System Pipe Rupture; and

7. Rupture Of A Control Rod Drive Mechanism Housing (Rod Cluster Control Assembly Ejection).

C.1

When Required Actions cannot be completed within their Completion Time, the unit must be brought to a MODE or Condition in which the LCO requirements are not applicable. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours, which obviates concerns about the development of undesirable xenon or power distributions. The allowed Completion Time of 6 hours is reasonable, based on operating experience, for reaching MODE 3 from full power conditions in an orderly manner and without challenging the plant systems.

D.1.1 and D.1.2

More than one control rod becoming misaligned from its group average position is not expected, and has the potential to reduce SDM. Therefore, SDM must be evaluated. One hour allows the operator adequate time to determine SDM. Restoration of the required SDM, if necessary, requires increasing the RCS boron concentration to provide negative reactivity, as described in the Bases or LCO 3.1.1. The required Completion Time of 1 hour for initiating boration is reasonable, based on the time required for potential xenon redistribution, the low probability of an accident occurring, and the steps required to complete the action. This allows the operator sufficient time to align the required valves and start the boric acid pumps. Boration will continue until the required SDM is restored.

D.2

If more than one rod is found to be misaligned or becomes misaligned because of bank movement, the unit conditions fall outside of the

(continued)

BASES

ACTIONS

D.2 (continued)

accident analysis assumptions. Since automatic bank sequencing would continue to cause misalignment, the unit must be brought to a MODE or Condition in which the LCO requirements are not applicable. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours.

The allowed Completion Time is reasonable, based on operating experience, for reaching MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.4.1

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.1.4.2

Verifying each control rod is OPERABLE would require that each rod be tripped. However, in MODES 1 and 2, tripping each control rod would result in radial or axial power tilts, or oscillations. Exercising each individual control rod provides increased confidence that all rods continue to be OPERABLE without exceeding the alignment limit, even if they are not regularly tripped. Moving each control rod by 10 steps will not cause radial or axial power tilts, or oscillations, to occur. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. Between required performances of SR 3.1.4.2 (determination of control rod OPERABILITY by movement), if a control rod(s) is discovered to be immovable, but remains trippable and aligned, the control rod(s) is considered to be OPERABLE. At any time, if a control rod(s) is immovable, a determination of the trippability (OPERABILITY) of the control rod(s) must be made, and appropriate action taken.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.1.4.3

Verification of rod drop times allows the operator to determine that the maximum rod drop time permitted is consistent with the assumed rod drop time used in the safety analysis. Measuring rod drop times prior to reactor criticality, after reactor vessel head removal, ensures that the reactor internals and rod drive mechanism will not interfere with rod motion or rod drop time, and that no degradation in these systems has occurred that would adversely affect control rod motion or drop time. This testing is performed with all RCPs operating and the average moderator temperature ≥ 541°F to simulate a reactor trip under actual conditions.

Testing is performed with the rods fully withdrawn (225 to 231 steps inclusive). The fully withdrawn position used for determining rod drop times shall be greater than or equal to the fully withdrawn position used during subsequent plant operation.

This Surveillance is performed during a plant outage, due to the plant conditions needed to perform the SR and the potential for an unplanned plant transient if the Surveillance were performed with the reactor at power.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 10 and GDC 26.
2. 10 CFR 50.46.
3. FSAR, Section 15.2.3.
4. FSAR, Section 15.2.3.2.2.C.

77. 004A2.02 077

Unit 1 is stable at 100% power with the following conditions:

- AOP-16.0, CVCS Malfunction, is in progress due to a loss of Pressurizer level control.
- At the step to "Check Pressurizer level", Pressurizer level is 76% and rising.

Which one of the following completes the statements below?

The Pressurizer is __(1)__ per Tech Spec 3.4.9, Pressurizer.

Per AOP-16.0, the Control Room crew is required to __(2)__ .

	(1)	(2)
A.✓	NOT OPERABLE	trip the Reactor and go to EEP-0.0, Reactor Trip or Safety Injection
B.	NOT OPERABLE	reduce Reactor power/TAVG as necessary using UOP-3.1, Power Operation
C.	OPERABLE	trip the Reactor and go to EEP-0.0, Reactor Trip or Safety Injection
D.	OPERABLE	reduce Reactor power/TAVG as necessary using UOP-3.1, Power Operation

A. Correct 1) Correct, per TS 3.4.9, the Pressurizer is <u>not</u> OPERABLE when level is >63.5%.

2) Correct, per AOP-16.0 a Reactor trip and transition to EEP-0 is required. This does not meet the normal Reactor trip setpoint for entry into EEP-0 and is a procedure transition directed in AOP-16 strictly to mitigate the rising Pressurizer level.

B. Incorrect 1) Correct, see A.1.

2) Incorrect, Plausible since this would be a correct answer if Pressurizer level was between 60-75%.

C. Incorrect 1) Incorrect, per TS 3.4.9 the Pressurizer is <u>not</u> OPERABLE when level is >63.5%. Plausible since the Pressurizer high level trip setpoint is 92%. This setpoint is commonly applied for Pressurizer operability and is incorrect.

2) Correct, see A.2.

D. Incorrect 1) Incorrect, see C.1.

2) Incorrect, see B.2.

K/A: 004A2.02 Chemical and Volume Control System:
Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:
(CFR: 41.5/ 43/5 / 45/3 / 45/5)
A2.02 Loss of PZR level (failure mode) 3.9 4.2

Importance Rating: 3.9 4.2

Technical Reference: FNP-1-AOP-16.0, v18
Tech Specs v190/186
Tech Spec Bases v58

References provided: None

Learning Objective: EVALUATE plant conditions and DETERMINE if transition to another section of AOP-16, CVCS Malfunction, or to another procedure is required. (OPS-62520K02)

Question History: New question

K/A match: The question tests the ability to predict the impacts of a loss of Pressurizer level control after a CVCS malfunction causes Pressurizer level to rise uncontrollably. The impacts are a Tech Spec RAS and a Reactor Trip. Based on the failure, the candidate has to select the proper procedure to mitigate the malfunction

SRO justification: Normally knowledge of entry conditions into EEP-0 would be RO knowledge. The normal Reactor trip setpoint for high Pressurizer level is 92% and would be RO knowledge, but in this question selection of EEP-0 is <u>NOT</u> from a direct entry setpoint, but is a procedure transition directed by AOP-16 at 75% Pressurizer level in an effort to control Pressurizer level. This makes this question an SRO procedure selection question rather than a direct EEP-0 entry RO question.

10 CFR 55.43(b)(5)
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations [10 CFR 55.43(b)(5)], involving BOTH:
1) assessing plant conditions and then
2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

One area of SRO level knowledge is knowledge of content of the procedure vs. the procedure's overall mitigative strategy or purpose. The applicant's knowledge can be evaluated at the level of 10 CFR55.43(b)(5) by ensuring that the additional knowledge of the procedure's
content is required to correctly answer the written test item, for example:
• Assessing plant conditions (normal, abnormal, or emergency) and then selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

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From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(5) :
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations [10 CFR 55.43(b)(5)], involving BOTH:
1) assessing plant conditions and then
2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

Using the flowchart, this question can:
- **NOT** be answered **solely** by knowing "systems knowledge", i.e., how the system works, flowpath, logic, component location.

- **NOT** be answered solely by knowing immediate operator actions.
- **NOT** be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry to major EOPs.(this is not a direct entry condition into EEP-0)
- **NOT** be answered **solely** by knowing the purpose, overall sequence of events, or **overall mitigative strategy** of a procedure.
- **CAN** be answered with knowledge of ONE or **MORE** of the following:

— **Assessing plant conditions** (normal, abnormal, or emergency) and then **selecting a procedure** or section of a procedure to mitigate, recover, or with which to proceed.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.9 Pressurizer

LCO 3.4.9 The pressurizer shall be OPERABLE with:

a. Pressurizer water level ≤ 63.5% indicated; and

b. Two groups of pressurizer heaters OPERABLE with the capacity of each group ≥ 125 kW and capable of being powered from an emergency power supply.

APPLICABILITY: MODES 1, 2, and 3.

-----------------------------------NOTE---
Pressurizer water level limit does not apply during:

a. THERMAL POWER ramp > 5% RTP per minute; or
b. THERMAL POWER step > 10% RTP.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressurizer water level not within limit.	A.1 Be in MODE 3 with reactor trip breakers open. AND A.2 Be in MODE 4.	6 hours 12 hours
B. One required group of pressurizer heaters inoperable.	B.1 Restore required group of pressurizer heaters to OPERABLE status.	72 hours
C. Required Action and associated Completion Time of Condition B not met.	C.1 Be in MODE 3. AND C.2 Be in MODE 4.	6 hours 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.9.1	Verify pressurizer water level is ≤ 63.5% indicated.	In accordance with the Surveillance Frequency Control Program
SR 3.4.9.2	Verify capacity of each required group of pressurizer heaters is ≥ 125 kW.	In accordance with the Surveillance Frequency Control Program
SR 3.4.9.3	Verify required pressurizer heaters are capable of being powered from an emergency power supply.	In accordance with the Surveillance Frequency Control Program

Step	Action/Expected Response		Response NOT Obtained
10.2	Go to procedure and step in effect		

NOTE:

- The intent of the following steps is to borate through the RCP seals and reduce reactor power. The power reduction and cooldown will lower TAVG and will either reduce the rate of pressurizer level increase or stop the pressurizer level increase through RCS shrinkage, and afford time to restore a letdown path.
- Maximum ramp rates specified in FNP-1-UOP-3.1 are not applicable. Pressurizer level, response to boration through the RCP seals, and time required to restore a letdown path will dictate the maximum ramp rate. Depending on pressurizer level a reactor trip may be required.

Step	Action/Expected Response		Response NOT Obtained
___11	**Verify CHG FLOW FK-122 - MANUALLY CLOSED**		
___12	**Check Reactor - CRITICAL**	12	Proceed to step 16.0.

NOTE:

- Tech Spec. 3.4.9 actions apply when pressurizer level exceeds 63.5%.
- The requirement for a reactor trip at 75% prior to reaching the automatic trip setpoint at 92% allows more time to establish a cooldown before the pressurizer fills solid.
- If a reactor trip is required, the remainder of this procedure should be performed in conjunction with FNP-1-ESP-0.1, REACTOR TRIP RESPONSE.

Step	Action/Expected Response		Response NOT Obtained
___13	**[CA] Check PRZR level - LESS THAN 75%**	13	Trip the reactor and go to FNP-1-EEP-0, REACTOR TRIP OR SAFETY INJECTION.
___14	**[CA] Maintain PRZR level - 20-60%.**		
14.1	Reduce reactor power/TAVG as necessary using FNP-1-UOP-3.1, POWER OPERATION		

Procedure transition based on Pressurizer level.

78. 006G2.2.22 078

Unit 1 is in Mode 3 with the following conditions:

- RCS pressure is 1800 psig.
- An RCS heatup is in progress.

1A Accumulator has been declared INOPERABLE.

- 1A Accumulator pressure is 655 psig.
- 1A Accumulator level is 41%.

Per Tech Specs 3.5.1, Accumulators, which one of the following completes the statements below?

Restore 1A Accumulator to OPERABLE by __(1)__ to within the Tech Spec required range.

Tech Spec 3.5.1 BASES states that __(2)__ .

A. 1) lowering 1A Accumulator pressure

2) the maximum pressure limit prevents injecting nitrogen into the RCS during a LOCA

B.✓ 1) lowering 1A Accumulator pressure

2) the maximum pressure limit prevents the accumulator relief valve from actuating

C. 1) raising 1A Accumulator level

2) the minimum level limit prevents injecting nitrogen into the RCS during a LOCA

D. 1) raising 1A Accumulator level

2) the minimum level limit ensures peak clad temperature remains below 2200°F during a LOCA

This is not a true 2+2 question since the 2nd part of each question has to be plausible and related to the first part. There are four distinct answer choices.

The answer choices "lowering pressure" and "raising level" were chosen to ensure that there were not two possible correct answer choices. The question asks which one of those two actions is required to restore the parameter to within limits. Under certain conditions, lowering level could also lower pressure. By the same token, raising level could raise pressure. The two answer choices were chosen to preclude the action of one correcting the condition of the other.

A. Incorrect 1) Correct, the TS SR 3.5.1.3 limits for Accumulator pressure are $\geq$ 601 psig and $\leq$ 649 psig.

2) Incorrect, this is a common misconception that too much nitrogen pressure will cause gas injection into the RCS during a LOCA. During a large break LOCA, nitrogen gas will be injected into the RCS since the RCS pressure is so much lower than the Accumulator pressure.

B. Correct 1) Correct, see A.1.

2) Correct, TS 3.5.1 Bases states "The maximum nitrogen cover pressure limit prevents accumulator relief valve actuation, and ultimately preserves Accumulator integrity."

C. Incorrect 1) Incorrect, the TS SR 3.5.1.2 limits for Accumulator level are $\geq$ 31.4% and $\leq$ 58.4%, which is already met in the stem conditions with level at 41%. Plausible since this setpoint could be seen as lower than we normally maintain our safety related tank levels (for example the Condensate Storage Tank or Refueling Water Storage Tank).

2) Incorrect, Plausible since, along with the first part, it would seem that a higher level would prevent nitrogen injection during a LOCA.

D. Incorrect 1) Incorrect, see C.1.

2) Correct, this statement could be correct, but in conjunction with the first part, it makes this whole distracter incorrect. Accumulator injection, along with sufficient level, does help prevent exceeding the peak cladding temperature limit of 2200°F.

K/A: 006G2.2.22 Emergency Core Cooling System (ECCS):
Knowledge of limiting conditions for operations and safety limits.
(CFR: 41.5 / 43.2 / 45.2)
IMPORTANCE RO 4.0 SRO 4.7

Importance Rating: 4.0 4.7

Technical Reference:	Tech Specs v190/186 Tech Spec Bases v58
References provided:	None
Learning Objective:	RECALL AND APPLY the information from the LCO BASES sections: BACKGROUND, APPLICABLE SAFETY ANALYSIS, ACTIONS, SURVEILLENCE REQUIREMENTS, for any Technical Specifications or TRM requirements associated with the Emergency Core Cooling System components and attendant equipment alignment, to include the following (OPS-62102B01): 10CFR55.43 (b) 2 3.5.1 Accumulators 3.5.2 ECCS—Operating 3.5.3 ECCS—Shutdown 3.5.4 Refueling Water Storage Tank (RWST) 2.1.1 Reactor Core Safety Limits
Question History:	FNP Bank question ECCS-62102B01 05
K/A match:	This question tests the candidate's knowledge of the Tech Spec ECCS Accumulator pressure and level limits. In addition, it tests the TS Bases reason for the limit.
SRO justification:	Facility operating limitations in the TS and their bases. [10 CFR 55.43(b)(2)] • Application of Required Actions (Section 3) and Surveillance Requirements (SR) (Section 4) in *accordance with rules of application* requirements (Section 1). • Knowledge of TS bases that is required to analyze TS required actions and terminology. All of the required knowledge is TS below the line limitations. The first part of the question requires the candidate to know the Surveillance requirements for Accumulator level and pressure and determine the action required to restore the Accumulator to OPERABLE status. The second part of the question tests the candidate's knowledge of the TS Bases for the pressure and level limits.

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From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(2) :

1) can NOT be answered by knowing less than 1 hour Tech Specs.
2) can NOT be answered by knowing information listed "above-the-line".
3) can NOT be answered by knowing the TS Safety Limits or their bases.

4) Does involve one or more of the following for TS, TRM or ODCM:
- Application of Required Actions (Section 3) and Surveillance Requirements (Section 4) in accordance with rules of application requirements (Section 1).
- Knowledge of TS bases that is required to analyze TS required actions and terminology.

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.1 Accumulators

LCO 3.5.1 Three ECCS accumulators shall be OPERABLE.

APPLICABILITY: MODES 1 and 2,
MODE 3 with RCS pressure > 1000 psig.

--NOTE--
In MODE 3, with RCS pressure > 1000 psig, the accumulators may be inoperable for up to 12 hours to perform pressure isolation valve testing per SR 3.4.14.1.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One accumulator inoperable due to boron concentration not within limits.	A.1 Restore boron concentration to within limits.	72 hours
B. One accumulator inoperable for reasons other than Condition A.	B.1 Restore accumulator to OPERABLE status.	24 hours
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 3. AND C.2 Reduce RCS pressure to ≤ 1000 psig.	6 hours 12 hours
D. Two or more accumulators inoperable.	D.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.1.1	Verify each accumulator isolation valve is fully open.	In accordance with the Surveillance Frequency Control Program
SR 3.5.1.2	Verify borated water volume in each accumulator is ≥ 7555 gallons (31.4%) and ≤ 7780 gallons (58.4%).	In accordance with the Surveillance Frequency Control Program
SR 3.5.1.3	Verify nitrogen cover pressure in each accumulator is ≥ 601 psig and ≤ 649 psig.	In accordance with the Surveillance Frequency Control Program
SR 3.5.1.4	Verify boron concentration in each accumulator is ≥ 2200 ppm and ≤ 2500 ppm.	In accordance with the Surveillance Frequency Control Program <u>AND</u> -------NOTE------- Only required to be performed for affected accumulators ---------------------- Once within 6 hours after each solution volume increase of ≥ 12% level, indicated, that is not the result of addition from the refueling water storage tank
SR 3.5.1.5	Verify power is removed from each accumulator isolation valve operator when RCS pressure is ≥ 2000 psig.	In accordance with the Surveillance Frequency Control Program

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.1 Accumulators

BASES

BACKGROUND

The functions of the ECCS accumulators are to supply water to the reactor vessel during the blowdown phase of a loss of coolant accident (LOCA), to provide inventory to help accomplish the refill phase that follows thereafter, and to provide Reactor Coolant System (RCS) makeup for a small break LOCA.

The blowdown phase of a large break LOCA is the initial period of the transient during which the RCS departs from equilibrium conditions, and heat from fission product decay, hot internals, and the vessel continues to be transferred to the reactor coolant. The blowdown phase of the transient ends when the RCS pressure falls to a value approaching that of the containment atmosphere.

In the refill phase of a LOCA, which immediately follows the blowdown phase, reactor coolant inventory has vacated the core through steam flashing and ejection out through the break. The core is essentially in adiabatic heatup. The balance of accumulator inventory is then available to help fill voids in the lower plenum and reactor vessel downcomer so as to establish a recovery level at the bottom of the core and ongoing reflood of the core with the addition of safety injection (SI) water.

The accumulators are pressure vessels partially filled with borated water and pressurized with nitrogen gas. The accumulators are passive components, since no operator or control actions are required in order for them to perform their function. Internal accumulator tank pressure is sufficient to discharge the accumulator contents to the RCS, if RCS pressure decreases below the accumulator pressure.

Each accumulator is piped into an RCS cold leg via an accumulator line and is isolated from the RCS by a motor operated isolation valve and two check valves in series.

The accumulator motor operated isolation valves are maintained in the open position with power to the valve removed when pressurizer pressure is ≥ 2000 psig. Should the valves be inadvertently closed below 2000 psig, the requirements of this LCO would ensure that the valves would be returned to their correct position in a timely manner or the plant would be taken out of the Mode of Applicability. The valves will

(continued)

BASES

BACKGROUND (continued)

automatically open, however, as a result of an SI signal. These features and requirements ensure that the accumulators will be available for injection.

The accumulator size, water volume, and nitrogen cover pressure are selected so that two of the three accumulators are sufficient to partially cover the core before significant clad melting or zirconium water reaction can occur following a LOCA. The need to ensure that two accumulators are adequate for this function is consistent with the LOCA assumption that the entire contents of one accumulator will be lost via the RCS pipe break during the blowdown phase of the LOCA.

APPLICABLE SAFETY ANALYSES

The accumulators are assumed OPERABLE in both the large and small break LOCA analyses at full power (Ref. 1). These are the Design Basis Accidents (DBAs) that establish the acceptance limits for the accumulators. Reference to the analyses for these DBAs is used to assess changes in the accumulators as they relate to the acceptance limits.

In performing the LOCA calculations, conservative assumptions are made concerning the availability of ECCS flow. In the early stages of a LOCA, with or without a loss of offsite power, the accumulators provide the sole source of makeup water to the RCS. The assumption of loss of offsite power is also considered to determine if it is most limiting, and if so, imposes a delay wherein the ECCS pumps cannot deliver flow until the emergency diesel generators start, come to rated speed, and go through their timed loading sequence. In cold leg break scenarios, the entire contents of one accumulator are assumed to be lost through the break.

The limiting large break LOCA is a double ended guillotine break in the cold leg. During this event, the accumulators discharge to the RCS as soon as RCS pressure decreases to below accumulator pressure.

As a conservative estimate, no credit is taken for ECCS pump flow until an effective delay has elapsed. This delay accounts for the diesels starting and the pumps being loaded and delivering full flow. The delay time is conservatively set with an additional 2 seconds to account for SI signal generation. During this time, the accumulators are analyzed as providing the sole source of emergency core cooling. No operator action is assumed during the blowdown stage of a large break LOCA.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The worst case small break LOCA analyses also assume a time delay before pumped flow reaches the core. For the larger range of small breaks, the rate of blowdown is such that the increase in fuel clad temperature is terminated solely by the accumulators, with pumped flow then providing continued cooling. As break size decreases, the accumulators and centrifugal charging pumps both play a part in terminating the rise in clad temperature. As break size continues to decrease, the role of the accumulators continues to decrease until they are not required and the centrifugal charging pumps become solely responsible for terminating the temperature increase.

This LCO helps to ensure that the following acceptance criteria established for the ECCS by 10 CFR 50.46 (Ref. 2) will be met following a LOCA:

a. Maximum fuel element cladding temperature is ≤ 2200°F;

b. Maximum cladding oxidation is ≤ 0.17 times the total cladding thickness before oxidation;

c. Maximum hydrogen generation from a zirconium water reaction is ≤ 0.01 times the hypothetical amount that would be generated if all of the metal in the cladding cylinders surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react; and

d. Core is maintained in a coolable geometry.

Since the accumulators discharge during the blowdown phase of a LOCA, they do not contribute to the long term cooling requirements of 10 CFR 50.46.

For both the large and small break LOCA analyses, a nominal contained accumulator water volume is used. The contained water volume is the same as the deliverable volume for the accumulators, since the accumulators are emptied, once discharged. For large breaks, an increase in water volume can be either a peak clad temperature penalty or benefit, depending on downcomer filling and subsequent spill through the break during the core reflooding portion of the transient. The safety analysis assumes values of 7331 gallons for the accumulator, and 337 gallons for the accumulator discharge line. To allow for instrument inaccuracy, values of 7,555 gallons and 7,780 gallons are specified. These values include the volume of water in the accumulator discharge line.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The minimum boron concentration setpoint is used in the post LOCA boron concentration calculation. The calculation is performed to assure reactor subcriticality in a post LOCA environment. Of particular interest is the large break LOCA, since no credit is taken for control rod assembly insertion. A reduction in the accumulator minimum boron concentration would produce a subsequent reduction in the available containment sump concentration for post LOCA shutdown and an increase in the maximum sump pH. The maximum boron concentration is used in determining the cold leg to hot leg recirculation injection switchover time and minimum sump pH.

The large and small break LOCA analyses are performed at the minimum nitrogen cover pressure for small break LOCA and nominal nitrogen cover pressure for large break LOCA, since sensitivity analyses have demonstrated that higher nitrogen cover pressure results in a computed peak clad temperature benefit. A sensitivity study is performed for the BE LOCA (large break LOCA) to determine the sensitivity of PCT to accumulator pressure. This study, in addition to several others, is incorporated into a PCT response surface in order to generate a 95/95 PCT. The maximum nitrogen cover pressure limit prevents accumulator relief valve actuation, and ultimately preserves accumulator integrity.

The effects on containment mass and energy releases from the accumulators are accounted for in the appropriate analyses (Ref. 2).

The accumulators satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO establishes the minimum conditions required to ensure that the accumulators are available to accomplish their core cooling safety function following a LOCA. Three accumulators are required to ensure that 100% of the contents of two of the accumulators will reach the core during a LOCA. This is consistent with the assumption that the contents of one accumulator spill through the break. If less than two accumulators are injected during the blowdown phase of a LOCA, the ECCS acceptance criteria of 10 CFR 50.46 (Ref. 2) could be violated.

For an accumulator to be considered OPERABLE, the isolation valve must be fully open, power removed above 2000 psig, and the limits established in the SRs for contained volume, boron concentration, and nitrogen cover pressure must be met.

BASES

APPLICABILITY

In MODES 1 and 2, and in MODE 3 with RCS pressure > 1000 psig, the accumulator OPERABILITY requirements are based on full power operation. Although cooling requirements decrease as power decreases, the accumulators are still required to provide core cooling as long as elevated RCS pressures and temperatures exist.

This LCO is only applicable at pressures > 1000 psig. At pressures ≤ 1000 psig, the rate of RCS blowdown is such that the ECCS pumps can provide adequate injection to ensure that peak clad temperature remains below the 10 CFR 50.46 (Ref. 2) limit of 2200°F.

The Accumulator Applicability is modified by a Note which takes exception to the LCO requirements for the Accumulators to be OPERABLE in MODE 3 with RCS pressure above 1,000 psig for up to 12 hours during the performance of isolation valve testing required by SR 3.4.14.1. The applicability of the Note is restricted solely to the isolation valve testing required by SR 3.4.14.1. In order to perform the required isolation valve testing, the Accumulators must be isolated and various parameters (e.g., pressure, level) must be adjusted. The exception provided by this Note allows operation in MODE 3 with RCS pressure above 1,000 psig for up to 12 hours with Accumulators not configured per the requirements of the LCO such that the Actions for an inoperable Accumulator are not applicable.

In MODE 3, with RCS pressure ≤ 1000 psig, and in MODES 4, 5, and 6, the accumulator motor operated isolation valves are closed to isolate the accumulators from the RCS. This allows RCS cooldown and depressurization without discharging the accumulators into the RCS or requiring depressurization of the accumulators.

ACTIONS

A.1

If the boron concentration of one accumulator is not within limits, it must be returned to within the limits within 72 hours. In this Condition, ability to maintain subcriticality or minimum boron precipitation time may be reduced. An average boron concentration for the injected water is assumed in the Best Estimate LOCA (large break LOCA) analysis. One accumulator up to 100 ppm below the minimum boron concentration limit, however, will have no effect on available ECCS water and an insignificant effect on post-LOCA core subcriticality. The large main steam line break analysis predicts that the accumulators would discharge following the event. However, their impact is minor and not a design limiting event. Thus, 72 hours is allowed to return the boron concentration to within limits.

(continued)

ACTIONS
(continued)

B.1

If one accumulator is inoperable for a reason other than boron concentration, the accumulator must be returned to OPERABLE status within 24 hours. In this Condition, the required contents of two accumulators cannot be assumed to reach the core during a LOCA. Due to the severity of the consequences should a LOCA occur in these conditions, the 24 hour Completion Time to open the valve, remove power to the valve, or restore the proper water volume or nitrogen cover pressure ensures that prompt action will be taken to return the inoperable accumulator to OPERABLE status. The Completion Time minimizes the potential for exposure of the plant to a LOCA under these conditions. The 24 hours allowed to restore an inoperable accumulator to OPERABLE status is justified in WCAP-15049-A, Rev. 1 (Ref. 3).

C.1 and C.2

If the accumulator cannot be returned to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 6 hours and RCS pressure reduced to ≤ 1000 psig within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

D.1

If more than one accumulator is inoperable, the plant is in a condition outside the accident analyses; therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.5.1.1

Each accumulator valve should be verified to be fully open. This verification ensures that the accumulators are available for injection and ensures timely discovery if a valve should be less than fully open. If an isolation valve is not fully open, the rate of injection to the RCS would be reduced. Although a motor operated valve position should not change with power removed, a closed valve could result in not meeting accident analyses assumptions. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.1.2 and SR 3.5.1.3

The borated water volume and nitrogen cover pressure are verified for each accumulator. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.5.1.4

The boron concentration should be verified to be within required limits for each accumulator since the static design of the accumulators limits the ways in which the concentration can be changed. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. Sampling the affected accumulator within 6 hours after a 12% level, indicated, increase (approximately 1% of tank volume) will identify whether inleakage has caused a reduction in boron concentration to below the required limit. It is not necessary to verify boron concentration if the added water inventory is from the refueling water storage tank (RWST), when the water contained in the RWST is within the accumulator boron concentration requirements. This is consistent with the recommendation of NUREG-1366 (Ref. 4).

SR 3.5.1.5

Verification that power is removed from each accumulator isolation valve operator when the pressurizer pressure is ≥ 2000 psig ensures that an active failure could not result in the undetected closure of an accumulator motor operated isolation valve. If this were to occur, only one accumulator would be available for injection given a single failure coincident with a LOCA. Therefore, each isolation valve operator is disconnected by a locked open disconnect device. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR allows power to be supplied to the motor operated isolation valves when RCS pressure is < 2000 psig, thus allowing operational flexibility by avoiding unnecessary delays to manipulate the breakers during plant startups or shutdowns.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.1.5 (continued)

Should closure of a valve occur below 2000 psig, the SI signal provided to the valves would open a closed valve in the event of a LOCA.

REFERENCES

1. FSAR, Chapter 15.
2. 10 CFR 50.46
3. WCAP-15049-A, Rev. 1, April 1999.
4. NUREG-1366, February 1990.

79. 008AG2.2.22 079

Unit 1 is in Mode 2 at 3% power when the following occurs:

- PCV-444B, PRZR PORV, fails open.
- The OATC performs actions of AOP-100, Instrumentation Malfunction.
- PCV-444B cannot be manually closed.
- The OATC closes MOV-8000B, PRZR PORV ISO.
- RCS pressure is rising.

Which one of the following completes the statements below per Tech Spec 3.4.11, Pressurizer Power Operated Relief Valves (PORVs)?

PRZR PORV ISO, MOV-8000B is required to be closed with

power __(1)__ .

Entry into Mode 1 __(2)__ allowed by Tech Specs.

	(1)	(2)
A.✓	removed	is NOT
B.	maintained	is NOT
C.	removed	IS
D.	maintained	IS

LCO 3.0.4 When an LCO is not met, entry into a MODE or other specified condition in the Applicability shall only be made:

a. When the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time;

b. After performance of a risk assessment addressing inoperable (continued) systems and components, consideration of the results, determination of the acceptability of entering the MODE or other specified condition in the Applicability, and establishment of risk management actions, if appropriate; exceptions to this Specification are stated in the individual Specifications, or

c. When an allowance is stated in the individual value, parameter, or other Specification.

This Specification shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

A. Correct 1) Correct, per TS 3.4.11, Condition B, the PORV block valve must be closed and power removed from the MOV.

2) Correct, with the PORV INOPERABLE, and TS 3.4.11 not having specific guidance that a Mode change is allowed with this failure, a mode change is not allowed per TS 3.0.4. Operation for an unlimited amount of time is not allowed for this condition.

B. Incorrect 1) Incorrect, plausible since this is the action required for a leaking PORV.

2) Correct, see A.2.

C. Incorrect 1) Correct, see A.1.

2) Incorrect, plausible since this would be acceptable for a leaking PORV. Operation for an unlimited amount of time with a leaking PORV isolated and power maintained to the Block Valve is allowed, so TS 3.0.4 allows a Mode change for that condition.

D. Incorrect 1) Incorrect, see B.1.

2) Incorrect, see C.2.

K/A: 008AG2.2.22 Pressurizer (PZR) Vapor Space Accident
(Relief Valve Stuck Open)
Knowledge of limiting conditions for operations and safety limits.
| (CFR: 41.5 / 43.2 / 45.2)

IMPORTANCE RO 4.0 SRO 4.7

Importance Rating:	4.0 4.7
Technical Reference:	Tech Specs v190/186 Tech Spec Bases v58
References provided:	None
Learning Objective:	RECALL AND APPLY the information from the LCO BASES sections: BACKGROUND, APPLICABLE SAFETY ANALYSIS, ACTIONS, SURVEILLENCE REQUIREMENTS, for any Technical Specifications or TRM requirements associated with the Pressurizer System components and attendant equipment alignment, to include the following (OPS-62101E01): 10CFR55.43 (b) 2 3.4.9, Pressurizer 3.4.10, Pressurizer Safety Valves 3.4.11, Pressurizer Power Operated Relief Valves 13.4.2, Pressurizer 13.4.4, Safety Valves - Shutdown
Question History:	Modified from Vogtle 2012 NRC Exam question
K/A match:	A Pressurizer PORV has stuck open (Relief Valve Stuck Open). The candidate displays "knowledge of limiting conditions for operations" by determining the TS 3.4.11 requirements for the stuck open PORV, and in addition the candidate is questioned on TS 3.0.4 requirements - is a Mode change allowed?
SRO justification:	Facility operating limitations in the TS and their bases. [10 CFR 55.43(b)(2)] • Application of generic Limiting Condition for Operation (LCO) requirements (LCO 3.0.1 thru 3.0.7; SR 4.0.1 thru 4.0.4). The first part of the question is $\leq$ 1 hour TS information for actions required for a stuck open PORV. This is RO knowledge. The second part of the question meets the K/A at the SRO level. SRO knowledge is required to determine if a Mode change is allowed by applying TS 3.0.4. The plant cannot be operated in this condition for an unlimited amount of time, so a Mode change is not allowed per TS 3.0.4.

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010

flowchart for 10 CFR 55.43(b)(2) :

1) can NOT be answered by knowing less than 1 hour Tech Specs.
   The first part of the question is ≤ 1 hour TS information for actions required for a stuck open PORV. The second part of the question meets the K/A at the SRO level.
2) can NOT be answered by knowing information listed "above-the-line".
3) can NOT be answered by knowing the TS Safety Limits or their bases.
4) Does involve one or more of the following for TS, TRM or ODCM:

- Application of generic Limiting Condition for Operation (LCO) requirements (LCO 3.0.1 thru 3.0.7; SR 4.0.1 thru 4.0.4).

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.11 Pressurizer Power Operated Relief Valves (PORVs)

LCO 3.4.11 Each PORV and associated block valve shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each PORV.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more PORVs inoperable and capable of being manually cycled.	A.1 Close and maintain power to associated block valve.	1 hour
B. One PORV inoperable and not capable of being manually cycled.	B.1 Close associated block valve.	1 hour
	AND	
	B.2 Remove power from associated block valve.	1 hour
	AND	
	B.3 Restore PORV to OPERABLE status.	72 hours

Operation for an unlimited amount of time is not allowed in this conditon, but would be allowed if the candidate thought CONDITION A was correct.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One block valve inoperable.	C.1 Place associated PORV in manual control. AND C.2 Restore block valve to OPERABLE status.	1 hour 72 hours
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 4.	6 hours 12 hours
E. Two PORVs inoperable and not capable of being manually cycled.	E.1 Close associated block valves. AND E.2 Remove power from associated block valves. AND E.3 Be in MODE 3. AND E.4 Be in MODE 4.	1 hour 1 hour 6 hours 12 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. More than one block valve inoperable.	F.1 Place associated PORVs in manual control. <u>AND</u> F.2 Restore one block valve to OPERABLE status. <u>AND</u> F.3 Restore remaining block valve to OPERABLE status.	1 hour 2 hours 72 hours
G. Required Action and associated Completion Time of Condition F not met.	G.1 Be in MODE 3. <u>AND</u> G.2 Be in MODE 4.	6 hours 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.11.1	------------------------------NOTES---------------------------- 1. Not required to be met with block valve closed in accordance with the Required Action of Condition B or E. 2. Not required to be performed prior to entry into MODE 3. 3. Not required to be performed for Unit 2 for the remainder of operating cycle 16 for block valve Q2B31MOV8000B. --- Perform a complete cycle of each block valve.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.4.11.2	---------------------------NOTE-------------------------------- Not required to be performed prior to entry into MODE 3. -- Perform a complete cycle of each PORV during MODE 3 or 4.	In accordance with the Surveillance Frequency Control Program
SR 3.4.11.3	Perform a complete cycle of each PORV using the backup PORV control system.	In accordance with the Surveillance Frequency Control Program
SR 3.4.11.4	---------------------------NOTE-------------------------------- Required to be performed only for Unit 2 for the remainder of operating cycle 16. -- Check power available to the Unit Two PORV block valve Q2B31MOV8000B.	24 hours

3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

LCO 3.0.1

LCOs shall be met during the MODES or other specified conditions in the Applicability, except as provided in LCO 3.0.2, 3.0.7, and 3.0.8.

LCO 3.0.2

Upon discovery of a failure to meet an LCO, the Required Actions of the associated Conditions shall be met, except as provided in LCO 3.0.5 and LCO 3.0.6.

If the LCO is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Action(s) is not required unless otherwise stated.

LCO 3.0.3

When an LCO is not met and the associated ACTIONS are not met, an associated ACTION is not provided, or if directed by the associated ACTIONS, the unit shall be placed in a MODE or other specified condition in which the LCO is not applicable. Action shall be initiated within 1 hour to place the unit, as applicable, in:

a. MODE 3 within 7 hours;

b. MODE 4 within 13 hours; and

c. MODE 5 within 37 hours.

Exceptions to this Specification are stated in the individual Specifications.

Where corrective measures are completed that permit operation in accordance with the LCO or ACTIONS, completion of the actions required by LCO 3.0.3 is not required.

LCO 3.0.3 is only applicable in MODES 1, 2, 3, and 4.

LCO 3.0.4

When an LCO is not met, entry into a MODE or other specified condition in the Applicability shall only be made:

a. When the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time;

Not allowed to operate for an unlimited amount of time with Inoperable PORV and closed Block valve.

(continued)

3.0 LCO APPLICABILITY

LCO 3.0.4 (continued)

No Risk Assessment has been performed

b. After performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering the MODE or other specified condition in the Applicability, and establishment of risk management actions, if appropriate; exceptions to this Specification are stated in the individual Specifications, or

Not allowed per the TS 3.4.11

c. When an allowance is stated in the individual value, parameter, or other Specification.

This Specification shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

LCO 3.0.5

Equipment removed from service or declared inoperable to comply with ACTIONS may be returned to service under administrative control solely to perform testing required to demonstrate its OPERABILITY or the OPERABILITY of other equipment. This is an exception to LCO 3.0.2 for the system returned to service under administrative control to perform the testing required to demonstrate OPERABILITY.

LCO 3.0.6

When a supported system LCO is not met solely due to a support system LCO not being met, the Conditions and Required Actions associated with this supported system are not required to be entered. Only the support system LCO ACTIONS are required to be entered. This is an exception to LCO 3.0.2 for the supported system. In this event, an evaluation shall be performed in accordance with specification 5.5.15, "Safety Function Determination Program (SFDP)." If a loss of safety function is determined to exist by this program, the appropriate Conditions and Required Actions of the LCO in which the loss of safety function exists are required to be entered.

When a support system's Required Action directs a supported system to be declared inoperable or directs entry into Conditions and Required Actions for a supported system, the applicable Conditions and Required Actions shall be entered in accordance with LCO 3.0.2.

LCO 3.0.7

Test Exception LCO 3.1.8 allows specified Technical Specification (TS) requirements to be changed to permit performance of special tests and operations. Unless otherwise specified, all other TS requirements remain unchanged. Compliance with Test Exception LCOs is optional. When a Test Exception LCO is desired to be met but is not met, the ACTIONS of the Test Exception LCO shall be met. When a Test Exception LCO is not desired to be met, entry into a MODE or other specified condition in the Applicability shall be made in accordance with the other applicable Specifications.

Original Vogtle 2012 NRC Exam question that was used to develop 008AG2.2.22

Initial conditions:

- Unit 1 is at 100% power, all systems normal.
- ALB12-D03, PRZR PRESS LO PORV BLOCK illuminates.
- ALB12-E01, PRZR RELIEF DISCH HI TEMP illuminates.
- All PRZR Relief temperatures are rising.

- PRZR PORV 455A has been placed in the closed position.
- PRZR PORV 455A indicates half red / hollow and half green / solid on the IPC computer point.

- PRZR pressure cycling between 2185 psig to 2200 psig.

Current conditions:

- PRZR PORV 455A Block Valve has been closed.

- PRZR pressure is 2208 psig and slowly rising.
- All PRZR Relief temperatures have stabilized and begun to lower.

Which one of the following correctly completes the following statement?

Per Tech Spec 3.4.11, "Pressurizer Power Operated Relief Valves (PORVs)", PRZR PORV 455A Block Valve ___(1)___ required to be de-energized

and

based on the currrent conditions, if an RCS pressure transient were to occur, **"B" PORV 456A** will lift at an RCS pressure of ____(2)___ psig.

A. (1) is NOT

(2) 2345

B. (1) is NOT

(2) 2335

C. (1) is

(2) 2345

D. ✓ (1) is

(2) 2335

80. 024AA2.06 080

Unit 1 has been in operation at 100% power for 3 months after a Refueling Outage. The following conditions exist:

<u>At 1000:</u>

- A Reactor Trip occurs.

<u>At 1400:</u>

- RCS Tavg is 547°F and stable.
- Source Range counts have been slowly increasing for the last two hours and is currently 320 cps.
- STP-29.1, Shutdown Margin Calculation (TAVG 547°F), has determined that Shutdown Margin is (-)1550 pcm.

Which one of the following completes the statements below?

Source Range counts are rising due to __(1)__ .

Per the BASES of Tech Spec 3.1.1, Shutdown Margin (SDM), one of the accidents that the SDM requirement must protect against is __(2)__ .

A. 1) TCV-3083, LTDN HX CCW TEMP CONT, valve has failed open

2) an uncontrolled Control Rod withdrawal

B. 1) Xenon decay

2) an uncontrolled Control Rod withdrawal

C✓ 1) TCV-3083, LTDN HX CCW TEMP CONT, valve has failed open

2) an inadvertent boron dilution

D. 1) Xenon decay

2) an inadvertent boron dilution

TCV-3083 is the temperature control valve for CCW cooling to the Letdown Heat Exchanger. This valve is controlled automatically per a setpoint demanded by a controller on the MCB. This valve fails open on a loss of air. If the valve fails open, it will cause more CCW cooling flow through the Letdown HX and cause Letdown temperature to go down, thus causing more boron absorption in the Letdown demins and causing Source Range counts to rise.

A. Incorrect 1) Correct, TCV-3083 failing open will cause excessive cooling of the Letdown flow, and a resultant increased absorption of boron in the Letdown demineralizers. This will equate to a dilution and cause Source Range counts to rise.

2) Incorrect, plausible because one of the accident scenarios evaluated for adequate SDM is a Control Rod ejection accident. This distracter is very similar. Both of the items mentioned will add positive reactivity. In addition, a candidate may think that Control Rods stepping out would reduce the SDM, but actually SDM should be basically unaffected. If Control rods step out during an uncontrolled Control Rod withdrawal, they are still available to insert negative reactivity upon a Reactor trip, and SDM should be unaffected.

B. Incorrect 1) Incorrect, Xenon will build in for the same hours as the square root of the original power level, i.e. if original power level is 100% (and stable for an extended period of time), xenon will build in for 10 hours. After that point Xenon will turn and start to decay away. In this case the Reactor trip occurred 4 hours ago, so Xenon is still steadily building in.
Plausible that a candidate would determine Xenon would be decaying away since that is what it would be doing after a 10 hour time frame. This could add positive reactivity and cause Source Range counts to increase.

2) Incorrect, see A.2.

C. Correct 1) Correct, see A.1.

2) Correct, one of the TS Bases accident conditions evaluated to determine required SDM to prevent core damage is an inadvertent boron dilution.

D. Incorrect 1) Incorrect, see B.1.

2) Correct, see C.2.

K/A: 024AA2.06 Emergency Boration:
Ability to determine and interpret the following as they apply

to the Emergency Boration:
(CFR: 43.5 / 45.13)
AA2.06 When boron dilution is taking place 3.6 3.7

Importance Rating: 3.6 3.7

Technical Reference: FNP-1-STP-29.1, v38
Tech Specs v190/186
Tech Spec Bases v58
COLR v24-1 / 22-1

References provided: None

Learning Objective: DETERMINE AND APPLY the information from the LCO BASES sections: BACKGROUND, APPLICABLE SAFETY ANALYSIS, ACTIONS, SURVEILLENCE REQUIREMENTS, for any Technical Specifications or TRM requirements associated with AOP-27, Emergency Boration, components and attendant equipment. (OPS-62521A01) 10CFR55.43 (b) 2

Question History: New question

Basis for meeting K/A: This question tests the candidate's ability to evaluate conditions relating to a boron dilution event causing Shutdown Margin to be inadequate. An Emergency Boration is required due to Shutdown Margin being less than the COLR required minimum. The candidate has to determine that a boron dilution event is occurring. In addition, the candidate is tested on knowledge of TS Bases accident analyses for SDM. One of the Bases requirements of adequate SDM is to allow the operator sufficient time to stop an inadvertent dilution prior to potential core damage.

SRO justification: Facility operating limitations in the TS and their bases. [10 CFR 55.43(b)(2)]

- Knowledge of TS bases that is required to analyze TS required actions and terminology.

TS Bases knowledge is tested for analysis of accidents for which adequate SDM is a limiting condition.

2013 NRC exam

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(2) :

1) can NOT be answered by knowing less than 1 hour Tech Specs.
2) can NOT be answered by knowing information listed "above-the-line".
3) can NOT be answered by knowing the TS Safety Limits or their bases.
4) Does involve one or more of the following for TS, TRM or ODCM:

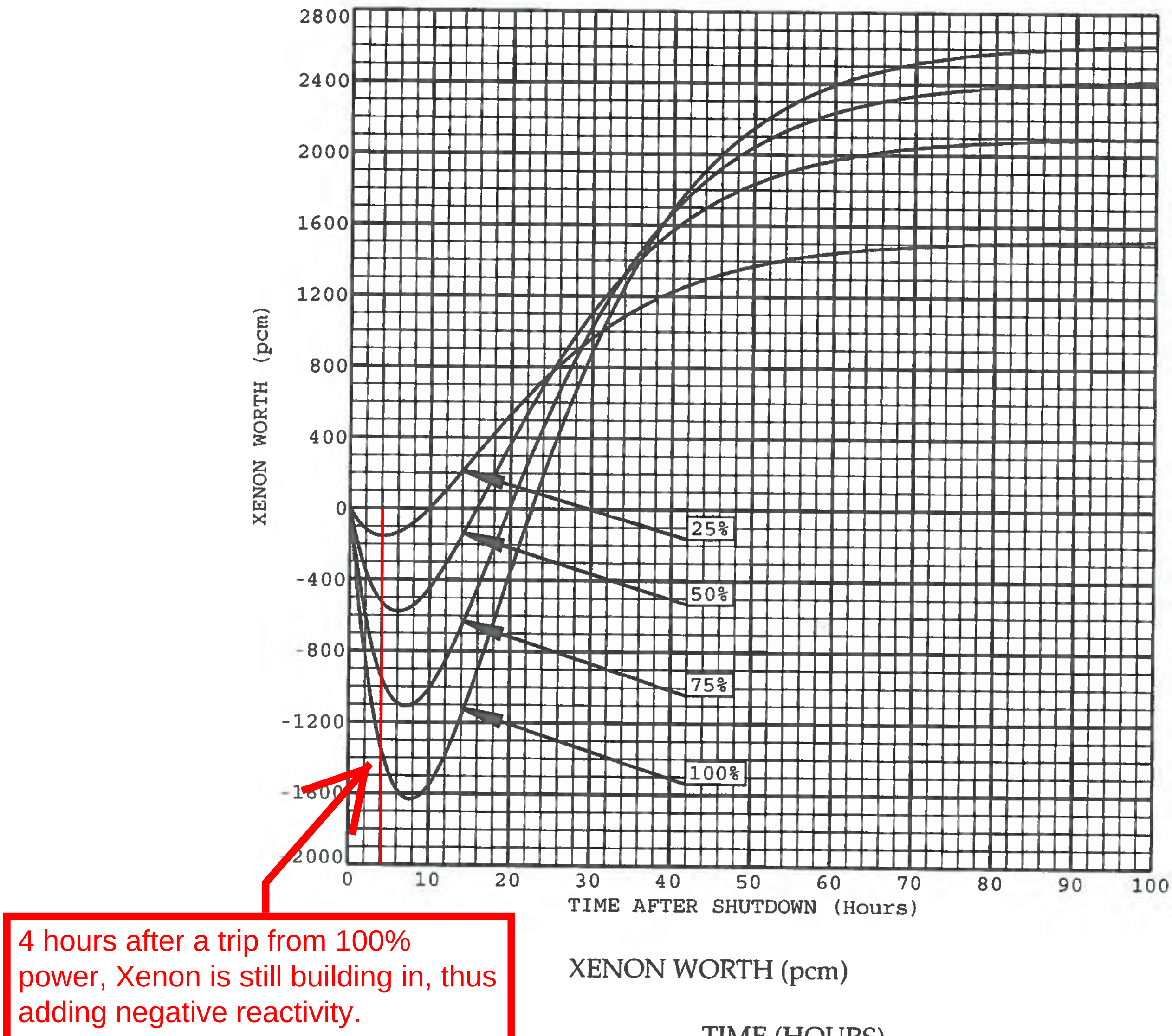
- Knowledge of TS bases that is required to analyze TS required actions and terminology

UNIT 1 CYCLE 25 CURVE 60
Xenon Worth vs. Time Following Plant Trip
at Various Burnups After Steady State Operation
at Various Power Levels

REV. 30

APPROVED: C A [signature] 4-2-12
ENGINEERING SUPPORT MANAGER DATE

BOL (0 - 5000 MWD/MTU)



XENON WORTH (pcm)

LEVEL	TIME (HOURS) 8	25	45	80	100
25%	-78	769	1311	1505	1518
50%	-543	768	1723	2074	2099
75%	-1099	563	1887	2383	2418
100%	-1632	311	1954	2576	2620

3.1 REACTIVITY CONTROL SYSTEMS

3.1.1 SHUTDOWN MARGIN (SDM)

LCO 3.1.1 SDM shall be within the limits provided in the COLR.

APPLICABILITY: MODE 2 with k_{eff} < 1.0,
MODES 3, 4, and 5.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. SDM not within limit.	A.1 Initiate boration to restore SDM to within limit.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.1.1	Verify SDM to be within limits.	In accordance with the Surveillance Frequency Control Program

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.1 SHUTDOWN MARGIN (SDM)

BASES

BACKGROUND

According to GDC 26 (Ref. 1), the reactivity control systems must be redundant and capable of holding the reactor core subcritical when shut down under cold conditions. Maintenance of the SDM ensures that postulated reactivity events will not damage the fuel.

SDM requirements provide sufficient reactivity margin to ensure that acceptable fuel design limits will not be exceeded for normal shutdown and anticipated operational occurrences (AOOs). As such, the SDM defines the degree of subcriticality that would be obtained immediately following the insertion or trip of all shutdown and control rods, assuming that the single rod cluster assembly of highest reactivity worth is fully withdrawn.

The system design requires that two independent reactivity control systems be provided, and that one of these systems be capable of maintaining the core subcritical under cold conditions. These requirements are provided by the use of movable control assemblies and soluble boric acid in the Reactor Coolant System (RCS). The Rod Control System can compensate for the reactivity effects of the fuel and water temperature changes accompanying power level changes over the range from full load to no load. In addition, the Rod Control System, together with the boration system, provides the SDM during power operation and is capable of making the core subcritical rapidly enough to prevent exceeding acceptable fuel damage limits, assuming that the rod of highest reactivity worth remains fully withdrawn. The Chemical and Volume Control System can control the soluble boron concentration to compensate for fuel depletion during operation and all xenon burnout reactivity changes and can maintain the reactor subcritical under cold conditions.

During power operation, SDM control is ensured by operating with the shutdown banks fully withdrawn and the control banks within the limits of LCO 3.1.6, "Control Bank Insertion Limits." When the unit is in the shutdown and refueling modes, the SDM requirements are met by means of adjustments to the RCS boron concentration.

BASES

APPLICABLE SAFETY ANALYSES

The minimum required SDM is assumed as an initial condition in safety analyses. The safety analysis (Ref. 2) establishes an SDM that ensures specified acceptable fuel design limits are not exceeded for normal operation and AOOs, with the assumption of the highest worth rod stuck out on a trip.

For MODE 5, the primary Safety Analysis that relies on the SDM limits is the boron dilution analysis.

The acceptance criteria for the SDM requirements are that specified acceptable fuel design limits are maintained. This is done by ensuring that:

a. The reactor can be made subcritical from all operating conditions, transients, and Design Basis Events;

b. The reactivity transients associated with postulated accident conditions are controllable within acceptable limits (departure from nucleate boiling ratio (DNBR), fuel centerline temperature limits for AOOs, and less than 200 cal/gm, thus meeting the NRC acceptance criteria of ≤ 280 cal/gm average fuel pellet enthalpy at the hot spot for the rod ejection accident); and

c. The reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

An Operating Procedure (Ref. 5) assures sufficient operator action time for the mitigation of an uncontrolled boron dilution event (Ref. 3) in MODE 5. This procedure is independent of SDM and uses the RHR system flowrate, and the calculated critical boron concentration to specify a minimum allowable boron concentration.

The most limiting accident for the SDM requirements is based on a guillotine break of a main steam line (MSLB) inside containment initiated at the end of core cycle life with RCS average temperature at no-load operating temperature, as described in the accident analysis (Ref. 2). The increased steam flow resulting from a pipe break in the main steam system causes an increased energy removal from the affected steam generator (SG), and consequently the RCS. This results in a reduction of the reactor coolant temperature. The resultant

(continued)

APPLICABLE SAFETY ANALYSES (continued)

coolant shrinkage causes a reduction in pressure. In the presence of a negative moderator temperature coefficient, this cooldown causes an increase in core reactivity. As RCS temperature decreases, the severity of an MSLB decreases until the MODE 5 value is reached. The most limiting MSLB, with respect to potential fuel damage before a reactor trip occurs, is a guillotine break of a main steam line inside containment initiated at the end of core life. The positive reactivity addition from the moderator temperature decrease will terminate when the affected SG boils dry, thus terminating RCS heat removal and cooldown. Following the MSLB, a post trip return to power may occur; however, no fuel damage occurs as a result of the post trip return to power, and that the Safety Limit (SL) requirement of SL 2.1.1 is met.

In addition to the limiting MSLB transient, the SDM requirement must also protect against:

a. Inadvertent boron dilution; and

b. Rod ejection.

Each of these events is discussed below.

In the boron dilution analysis (Ref. 3), the required SDM defines the reactivity difference between an initial subcritical boron concentration and the corresponding critical boron concentration. These values, in conjunction with the configuration of the RCS and the assumed dilution flow rate, directly affect the results of the analysis. This event is most limiting at the beginning of core life, when critical boron concentrations are highest. For each cycle of operation at Farley Nuclear Plant, the minimum boron concentrations that are required in MODES 4 and 5 to allow 15 minutes operator action time are given in the Nuclear Design Report for that cycle.

The ejection of a control rod rapidly adds reactivity to the reactor core, causing both the core power level and heat flux to increase with corresponding increases in reactor coolant temperatures and pressure. The ejection of a rod also produces a time dependent redistribution of core power.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

SDM satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii). Even though it is not directly observed from the control room, SDM is considered an initial condition process variable because it is periodically monitored to ensure that the unit is operating within the bounds of accident analysis assumptions.

With T_{avg} less than 200°F, the reactivity transients resulting from a postulated steam line break cooldown are minimal, and a 1% delta k/k SHUTDOWN MARGIN provides adequate protection.

LCO

SDM is a core design condition that can be ensured during operation through control rod positioning (control and shutdown banks) and through the soluble boron concentration.

The MSLB (Ref. 2) and the boron dilution (Ref. 3) accidents are the most limiting analyses that establish the SDM value of the LCO. For MSLB accidents, if the LCO is violated, there is a potential to exceed the DNBR limit and to exceed 10 CFR 100, "Reactor Site Criteria," limits (Ref. 4). For the boron dilution accident, if the LCO is violated, the minimum required time assumed for operator action to terminate dilution may no longer be applicable.

APPLICABILITY

In MODE 2 with k_{eff} < 1.0 and in MODES 3, 4, and 5, the SDM requirements are applicable to provide sufficient negative reactivity to meet the assumptions of the safety analyses discussed above. In MODE 6, the shutdown reactivity requirements are given in LCO 3.9.1, "Boron Concentration." In MODES 1 and 2, SDM is ensured by complying with LCO 3.1.5, "Shutdown Bank Insertion Limits," and LCO 3.1.6, "Control Bank Insertion Limits."

ACTIONS

A.1

If the SDM requirements are not met, boration must be initiated promptly. A Completion Time of Immediately is adequate to ensure prompt operator action to correctly align and start the required

(continued)

ACTIONS

A.1 (continued)

systems and components. It is assumed that boration will be continued until the SDM requirements are met.

In the determination of the required combination of boration flow rate and boron concentration, there is no unique requirement that must be satisfied. Since it is imperative to raise the boron concentration of the RCS as soon as possible, the flowpath of choice would utilize a highly concentrated solution, such as that normally found in the boric acid storage tank, or the refueling water storage tank. The operator should borate with the best source available for the plant conditions.

In determining the boration flow rate, the time in core life must be considered. For instance, the most difficult time in core life to increase the RCS boron concentration is at the beginning of cycle when the boron concentration may approach or exceed 2000 ppm. For example, if the emergency boration path is used, the CVCS is capable of inserting negative reactivity at a rate of approximately 65 pcm/min when the RCS boron concentration is 1000 ppm and approximately 75 pcm/min when the RCS boron concentration is 100 ppm.

SURVEILLANCE REQUIREMENTS

SR 3.1.1.1

In MODES 1 and 2, SDM is verified by observing that the requirements of LCO 3.1.5 and LCO 3.1.6 are met. In the event that a rod is known to be untrippable, however, SDM verification must account for the worth of the untrippable rod as well as another rod of maximum worth.

In MODES 3, 4, and 5, the SDM is verified by performing a reactivity balance calculation, considering the listed reactivity effects:

a. RCS boron concentration;

b. Control bank position;

c. RCS average temperature;

d. Fuel burnup based on gross thermal energy generation;

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.1.1 (continued)

e. Xenon concentration;

f. Samarium concentration; and

g. Isothermal temperature coefficient (ITC).

Using the ITC accounts for Doppler reactivity in this calculation because the reactor is subcritical, and the fuel temperature will be changing at the same rate as the RCS.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 26.
2. FSAR, Section 15.4.2.
3. FSAR, Section 15.2.4.
4. 10 CFR 100.
5. Letter from D.E. McKinnon to L.K. Mathews, “Operating Procedure for Mode 4/5 Boron Dilution,” 90 AP*-G-0041, July 6, 1990.

81. 028G2.1.1 081

Unit 2 is in Mode 5 with the following conditions:

- CTMT Purge was secured for a Local Leak Rate Test (LLRT) and the LLRT Tagout has been cleared.
- R-24A, Containment Radiation Monitor, has been declared INOPERABLE.

Prior to placing the CTMT Purge system in operation per SOP-12.2, Containment Purge and Pre-Access Filtration System, which one of the following requirements must be met?

A. R-24A is required to be restored to OPERABLE status.

B.✔ Gaseous Release Permits are required to be issued.

C. Alternate sampling is required to be performed per the ODCM.

D. CTMT Pre-Access Filtration must always be placed in service prior to placing CTMT Purge in service.

FNP-2-SOP-12.2 v38.0

A. Incorrect SOP-12.2 requires that either R-24A or B is in service prior to starting Containment Purge. A candidate could think that both rad monitors are required to be in service prior to placing Containment Purge in service. In MODE 5 with no CORE ALTERATIONS in progress, there are no TS requirements for R-24A or B to be in service. Plausible since this answer would be a correct statement if CORE ALTERATIONS or fuel movement were in progress

B. Correct Current Gaseous Release Permits are required to be issued. This is plural because there is also a release permit that is in effect at all times when the Plant Vent Stack exhaust fans are running. Step 4.4.9 has the operator verify this. This is to comply with the ODCM requirement for sampling. The Gaseous Release Permit establishes that the Containment atmosphere has been sampled and its activity is within limits bounded by the ODCM, Table 3-3. (FNP-0-CCP-213.0)

C. Incorrect Plausible since SOP-12.2 has the operator verify R-14 and 22 are aligned for normal operation OR applicable ODCM or TS actions are being performed. These actions may include alternate sampling requirements. Neither R-14 or R-22 is out of service. In addition, SOP-12.2 has alternate sampling requirements for R-14, R-22, or R-29B (step 2.4.3 of Appendix 3). Plausible that the candidate may think these requirements are for R-24A and R-24B.
In MODE 5 with no CORE ALTERATIONS in progress, there are no TS requirements for R-24A or B to be in service.

D. Incorrect Plausible, SOP-12.2 states:
"IF the activity level within containment is determined to be excessive by sample analysis, THEN operate the containment pre-access filtration system per Section 4.1 as necessary to reduce the activity level as specified by Health Physics."

Placing Pre-Access Filtration in service is not always required, but is required when CTMT activity is excessive.

K/A: 028G2.1.1 Hydrogen Recombiner and Purge Control System (HRPS)
Knowledge of conduct of operations requirements.
(CFR: 41.10 / 45.13)
IMPORTANCE RO 3.8 SRO 4.2

Importance Rating: 3.8 4.2

Technical Reference: FNP-2-SOP-12.2, v38

References provided: None

Learning Objective: RECALL AND APPLY the information from the LCO BASES

sections: BACKGROUND, APPLICABLE SAFETY ANALYSIS, ACTIONS, SURVEILLENCE REQUIREMENTS, for any Technical Specifications or TRM requirements associated with Miscellaneous Ventilation System components and attendant equipment alignment, to include the following (OPS-62107D01): 10CFR55.43 (b) 2
13.3.4, Radiation Monitoring Instrumentation
13.7.5, Area Temperature Monitoring (Unit 2 Only)

Question History: FNP Bank question from HLT-28, 2004 NRC Exam
CMNT VENT-62107A02 01

K/A match: Candidate is questioned on the requirements of a Containment atmosphere release. Per the Farley ODCM, a Containment atmosphere release is not considered an effluent release, but there are ODCM requirements for sampling to ensure that the effects will not cause an effluent release to exceed limits in the ODCM. Candidate has to have knowledge of the ODCM and actions required for conducting a release of the Containment atmosphere.

SRO justification: 10 CFR 55.43(b)(2):
Application of Required Actions (Section 3) and Surveillance Requirements (SR) (Section 4) in accordance with rules of application requirements (Section 1).

Same items listed above for the Technical Requirements Manual (TRM) and Offsite Dose Calculation Manual (ODCM).

Requires knowledge of Surveillance Requirements of the ODCM - the ODCM requires sampling of the Containment atmosphere prior to release. This is performed by CHEMISTRY, who then issues a release permit to allow the Containment atmosphere release.

2013 NRC exam

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(2)

1) can **NOT** be answered by knowing less than 1 hour Tech Specs.
2) can **NOT** be answered by knowing information listed "above-the-line".
3) can **NOT** be answered by knowing the TS Safety Limits or their bases.
4) Does involve **one or** more of the following for TS, TRM or ODCM:

- Application of Required Actions (Section 3) and Surveillance Requirements (SR) (Section 4) in accordance with rules of application requirements (Section 1)..

FARLEY NUCLEAR PLANT

SYSTEM OPERATING PROCEDURE

FNP-2-SOP-12.2

See pages 2, 5, and page 2 of 5 of Appendix 3.

SAFETY RELATED

CONTAINMENT PURGE AND PRE-ACCESS FILTRATION SYSTEM

PROCEDURE LEVEL OF USE CLASSIFICATION PER NMP-AP-003	
CATEGORY	**SECTIONS**
Continuous:	**ALL**
Reference:	**NONE**
Information:	**NONE**

Approved:

David L Reed (for)
Operations Manager

Date Issued: February 23, 2012

TABLE OF CONTENTS

FARLEY NUCLEAR PLANT
UNIT 2
SYSTEM OPERATING PROCEDURE SOP-12.2

CONTAINMENT PURGE AND PRE-ACCESS FILTRATION SYSTEM

1.0 PURPOSE

This procedure provides the Initial Conditions, Precautions and Limitations, and Instructions for operation of the Containment Purge and Pre-Access Filtration System. Instructions are included in the following sections:

4.1 Containment Pre-Access Filtration Operation

4.2 Containment Radiation Monitor R-11 and R-12 Operation

4.3 Containment/Atmosphere Differential Pressure Instrument PDI-3317 Operation

4.4 Placing Containment Purge System in Operation

4.5 Removing Containment Purge System from Operation

4.6 Restoring Containment Purge Following a Safety Injection or Hi Hi Radiation System

4.7 Placing Containment Mini-Purge System in Operation

4.8 Removing Containment Mini-Purge System from Operation

4.9 Restoring Containment Mini-Purge Following a Safety Injection or Hi Hi Radiation Signal

Appendix 1 Contingency Operation of Containment Mini-Purge with Supply Fan Unavailable

Appendix 2 Contingency Operation of Containment Main Purge with Supply Fan Unavailable with Containment Integrity Not Required

Appendix 3 Batch Releases of Containment Atmosphere

2.0 INITIAL CONDITIONS

2.1 The electrical distribution system is energized and aligned for normal operation per FNP-2-SOP-36.0, PLANT ELECTRICAL DISTRIBUTION LINE-UP, with exceptions noted.

2.2 The compressed air system is in service and aligned for normal operation per FNP-2-SOP-31.0, COMPRESSED AIR SYSTEM.

2.3 The containment purge and pre-access filtration system valves and electrical distribution systems are aligned per system checklist FNP-2-SOP-12.2A with exceptions noted.

2.4 The auxiliary building main exhaust system is in service per FNP-2-SOP-58.0, AUXILIARY BUILDING HVAC SYSTEM.

2.5 Radiation monitors (R-14, R-22, R-24A and R-24B) are aligned for normal operation per FNP-2-SOP-45.0, RADIATION MONITORING SYSTEM, or applicable ODCM or technical specifications action statement is being met.

Plausibility for ODCM Alternate actions

2.6 The plant hot water heating system is aligned for normal operation as required by seasonal conditions per FNP-2-SOP-59.0, PLANT HOT WATER HEATING SYSTEM (applicable only to section 4.4).

3.0 PRECAUTIONS AND LIMITATIONS

3.1 The following rules apply to operation of the Auxiliary Building Main Exhaust fans, in relation to the CTMT Purge system:

3.1.1. Both Auxiliary Building Main Exhaust Fans must be and should only be placed in service when CTMT main purge is placed in service to prevent an overpressurization or excessive vacuum from being developed inside the exhaust plenum. (NEL 99-0078; REA 98 1808).

3.1.2. There is one exception to this rule: WHEN the Spent Fuel Pool Ventilation system is NOT operating, and the CTMT Main Purge system is in operation in Lo-Speed, THEN only one main exhaust fan is required (NEL 99 0078)

3.1.3. For the normal situation when the Spent Fuel Ventilation and Radwaste Ventilation fans are running, THEN both Auxiliary Building Main Exhaust fans shall be in operation to operate CTMT Main Purge.

3.2 A gaseous waste release permit must be obtained prior to purge or mini-purge of CTMT.

Correct answer

NOTE: FNP-2-UOP-1.1 and FNP-2-UOP-2.2 control the associated links as necessary to inhibit CTMT Main Purge damper operation when RCS temperature is > 200°F.

3.3 The CTMT main purge system can only be used when RCS temperature is < 200°F.

3.4 Evaluation on a case by case basis may be necessary for the release of smoke or other chemicals not considered VOCs that could contaminate the charcoal adsorbers or HEPA filter.

3.5 The main and mini-purge supply and exhaust dampers must not be opened with CTMT TO ATMOS ΔP greater than 0.4 psid.

3.6 The mini-purge supply and exhaust fans must not be started with CTMT TO ATMOS ΔP greater than 0.25 psid.

3.7 IF unable to commence a batch release of the CTMT per Appendix 3 prior to exceeding 0.4 psid, THEN go to FNP-2-SOP-10.0 Appendix 1 for instructions for venting the CTMT.

3.8 Following a CTMT ILRT, CTMT purge must be verified vented prior to being placed in service. (AI 2009207430)

4.0 INSTRUCTIONS

4.1 CONTAINMENT PRE-ACCESS FILTRATION OPERATION:

NOTE: The local control panels for the filtration units are at the following locations:

- **2A CTMT Pre-Access Filtration Unit - 155 ft by 2C MCC**
- **2B CTMT Pre-Access Filtration Unit - 121 ft by 2D MCC**

4.1.1 IF desired to place CTMT pre-access filtration in service, THEN **start** the desired filtration unit(s):

- 2A CTMT Pre-Access Filtration Unit N2T50M001A
- 2B CTMT Pre-Access Filtration Unit N2T50M001B

4.1.2 IF desired to remove CTMT pre-access filtration from service, THEN **stop** the filtration unit(s):

- 2A CTMT Pre-Access Filtration Unit N2T50M001A
- 2B CTMT Pre-Access Filtration Unit N2T50M001B

4.2 CONTAINMENT RADIATION MONITOR R-11 AND R-12 OPERATION:

4.2.1 **Align** R-11/12 flow path for operation per FNP-2-SOP-45.0.

4.2.2 **Remove** R-11/12 flow path from operation per FNP-2-SOP-45.0.

4.3 CONTAINMENT/ATMOSPHERE DIFFERENTIAL PRESSURE INSTRUMENT PDI-3317 OPERATION:

4.3.1 IF desired to place CTMT TO ATMOS ΔP N2C14PDI3317 in service, THEN **open** the following:

- CTMT ΔP ISO Q2E14MOV3318A
- CTMT ΔP ISO Q2E14MOV3318B

4.3.2 IF desired to remove CTMT TO ATMOS ΔP N2C14PDI3317 from service, THEN **close** the following:

- CTMT ΔP ISO Q2E14MOV3318A
- CTMT ΔP ISO Q2E14MOV3318B

4.4 PLACING CONTAINMENT PURGE SYSTEM IN OPERATION

4.4.1 IF CTMT Purge system was removed from operation for a short duration for maintenance or testing, THEN **place** the CTMT Purge system back in service by performing steps 4.4.13 through 4.4.21.

4.4.2 IF main purge supply and exhaust fans were tripped by temperature switches TSH-2280A, TSH-2280B, TSH-2281A, or TSH-2281B, THEN **refer** to FNP-2-FVP-9.0, CONTAINMENT AND PURGE EQUIPMENT ROOM AREAS.

4.4.3 **Verify** auxiliary building main exhaust system in service.

4.4.4 **Verify** plant vent stack radiation monitor R-14 is in service per FNP-2-SOP-45.0, RADIATION MONITORING SYSTEM.

4.4.5 **Verify** one of the following plant vent stack radiation monitors are in service:

- R22 per FNP-2-SOP-45.0, RADIATION MONITORING SYSTEM
  OR
- R29B per FNP-0-CCP-641, OPERATIONS OF THE PLANT VENT STACK MONITORING SYSTEM

4.4.6 **Verify** radiation monitor R-24A or R-24B in service per FNP-2-SOP-45.0, RADIATION MONITORING SYSTEM.

Only one rad monitor, Either R24A or R24B is required

4.4.7 **Verify** CTMT PURGE SUPP/EXH FANS & DAMPERS handswitch selected to STOP.

4.4.8 **Verify** the following are in operation OR CR written for repair:

- Recorders RR0100 (points RR14 and RR22), RR24A, and RR24B
  OR
- Recorders RR0100 (point RR14), RR24A, RR24B, and printer R29B

Correct Answer

4.4.9 **Verify** gaseous waste release permit has been issued for CTMT purge operation.

4.4.10 IF the activity level within containment is determined to be excessive by sample analysis, THEN **operate** the containment pre-access filtration system per section 4.1 as necessary to reduce the activity level as specified by Health Physics.

Plausibility for placing Pre-Access Filtration in service

4.4.11 **Verify** that the alarm setpoints for R-24A and R-24B are less than or equal to the maximum allowable setpoints listed in Part II of the gaseous waste release permit. (See FNP-2-CCP-213.1, GASEOUS EFFLUENT RADIATION MONITORING SYSTEM SETPOINTS, for current alarm setpoints.)

4.4.12 **Verify** closed the following CTMT purge filter cooling valves:

- N2P13V293
- N2P13V294

4.4.13 **Verify** stopped MINI PURGE SUPP/EXH FAN.

4.4.14 **Place** CTMT PURGE DMPRS handswitch HS-3196 to FULL.

4.4.15 **Place** CTMT PURGE DMPRS handswitch HS-3198 to FULL.

CAUTION: **Operation of CTMT main purge in High Speed with only one auxiliary building main exhaust fan available AND SFP ventilation in service will over pressurize the exhaust plenum. (OR 99750.2)**

4.4.16 IF only one Auxiliary Building Main Exhaust Fan is available THEN **secure** SFP ventilation per FNP-2-SOP-58.0, AUXILIARY BUILDING HVAC SYSTEM, and then continue on in this procedure. (Refer to P&L 3.13.1.)

NOTE: **Step 4.4.18 below needs to be performed without delay after performing step 4.4.17, to avoid overpressurizing the exhaust plenum. Consideration should be given to the use of two operators in communication, if available, to perform these two steps.**

CAUTION: **Placing CTMT main purge supply and exhaust fans in service, with only one auxiliary building main exhaust fan in service will over pressurize the exhaust plenum, unless SFP Ventilation system has been secured. (NEL 99-0078)**

4.4.17 **Start** CTMT PURGE SUPP/EXH FANS & DAMPERS in LOW.

4.4.18 IF available, THEN Immediately **start** the second Auxiliary Building Main Exhaust Fan,

4.4.19 **Perform** the following to checkout the operating system:

- **Walkdown** fans and ductwork.
- Visually **inspect** for damage.
- **Report** any problems to the control room.

4.4.20 IF increased flow is required AND **both** Auxiliary Building Main Exhaust Fans are operating, THEN **shift** CTMT PURGE SUPP/EXH FANS & DAMPERS to HI.

4.4.21 **Notify** the Shift Radiochemist that CTMT main-purge is in service.

4.5 REMOVING CONTAINMENT PURGE SYSTEM FROM OPERATION

CAUTION: Both Auxiliary Building Main Exhaust Fans must be and should only be placed in service when CTMT main purge is placed in service to prevent over pressurizing the exhaust plenum. (NEL 99-0078)

4.5.1 **Notify** the Shift Radiochemist prior to securing CTMT purge.

4.5.2 IF the unit is in Modes 5, 6 or Defueled THEN **notify** HP prior to securing CTMT purge.

4.5.3 **Reduce** the number of Aux Bldg Mn Exh Fans in service to one.

4.5.4 **Place** CTMT PURGE SUPP/EXH FANS & DAMPERS handswitch to STOP.

4.5.5 **Place** CTMT PURGE DMPRS handswitch HS-3196 to CLOSE.

4.5.6 **Place** CTMT PURGE DMPRS handswitch HS-3198 to CLOSE.

4.5.7 **Check** the following containment purge dampers closed:

- HV-3198A & D
- HV-3198B & C

> **NOTE: If CTMT Purge system is to be removed from operation for a short duration for maintenance or testing, steps 4.5.8 and 4.5.9 are NOT required.**

4.5.8 IF desired AND approved by the Shift Supervisor, THEN **open** the following CTMT purge filter cooling valves:

- N2P13V293
- N2P13V294

> **NOTE: R-24A or R-24B is required to be operable in Modes 1-4, AND both channels are required to be operable during core alterations and moving of irradiated fuel in containment.**

4.5.9 IF desired, THEN **turn** OFF radiation monitors R-24A and R-24B and their respective recorders.

4.6 RESTORING CONTAINMENT PURGE FOLLOWING A SAFETY INJECTION OR HI HI RADIATION SIGNAL:

4.6.1 **Verify** Safety Injection or Hi Hi Radiation signal has been reset.

4.6.2 **Place** the following CTMT PURGE DMPRS handswitches to CLOSE for at least 2 seconds:

- HS-3196
- HS-3198

4.6.3 **Place** the following CTMT PURGE DMPRS handswitches to FULL:

- HS-3196
- HS-3198

4.6.4 **Restart** CTMT purge supply and exhaust fans per steps 4.4.17 through 4.4.21.

4.7 PLACING CONTAINMENT MINI-PURGE SYSTEM IN OPERATION

4.7.1 IF CTMT mini-purge system was removed from operation for a short duration for maintenance or testing, THEN **go** to step 4.7.12 to place the CTMT mini-purge system back in service.

4.7.2 **Verify** auxiliary building main exhaust system in service per FNP-2-SOP-58.0, AUXILIARY BUILDING HVAC SYSTEM.

4.7.3 **Verify** that plant vent stack radiation monitors R-14 and R-22 are aligned for normal operation per FNP-2-SOP-45.0, RADIATION MONITORING SYSTEM, OR alternate sampling being performed as required per ODCM.

4.7.4 **Verify** radiation monitor R-24A OR R-24B in service per FNP-2-SOP-45.0, RADIATION MONITORING SYSTEM.

4.7.5 **Verify** CTMT PURGE SUPP/EXH FANS & DAMPERS handswitch selected to STOP.

4.7.6 **Verify** recorders RR0100 (points RR14 and RR22), RR24A, and RR24B in operation, OR CR written for repair.

4.7.7 **Verify** gaseous waste release permit has been issued for CTMT mini-purge operation.

4.7.8 **Verify** that the alarm setpoints for R-24A and R-24B are less than or equal to the maximum allowable setpoints listed in Part II of the gaseous waste release permit. (See FNP-2-CCP-213.1, GASEOUS EFFLUENT RADIATION MONITORING SYSTEM SETPOINTS, current alarm setpoints.)

4.7.9 IF the activity level within containment is determined to be excessive by sample analysis, THEN **operate** the containment pre-access filtration system per section 4.1 to reduce the activity level as specified by the Health Physics department.

4.7.10 **Verify** the following are current prior to initiating mini-purge flow:

- FNP-2-STP-18.5, CONTAINMENT MINI PURGE AND EXHAUST VALVE INSERVICE TEST
- FNP-2-STP-18.6, CONTAINMENT MINI PURGE AND EXHAUST ISOLATION TEST MODES 1, 2, 3, 4

4.7.11 IF opened while removing CTMT mini-purge system from operation, THEN **close** the following containment purge filter cooling valves:

- N2P13V293
- N2P13V294

4.7.12 **Perform** the following for containment purge:

4.7.12.1 **Place** the following CTMT PURGE DMPRS handswitches to MINI:

- HS-3196
- HS-3198

4.7.12.2 **Verify** the following dampers are OPEN:

- Q2P13HV2866C
- Q2P13HV2866D
- Q2P13HV2867C
- Q2P13HV2867D
- N2P13HV3198B
- N2P13HV3198C

4.7.13 **Perform** the following for containment mini-purge:

4.7.13.1 **Start** MINI PURGE SUPP/EXH FAN.

4.7.13.2 **Verify** the following dampers are OPEN:

- N2P13HV3203A
- N2P13HV3203B

4.7.14 **Verify** the following dampers are CLOSED:

- Q2P13HV3196
- Q2P13HV3197
- Q2P13HV3198A
- Q2P13HV3198D

4.7.15 **Perform** the following to checkout the operating system:

- **Walkdown** fans and ductwork.
- Visually **inspect** for damage.
- **Report** any problems to the control room.

4.7.16 **Notify** the Shift Radiochemist that CTMT mini-purge is in service.

4.8 REMOVING CONTAINMENT MINI-PURGE SYSTEM FROM OPERATION

4.8.1 **Stop** MINI PURGE SUPP/EXH FAN.

4.8.2 **Place** the following CTMT PURGE DMPRS handswitches to CLOSE:

- HS-3196
- HS-3198

4.8.3 **Notify** the Shift Radiochemist that CTMT mini-purge has been secured.

NOTE:	**If CTMT Mini Purge is to be removed from operation for a short duration for maintenance or testing, step 4.8.4 is NOT required.**

4.8.4 IF desired AND approved by the Shift Supervisor, THEN **open** the following containment purge filter cooling valves:

- N2P13V293
- N2P13V294

NOTE:	**R-24A or R-24B is required to be operable in Modes 1-4, AND both channels are required to be operable during core alterations and moving of irradiated fuel in containment.**

4.8.5 IF desired, THEN **turn** off radiation monitors R-24A, R-24B, and their respective recorders.

4.9 RESTORING CONTAINMENT MINI-PURGE FOLLOWING A SAFETY INJECTION OR HI HI RADIATION SIGNAL:

4.9.1 **Verify** Safety Injection or Hi Hi Radiation Signal has been reset.

4.9.2 **Place** the following CTMT PURGE DMPRS handswitches to CLOSE for at least 2 seconds:

- HS-3196
- HS-3198

4.9.3 **Place** the following CTMT PURGE DMPRS handswitches to MINI:

- HS-3196
- HS-3198

4.9.4 **Start** MINI PURGE SUPP/EXH FAN.

4.9.5 **Perform** the following to checkout the operating system:

- **Walkdown** fans and ductwork.
- Visually **inspect** for damage.
- **Report** any problems to the control room.

4.9.6 **Notify** the Shift Radiochemist that CTMT mini-purge is in service.

4.9.7 **Verify** the following damper positions:

- Q2P13HV3203A, open
- Q2P13HV3203B, open
- Q2P13HV3196, closed
- Q2P13HV3197, closed
- Q2P13HV3198A, closed
- N2P13HV3198B, open
- N2P13HV3198C, open
- Q2P13HV3198D, closed
- Q2P13HV2866C, open
- Q2P13HV2866D, open
- Q2P13HV2867C, open
- Q2P13HV2867D, open

5.0 REFERENCES

5.1 P & IDs:

5.1.1 D-205010, sheets 1 and 2, Containment Cooling and Purge System P & ID

5.1.2 D-207783, Elem. Diag., Containment Mini-Purge Fans

5.1.3 D-207204, Elem. Diag., Containment Purge Iso. Dampers Train A

5.1.4 D-207199, Elem. Diag., Containment Purge Iso. Dampers Train B

5.1.5 D-207236, Elem. Diag., Containment Purge Air Handling Unit Fan

5.1.6 D-207237, Elem. Diag., Containment Purge Exhaust Fan

5.1.7 D-204654, Conn. Diag., Containment Purge Starter Panels

5.2 FSAR Section 6.2.3

APPENDIX 1

CONTINGENCY OPERATION OF CONTAINMENT MINI-PURGE
WITH SUPPLY FAN UNAVAILABLE

Performed by: ______________________ Date ______________________

Reviewed by: ______________________ Date ______________________

This appendix consists of 5 pages

APPENDIX 1

CONTINGENCY OPERATION OF CONTAINMENT MINI-PURGE
WITH SUPPLY FAN UNAVAILABLE

1.0 Verify the following: (OR 1-98-498)

_____ 1.1 The version of this procedure has been verified to be the current version. (OR 1-98-498)

_____ 1.2 This procedure has been verified to be the correct unit for the task. (OR 1-98-498)

2.0 Prepare MINI PURGE EXH FAN for contingency operation.

_____ 2.1 Open BKR FD-G5.

NOTE:	**FNP-0-EMP-1906.1, INSTALLATION AND REMOVAL OF TEMPORARY ELECTRICAL ALTERATIONS, must be used to provide detailed guidance for installing the following jumper.**

_____ 2.2 Record the following information for test instrument(s) used in accordance with FNP-0-EMP-1906.1:

Instrument Serial Number: ____________________

Calibration Due Date: ________________________

___/___ EM/EM CV 2.3 Jumper the 42 interlock contact (C2 to X1) for BKR FD-G5.

_____ 2.4 Place a caution tag on MINI PURGE SUPP/EXH FAN MCB handswitch to indicate that the MINI PURGE EXH FAN is being controlled locally at BKR FD-G5.

3.0 Operate MINI PURGE EXH FAN to control CTMT to atmosphere ΔP.

3.1 Monitor Narrow Range CTMT Pressure Avg. as indicated by computer point PC1501 and log on Data Sheet 1 on an hourly basis.

CAUTION: CTMT to atmosphere ΔP must be maintained -0.5 - +0.2 psid.

3.2 IF at any time during operation of the MINI PURGE EXH FAN, CTMT to atmosphere ΔP exceeds +0.2 psid, THEN notify the Shift Supervisor.

3.3 WHEN CTMT to atmosphere ΔP approaches +0.2 psid, THEN start the MINI PURGE EXH FAN.

3.3.1 Verify auxiliary building main exhaust system is in service per FNP-2-SOP-58.0, AUXILIARY BUILDING HVAC SYSTEM.

3.3.2 Verify that plant vent stack radiation monitors R-14 and R-22 are aligned for normal operation per FNP-2-SOP-45.0, RADIATION MONITORING SYSTEM.

3.3.3 Verify radiation monitor R-24A OR R-24B in service per FNP-2-SOP-45.0, RADIATION MONITORING SYSTEM.

3.3.4 Verify CTMT PURGE SUPP/EXH FANS & DAMPERS handswitch selected to STOP.

3.3.5 Verify Recorders RR0100 (points RR14 and RR22), RR24A, and RR24B in operation or CR written for repair.

3.3.6 Verify gaseous waste release permit has been issued for CTMT mini-purge operation.

3.3.7 Verify that the alarm setpoints for R-24A and R-24B are less than or equal to the maximum allowable setpoints listed in Part II of the gaseous waste release permit. (See FNP-2-CCP-213.1, GASEOUS EFFLUENT RADIATION MONITORING SETPOINTS, for current alarm setpoints.)

3.3.8 IF the activity level within containment is determined to be excessive by sample analysis, THEN operate the containment pre-access filtration system per procedure section 4.1 as necessary to reduce the activity level as specified by Health Physics.

3.3.9 Verify the following are current prior to initiating mini-purge flow:

- FNP-2-STP-18.5, CONTAINMENT MINI PURGE AND EXHAUST VALVE INSERVICE TEST
- FNP-2-STP-18.6, CONTAINMENT MINI PURGE AND EXHAUST ISOLATION TEST MODES 1, 2, 3, 4

3.3.10 IF opened while removing CTMT mini-purge from operation, THEN close the following CTMT purge filter cooling valves:

- N2P13V293
- N2P13V294

3.3.11 Position the following CTMT PURGE DMPRS handswitches to MINI:

- HS-3196
- HS-3198

3.3.12 Start MINI PURGE EXH FAN by locally closing BKR FD-G5.

3.3.13 Notify the Shift Radiochemist that CTMT mini-purge is in service.

3.4 WHEN CTMT to atmosphere ΔP approaches -0.5 psid, THEN stop the MINI PURGE EXH FAN.

3.4.1 Open BKR FD-G5.

3.4.2 Place the following CTMT PURGE DMPRS handswitches to CLOSE:

- HS-3196
- HS-3198

3.4.3 Notify the Shift Radiochemist that CTMT mini-purge has been secured.

NOTE:	**If CTMT Mini Purge is to be removed from operation for a short duration for maintenance or testing, step 3.4.4 is NOT required.**

3.4.4 IF desired AND approved by the Shift Supervisor, THEN open the following CTMT purge filter cooling valves:

- N2P13V293
- N2P13V294

NOTE:	**R-24A or R-24B is required to be operable in Modes 1-4, AND both channels are required to be operable during core alterations and moving of irradiated fuel in containment.**

3.4.5 IF desired, THEN turn off radiation monitors R-24A and R-24B, AND their respective recorders.

4.0 WHEN contingency operation NOT required, THEN restore MINI PURGE EXH FAN to normal operation.

_____ 4.1 Verify open BKR FD-G5.

NOTE:	**FNP-0-EMP-1906.1, INSTALLATION AND REMOVAL OF TEMPORARY ELECTRICAL ALTERATIONS, must be used to provide detailed guidance for removing the jumper in the following step.**

__/__ 4.2 Remove jumper installed in step 2.3 from the 42 interlock contact (C2 to X1) for BKR FD-G5.
CV EM

_____ 4.3 Remove caution tag placed in step 2.4.

DATA SHEET 1

DATE									
TIME	ΔP	ΔP	ΔP	ΔP	ΔP	ΔP	ΔP	ΔP	ΔP
0000									
0100									
0200									
0300									
0400									
0500									
0600									
0700									
0800									
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APPENDIX 2

CONTINGENCY OPERATION OF CONTAINMENT MAIN PURGE
WITH SUPPLY FAN UNAVAILABLE
WITH CONTAINMENT INTEGRITY NOT REQUIRED

Performed by: ______________________ Date ______________________

Reviewed by: ______________________ Date ______________________

This appendix consists of 2 pages

APPENDIX 2

CONTINGENCY OPERATION OF CONTAINMENT MAIN PURGE
WITH SUPPLY FAN UNAVAILABLE
WITH CONTAINMENT INTEGRITY NOT REQUIRED

1.0 Procedure Verifications

_____ 1.1 The version of this procedure has been verified to be the current version. (OR 1-98-498)

_____ 1.2 This procedure has been verified to be the correct unit for the task. (OR 1-98-498)

2.0 Defeat Purge Supply Fan Starting Capability as follows:

_____ 2.1 Verify containment integrity NOT required.

_____ 2.2 Verify equipment hatch is open.

NOTES:

- **The Purge Supply Fan control circuit must be energized for the Purge Exhaust Fan damper to open and provide a flow path for the exhaust fan. The intent of lifting the motor leads at the starter panel is to provide personnel safety for any one working on the Purge Supply Fan while allowing the Purge Supply Fan control circuit to remain energized. The Purge Supply damper will also open with the Purge Exhaust damper when Purge is placed in service.**
- **The cable scheme number for the Hi speed motor leads is 2VXEA06Q and for the Low speed motor leads is 2VXEA06R as shown on D-204654.**

_____ 2.3 Submit a CR to have Electrical Maintenance lift, tape and tag the Purge Supply Fan Hi and Low speed motor leads at the CTMT PURGE SUPPLY FAN STARTER PANEL N2P13L002-N.

CR number ____________________________

2.4 WHEN ready to implement the work order, THEN perform the following per the appropriate section(s) in the body of this procedure:

_____ 2.4.1 Secure Main Purge.

_____ 2.4.2 IF desired, THEN start Mini Purge system.

_____ 2.5 Direct EM to lift, tape and tag the Purge Supply Fan motor leads per the work order.

_____ 2.6 Place a caution tag on CTMT PURGE SUPP/EXH FANS & DAMPERS MCB handswitch to indicate that annunciator BF3 may alarm during purge operation due to the supply fan motor leads being lifted.

2.7 WHEN the Purge Supply Fan motor leads have been lifted AND the associated tagout completed for this stage, THEN perform the following per the appropriate sections in the body of this procedure:

_____ 2.7.1 Verify Mini Purge is secured.

_____ 2.7.2 Place Main Purge in service.

3.0 Restoration of Purge Supply Fan Following Maintenance

3.1 WHEN ready to restore purge supply fan starting capability, THEN perform the following per the appropriate section(s) in the body of this procedure:

_____ 3.1.1 Secure Main Purge.

_____ 3.1.2 IF desired, THEN start Mini Purge system.

_____ 3.2 Direct EM to untag, untape, and reland the Purge Supply Fan motor leads per the work order.

_____ 3.3 Clear the caution tag on CTMT PURGE SUPP/EXH FANS & DAMPERS handswitch that indicates that annunciator BF3 may alarm during purge operation due to the supply fan leads being lifted.

3.4 WHEN the Purge Supply Fan motor leads have been relanded AND the associated tagout cleared, THEN perform the following per the appropriate section in the body of this procedure:

_____ 3.4.1 Verify Mini Purge is secured.

_____ 3.4.2 Place Main Purge in service.

APPENDIX 3

BATCH RELEASES OF CONTAINMENT ATMOSPHERE

Verified By: ______________________ Date ______________________

Performed by: ______________________ Date ______________________

Reviewed by: ______________________ Date ______________________

This appendix consists of 5 pages

APPENDIX 3

BATCH RELEASES OF CONTAINMENT ATMOSPHERE

1.0 Procedure Verifications

_____ 1.1 The version of this procedure has been verified to be the current version. (OR 1-98-498)

_____ 1.2 This procedure has been verified to be the correct unit for the task. (OR 1-98-498)

2.0 Initial Conditions

NOTES:

- **Provide Shift Radio Chemist with request for Batch Release permit at least 12-24 hours in advance of determined time batch release will take place. (Batch Release should take place before CTMT to ATMOS ΔP reaches 0.4 psid.)**
- **Use computer point PC1501 NARROW RANGE CTMT AVG PRESS (preferred) <u>OR</u> the <u>average</u> of the following computer points for monitoring CTMT pressure.**
  - **PT0951**
  - **PT0952**
  - **PT0953**
- **<u>IF</u> purge is to started for other than routine batch releases or is requested to run longer than expected to meet termination criteria, <u>THEN</u> document the reason (CTMT entry, maintenance, chemistry or other reason) in CONTROL ROOM LOG and on the release permit. (AI 2009202457)**

_____ 2.1 Once CTMT to ATMOS ΔP is approximately 0.25 psid, then notify the Shift Radio Chemist to prepare a Batch Gaseous Waste Release Permit for the Unit 2 CTMT Atmosphere.

_____ 2.2 Verify auxiliary building main exhaust system in service per FNP-2-SOP-58.0, AUXILIARY BUILDING HVAC SYSTEM.

__/__ IV 2.3 Verify gaseous waste release permit has been issued for CTMT mini-purge operation.

2.4 Verify either 2.4.1, 2.4.2 OR 2.4.3 is satisfied:

____ 2.4.1 R-14 is in service and aligned for normal operation per FNP-2-SOP-45.0, RADIATION MONITORING SYSTEM.

AND

R-29B is in service and aligned per FNP-0-CCP-641, OPERATIONS OF THE PLANT VENT STACK MONITORING SYSTEM.

OR-

____ 2.4.2 R-22 is in service and aligned for normal operation per FNP-2-SOP-45.0, RADIATION MONITORING SYSTEM.

AND

R-29B is in service and aligned per FNP-0-CCP-641, OPERATIONS OF THE PLANT VENT STACK MONITORING SYSTEM.

OR-

____ 2.4.3 IF R-14 and R-22 **OR** R-29B is inoperable, THEN Alternate sampling is being performed as required per ODCM.

Plausibility for Alternate Sampling

NOTE:	**Any containment purge isolation valve made inoperable due to a failed rad monitor shall be close and deactivated in accordance with the time frame indicated in TS 3.6.3.**

2.5 Verify Containment Purge Rad Monitor operation:

2.5.1 Verify one of the following radiation monitors in service per FNP-2-SOP-45.0, RADIATION MONITORING SYSTEM.

____ • R-24A

OR

____ • R-24B

2.5.2 Verify alarm setpoint for the above selected radiation monitor is less than or equal to the maximum allowable setpoint listed in Part II of the gaseous waste release permit. (See FNP-2-CCP-213.1, GASEOUS EFFLUENT RADIATION MONITORING SYSTEM SETPOINTS, current alarm setpoints.)

__/__ IV • R-24A

__/__ IV • R-24B

2.6 Verify items listed below are in operation for operable radiation monitors:

____ • Recorder RR0100 (point RR14 and/or RR22)

____ • Recorder RR24A OR RR24B

____ • Printer R29B

3.0 Performing Batch Release of CTMT Atmosphere

NOTE: Batch releases should be terminated as soon as the criterion for termination is satisfied. (Historical data indicates on average, the criterion will be satisfied in approximately ninety minutes.) AI 2009202457

_____ 3.1 Record initial pressure as indicated by Computer Point PC1501 NARROW RANGE CTMT AVG PRESS, on Part III of the Batch Gaseous Waste Release Permit.

_____ 3.2 Open N2P13V294, PURGE FILTER COOLING OUTLET VALVE.

_____ 3.3 Record start date/time data in Part III of the Batch Gaseous Waste Release Permit.

3.4 WHEN performing the following valve manipulations, THEN note the start time for recording purposes:

3.4.1 Place the following CTMT Purge DMPRS hand switches to MINI to initiate CTMT Batch Release:

_____ ● HS-3196

_____ ● HS-3198

3.5 WHEN CTMT DIFF PRESSURE decreases to ≤ 0.25 psid, THEN perform the following, noting the fan start time and containment-to-atmosphere delta pressure for recording purposes:

__/__ IV 3.5.1 Close N2P13V294, PURGE FILTER COOLING OUTLET VALVE.

_____ 3.5.2 Start MINI PURGE SUPP/EXH FAN.

_____ 3.5.3 Record fan start date/time data in Part III of the Batch Gaseous Waste Release Permit.

_____ 3.5.4 Record CTMT TO ATMOS ΔP (Computer Point PC1501 NARROW RANGE CTMT AVG PRESS) at which the mini purge fans were started in Part III of the Batch Gaseous Waste Release Permit.

NOTE: During highly active or busy periods consider using a timer to ensure the release is terminated when anticipated. AI 2009202457

_____ 3.6 After CTMT DIFF PRESSURE has leveled off, OR when at desired value, THEN secure the CTMT Mini Purge System per section 4.0 of this Appendix.

4.0 Securing CTMT Mini Purge System after CTMT Batch Release Complete

_____ 4.1 Stop the MINI PURGE SUPP/EXH FAN.

4.2 Place the following CTMT Purge DMPRS hand switches to CLOSE, noting the time for recording purposes:

__/__ IV
- HS-3196

__/__ IV
- HS-3198

4.3 Record the following data in Part III of the Batch Gaseous Waste Release Permit:

_____
- Final pressure as indicated by Computer Point PC1501 NARROW RANGE CTMT AVG PRESS

_____
- Release stop date/time data

_____ 4.4 Notify the Shift Radio Chemist that CTMT Mini-purge has been secured.

_____ 4.5 Ensure the Batch Gaseous Waste Release Permit is reviewed by a member of OPS supervision.

82. 029EA2.04 082

The following conditions exist on Unit 1:

At 1000:

- A Reactor Trip was initiated, but was unsuccessful.
- The crew entered FRP-S.1, Response to Nuclear Power Generation/ATWT.
- The Rover was dispatched to open Reactor Trip breakers.

At 1005:

- Per FRP-S.1, an Emergency Boration is in progress from the 1A BAT (Boric Acid Tank).
- FK-122, CHG FLOW, is in AUTO.
- FI-122A, CHG FLOW, indicates 35 gpm.
- All Reactor Trip and Reactor Trip bypass breakers are open.
- The Shift Manager is evaluating emergency classifications.

Which one of the following completes the statements below?

At 1005, Charging flow __(1)__ adequate for the Emergency Boration.

The Shift Manager is required to declare a(n) __(2)__ emergency classification.

Reference Provided

	(1)	(2)
A.	IS	Alert
B.	is NOT	Alert
C.	IS	Site Area
D.✔	is NOT	Site Area

A. Incorrect 1) Incorrect, per FRP-S.1, minimum Emergency Boration flow from the BATs is 30 gpm with minimum Charging flow of 40 gpm.
Plausible: A candidate determining that Charging flow is adequate is plausible because minimum BAT flow is 30 gpm.

2) Incorrect, per NMP-EP-110 Classification Matrix, a Site Area Emergency is required.
Plausible if the candidate determines that the actions to dispatch an operator to manually open the RX trip breakers is considered manually tripping the Reactor.
There is also plausibility that a candidate may choose the Alert classification because the Reactor is shutdown prior to the Shift Manager declaring the initial classification. The Shift Manager has to declare the emergency classification within 15 minutes. The candidate may determine that since Reactor trip breakers are open prior to the end of the 15 minute window, the Manual Trip was successful by opening the trip breakers. This is not a direct look-up since the key to the correct classification is how "Manual Trip" is interpreted. The interpretation of Manual Trip is explained in places other than the reference that is provided to the candidate.

B. Incorrect 1) Correct, minimum Charging flow required during Emergency Boration from the BATs is 40 gpm.

2) Incorrect, see A.2.

C. Incorrect 1) Incorrect, see A.1.

2) Correct, having to drive control rods manually and locally tripping the reactor during FRP-S.1 will be classified as a Site Area Emergency.

D. Correct 1) Correct, see B.1.

2) Correct, see C.2.

K/A: 029EA2.04 Anticipated Transient Without Scram (ATWS) - Ability to determine or interpret the following as they apply to a ATWS:
EA2.01 CVCS centrifugal charging pump operating indication 3.2* 3.3*

Importance Rating: 3.2* 3.3*

Technical Reference: FNP-1-FRP-S.1, Response to Nuclear Power Generation/ATWT, V 27
NMP-EP-110-GL01 FNP EALs-IC's, Threshold Values and

References provided:	Applicable portion of NMP-EP-110-GL01 that only allows evaluation of Site Area and Alert classifications
Learning Objective:	Using plant procedures/references, ANALYZE a set of plant conditions and DETERMINE the proper classification of the emergency condition as being a NOUE, Alert, Site Area, or General Emergency. (OPS-63002C01).
Question History:	New question
K/A match:	During an ATWT event, a candidate has to evaluate indications for Charging pump flow and determine if is acceptable during an Emergency Boration per FRP-S.1.
SRO justification:	III. Justification for Plant Specific Exemptions UNIQUE to the SRO position:

Justification: A question that is not tied to one of the 10 CFR 55.43(b) items can still be classified as "SRO-only" provided the licensee has documented evidence to prove that the knowledge/ability is "unique to the SRO position" at the site. An example of documented evidence includes:

• The question is linked to a learning objective that is specifically labeled in the lesson plan as being SRO-only (e.g., some licensee lesson plans have columns in the margin that differentiate AO, RO, and SRO learning objectives) [NUREG 1021, ES-401, Section D.2.d]

AND/OR

• A question is linked to a task that is labeled as an SRO-only task, and the task is NOT listed in the RO task list.

The SRO is solely responsible for determining Classifications at FNP, the objective listed above is an SRO only objectives.

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III. Justification for Plant Specific Exemptions UNIQUE to the SRO position:

DOES NOT MATCH one of the 10 CFR 55.43(b) items but for the Emergency Plan implementation, FNP has classified the knowledge/ability as "unique to the SRO position" as documented within SAT process as ties the knowledge/ability to the licensee's SRO job position duties.

Reference provided to candidate for this question - from NMP-EP-110 classification Matrix

SS2 - Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Trip Once a Reactor Protection System Setpoint Has Been Exceeded **AND** Manual Trip Was NOT Successful. (pg. 45)
SA2 - Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Trip Once a Reactor Protection System Setpoint Has Been Exceeded **AND** Manual Trip Was Successful. (pg. 50)

Step | **Action/Expected Response** | **Response NOT Obtained**

___ **3** **Verify AFW pumps - RUNNING.**

3.1 MDAFWPs - RUNNING

[] 1A amps > 0
[] 1B amps > 0

3.2 TDAFWP - RUNNING IF NECESSARY

- TDAFWP STM SUPP FROM 1B(1C) SG
[] MLB-4 1-3 lit
[] MLB-4 2-3 lit
[] MLB-4 3-3 lit

- TDAFWP SPEED
[] SI 3411A > 3900 rpm

- TDAFWP SPEED CONT

[] SIC 3405 at 100%

NOTE:
- 2500 gallons of emergency boration is required for each control rod not fully inserted, up to a maximum of 17,309 gallons.
- [CA] Emergency boration should continue until an adequate shutdown margin is established.

___ **4** **Initiate Emergency Boration of the RCS.**

4.1 <u>IF</u> safety injection in progress,
<u>THEN</u> go to step 4.7.

4.2 Verify at least one CHG PUMP - RUNNING.

Step 4 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
4.3	Start a boric acid transfer pump. BATP [] 1A [] 1B	4.3 Perform the following. 4.3.1 Align charging pump suction to RWST. RWST TO CHG PUMP [] Q1E21LCV115B open [] Q1E21LCV115D open VCT OUTLET ISO [] Q1E21LCV115C closed [] Q1E21LCV115E closed 4.3.2 Proceed to step 4.5.
4.4	Align normal emergency boration. EMERG BORATE TO CHG PUMP SUCT [] Q1E21MOV8104 open	4.4 Perform the following. • Align charging pump suction to RWST. RWST TO CHG PUMP [] Q1E21LCV115B open [] Q1E21LCV115D open VCT OUTLET ISO [] Q1E21LCV115C closed [] Q1E21LCV115E closed <u>OR</u> • Align manual emergency boration flow path. BORIC ACID TO BLENDER [] Q1E21FCV113A open MAN EMERG BORATION [] Q1E21V185 open (100 ft, AUX BLDG rad-side chemical mixing tank area)

Step 4 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
4.5	Establish adequate letdown.	
4.5.1	Verify 45 GPM letdown orifice - IN SERVICE. LTDN ORIF ISO 45 GPM [] Q1E21HV8149A open	
4.5.2	Verify one 60 GPM letdown orifice - IN SERVICE. LTDN ORIF ISO 60 GPM [] Q1E21HV8149B open [] Q1E21HV8149C open	
4.6	Establish adequate charging flow. • IF boration is from boric acid storage tank, THEN verify charging flow - GREATER THAN 40 GPM. OR • IF boration is from the RWST, THEN verify charging flow - GREATER THAN 92 GPM.	Actual Charging flow is 35 gpm, <40 gpm required

Step 4 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
4.7	Verify emergency boration flow adequate.	
4.7.1	IF normal emergency boration flow path aligned, THEN check emergency boration flow greater than 30 GPM. BORIC ACID EMERG BORATE [] FI 110	This is plausibility for Charging flow being adequate. This is BORATION flow, not Charging flow
4.7.2	IF manual emergency boration flow path aligned, THEN check boric acid flow greater than 30 GPM. MAKEUP FLOW TO CHG/VCT [] BA FI 113	
4.7.3	IF boration is from the RWST, THEN verify charging OR HHSI flow - GREATER THAN 92 GPM.	
4.8	Check pressurizer pressure LESS THAN 2335 psig.	4.8 Verify PRZR PORVs and PRZR PORV ISOs - OPEN. IF NOT, THEN open PRZR PORVs and PORV ISOs as necessary until pressurizer pressure less than 2135 psig.

SS2 - Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Trip Once a Reactor Protection System Setpoint Has Been Exceeded **AND** Manual Trip Was NOT Successful. (pg. 45)
NOTE: A successful manual trip for purposes of declaration is any action taken from the Main Control Board (MCB) that rapidly inserts the control rods. This can be accomplished by tripping the reactor using the Reactor Trip switches on the MCB OR by de-energizing both Rod Drive Motor Generator sets from the MCB.
NOTE: Failure of both MCB Rx Trip switches to trip the reactor meets the TV criteria of a setpoint being exceeded with no automatic trip occurring.
1. Indications exist that a reactor protection system setpoint was exceeded and automatic trip did not occur, and a manual trip did not result in the reactor being made subcritical. (NOTE)
SS4 - Complete Loss of Heat Removal Capability (pg. 47)
NOTE: Heat Sink CSF should not be considered RED if total AFW flow is less than 395 gpm due to operator action.
1. Complete Loss of Heat Removal Capability as indicated by: a. Core Cooling CSF - ORANGE **AND** b. Heat Sink CSF - RED (NOTE)
SA2 - Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Trip Once a Reactor Protection System Setpoint Has Been Exceeded **AND** Manual Trip Was Successful. (pg. 50)
NOTE: A successful manual trip for purposes of declaration is any action taken from the Main Control Board (MCB) that rapidly inserts the control rods. This can be accomplished by tripping the reactor using the Reactor Trip switches on the MCB OR by de-energizing both Rod Drive Motor Generator sets from the MCB.
NOTE: Failure of both MCB Rx Trip switches to trip the reactor meets the TV criteria of a setpoint being exceeded with no automatic trip occurring.
1. Indication(s) exist that a reactor protection setpoint was exceeded and an automatic trip did not occur, and a manual trip resulted in the reactor being subcritical. (NOTE)

This is the Site Area classification background

SS2

Initiating Condition (Back to Hot IC p. 105)

Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Trip Once a Reactor Protection System Setpoint Has Been Exceeded **AND** Manual Trip Was NOT Successful.

Operating Mode Applicability: Power Operation (Mode 1)
Startup (Mode 2)

Threshold Value: (1)

NOTE:	**A successful manual trip for purposes of declaration is any action taken from the MCB that rapidly inserts the control rods. This can be accomplished by tripping the reactor using the Reactor Trip switches on the MCB OR by de-energizing both Rod Drive Motor Generator sets from the MCB.**

NOTE	**Failure of both MCB Rx Trip switches to trip the reactor meets the TV criteria of a setpoint being exceeded with no automatic trip occurring.**

1. Indications exist that a reactor protection system setpoint was exceeded and automatic trip did not occur, and a manual trip did not result in the reactor being made subcritical (NOTE).

Basis:

Automatic and manual trip are not considered successful if action away from the reactor control console was required to trip the reactor.

The Reactor should be considered subcritical when reactor power level has been reduced to less than 5% power and SUR is negative.

Under these continued power generation conditions, the reactor may be producing more heat than the maximum decay heat load for which the safety systems are designed. A Site Area Emergency is indicated because conditions exist that may lead to imminent loss or potential loss of both fuel clad and RCS. Although this IC may be viewed as redundant to the Fission Product Barrier Degradation IC, its inclusion is necessary to better assure timely recognition and emergency response. Escalation of this event to a General Emergency would be via Fission Product Barrier Degradation or Emergency Director Judgment ICs. A manual reactor trip is considered to be a trip input to the automatic Reactor Protection System.

This is the Alert Classification background

SA2

Initiating Condition (Back to Hot IC p. 105)

Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Trip Once a Reactor Protection System Setpoint Has Been Exceeded **AND** Manual Trip Was Successful.

Operating Mode Applicability: Power Operation (Mode 1)
Startup (Mode 2)
Hot Standby (Mode 3)

Threshold Value: (1)

NOTE:	**A successful manual trip for purposes of declaration is any action taken from the MCB that rapidly inserts the control rods. This can be accomplished by tripping the reactor using the Reactor Trip switches on the MCB OR by de-energizing both Rod Drive Motor Generator sets from the MCB.**

NOTE	**Failure of both MCB Rx Trip switches to trip the reactor meets the TV criteria of a setpoint being exceeded with no automatic trip occurring.**

1. Indication(s) exist that a reactor protection setpoint was exceeded and an automatic trip did not occur, and a manual trip resulted in the reactor being subcritical.

Basis:

This condition indicates failure of the automatic protection system to trip the reactor. This condition is more than a potential degradation of a safety system in that a front line automatic protection system did not function in response to a plant transient and thus the plant safety has been compromised, and design limits of the fuel may have been exceeded. An Alert is indicated because conditions exist that lead to potential loss of fuel clad or RCS. Reactor protection system setpoint being exceeded, rather than limiting safety system setpoint being exceeded, is specified here because failure of the automatic protection system is the issue. A manual reactor trip is considered to be a trip input to the automatic Reactor Protection System or de-energizing the MG sets should initiate a manual trip.

The Reactor should be considered subcritical when reactor power level has been reduced to less than 5% power and SUR is negative.

83. 051AG2.1.7 083

Unit 1 is at 28% power with the following conditions:

At 1000:

- Condenser pressure is 1.7 psia and slowly rising (vacuum degrading).
- KK1, TURB COND VAC LO, is in alarm.
- HP Gland steam supply pressure is 3.5 psig.
- Main Turbine LP Gland pressures are as follows:
  - #3 LP Gland pressure is 2.0 psig.
  - #4 LP Gland pressure is 4.8 psig.
  - #5 LP Gland pressure is 2.5 psig.
  - #6 LP Gland pressure is 0.5 psig.

At 1015:

- Condenser pressure is 2.1 psia and still slowly rising (vacuum degrading).
- KK2, TURB COND VAC LO-LO, is in alarm.

Which one of the following completes the statements below per AOP-8.0?

The action required at 1000 to stabilize Condenser pressure is to __(1)__ .

The action required at 1015 is to __(2)__ .

Procedure titles are as follows:
AOP-3.0, Turbine Trip Below P-9 Setpoint
AOP-8.0, Partial Loss of Condenser Vacuum

A.✓ 1) bypass the #6 Gland Seal Regulator

2) perform AOP-3.0 in parallel with AOP-8.0

B. 1) bypass the #6 Gland Seal Regulator

2) perform AOP-3.0 ONLY

C. 1) throttle closed V528, SPILLOVER VALVE BYPASS

2) perform AOP-3.0 in parallel with AOP-8.0

D. 1) throttle closed V528, SPILLOVER VALVE BYPASS

2) perform AOP-3.0 ONLY

A. Correct 1) Correct, per AOP-8.0, step 4.2 - if individual gland seal pressures are not in the band of 1-5 psig (#6 is .5 psig), the RNO action is to bypass the affected gland seal regulator.

2) Correct, per AOP-8.0, step 2. This is a Continuing Action throughout the procedure. Step 2.1.2.1 of the RNO actions requires performing AOP-3.0 in parallel with AOP-8.0.

B. Incorrect 1) Correct, see A.1.

2) Incorrect, performing AOP-3.0 is required when the Turbine is tripped <35% power. Plausible since the candidate may think AOP-3.0 is the highest priority, and since the Turbine is tripped, actions of AOP-8.0 are no longer required.

C. Incorrect 1) Incorrect, plausible if the candidate does not fully understand the function of the Spillover Valve and its Bypass valve. There is a common misconception that this valve controls the Gland Sealing Steam pressures on both the LP Turbine and the HP Turbine. In actuality, it only controls the HP Turbine Gland pressure.

2) Correct, see A.2.

D. Incorrect 1) Incorrect, see C.1.

2) Incorrect, see B.2.

K/A: 051AG2.1.7 Loss of Condenser Vacuum
Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.
(CFR: 41.5 / 43.5 / 45.12 / 45.13)
IMPORTANCE RO 4.4 SRO 4.7

Importance Rating: 4.4 4.7

Technical Reference: FNP-1-AOP-8.0, v22.1

References provided: None

Learning Objective: EVALUATE plant conditions and DETERMINE if transition to another section of AOP-8.0, Partial Loss of Condenser Vacuum or to another procedure is required. (OPS-62520H02)

Question History: New question

Basis for meeting K/A: Plant instrumentation conditions are given for a malfunction causing a Loss of Condenser Vacuum event. The candidate has to demonstrate the ability to determine the appropriate actions to perform per AOP-8.0, and ability to determine proper procedure implementation while in AOP-8.0.

SRO justification: 10 CFR 55.43(b)(5)
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations [10 CFR 55.43(b)(5)], involving BOTH:
1) assessing plant conditions and then
2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

The candidate has to have knowledge of the transition criteria in AOP-8.0 (to go to AOP-3.0 upon a Turbine Trip condition), but in addition knowledge of how AOP-3.0 will be implemented (in parallel with AOP-8.0, or alone) is required. This also falls under the 10 CFR 55.43(b)(5) condition of:

Knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps.

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From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 **flowchart for 10 CFR 55.43(b)(5)** :
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations [10 CFR 55.43(b)(5)], involving BOTH:

1) **assessing plant conditions** and then
2) **selecting** a procedure or section of a procedure to mitigate, recover, or with which to proceed.

Using the flowchart, this question can:

- **NOT** be answered **solely** by knowing "systems knowledge", i.e., how the system works, flowpath, logic, component location. **(PT 1 IS sys/fund knowledge, but PT 2 requires procedural knowledge)**
- **NOT** be answered solely by knowing immediate operator actions.
- **NOT** be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry to major EOPs.**(Knowledge of how AOP-8.0 is implemented in parallel with AOP-3.0 is required.)**
- **NOT** be answered **solely** by knowing the purpose, overall sequence of events, or **overall mitigative strategy** of a procedure.
- **CAN** be answered with knowledge of ONE or **MORE** of the following:

— **Assessing plant conditions** (normal, abnormal, or emergency) and then **selecting a procedure** or section of a procedure to mitigate, recover, or with which to proceed. **(Yes).**

— **Knowledge of when to implement** attachments **and** appendices, including how to **coordinate** these items with procedure steps. (**Knowledge of how AOP-8.0 is implemented in parallel with AOP-3.0 is required.**).

— **Knowledge of diagnostic steps and decision points** in the EOPs that involve transitions **to event specific sub-procedures** or emergency contingency procedures.

— **Knowledge of administrative procedures that specify** hierarchy, implementation, and/or **coordination** of plant normal, abnormal, and emergency procedures.

FARLEY NUCLEAR PLANT

ABNORMAL OPERATING PROCEDURE

FNP-1-AOP-8.0

See pages 2, 3, 7

S A F E T Y R E L A T E D

PARTIAL LOSS OF CONDENSER VACUUM

PROCEDURE LEVEL OF USE CLASSIFICATION PER NMP-AP-003	
CATEGORY	**SECTIONS**
Continuous:	**ALL**
Reference:	**NONE**
Information:	**NONE**

Approved:

David L. Reed (for)
Operations Manager

Effective Date: March 26, 2012

Table of Contents

PROCEDURE CONTAINS NUMBER OF PAGES

A. Purpose

This procedure provides actions to prevent a turbine trip following a partial loss of condenser vacuum.

This procedure is applicable in Modes 1 and 2.

B. Symptoms or Entry Conditions

I. This procedure is entered when a partial loss of condenser vacuum is indicated by any of the following:

a. Rapidly falling condenser vacuum.

b. Loss of one or both circulating water pumps.

c. Actuation of TURB COND VAC LO annunciator KK1

- 1.485 psia when < 25% turbine power
- 2.901 psia when > 47.9% turbine power
- Varies Linearly Between 25% (1.485 psia) and 47.9% (2.901 psia)

d. Loss of the 12Kv line—de-energizes 16 cooling tower fans.

Step	Action/Expected Response	Response Not Obtained

NOTE:
- DEHC point CNDP1 displays condenser pressure in Hga absolute on the point detail page. On all other pages CNDP1 displays condenser pressure in psia.
- IPC points PT0214 and PT0215 display condenser pressure in psia.
- MCB recorder PR 4029 displays condenser pressure in psia.
- Main turbine trip will occur at 4.351 psia
- SGFP trip will occur at 5.9 psia
- DEH Condenser Vacuum Display AND Figure 2 provides condenser vacuum setpoints for various turbine power levels.

__ 1 **[CA] Monitor Condenser pressure**

1.1 IF annunciator KK1, TURB COND VAC LO in alarm OR setpoint exceeded, THEN increased monitoring of condenser pressure is required:

- 1.485 psia when < 25% turbine power
- 2.901 psia when > 47.9% turbine power
- Varies Linearly Between 25% (1.485 psia) and 47.9% (2.901 psia)

At 10:15 - Annunciator KK2 is in alarm, so RNO actions are required - 2nd part of the question

__ 2 **[CA] Monitor turbine trip criteria.**

2.1 Check condenser pressure less than annunciator KK2, TURB COND VAC LO-LO setpoint for existing turbine power using MWe or PT-446/447:

- 1.885 psia when ≤ 25% turbine power
- 3.8 psia when ≥ 55.9% turbine power
- Varies Linearly Between 25% (1.885 psia) and 55.9% (3.8 psia)

Response Not Obtained:

2.1 Perform the following.

2.1.1 IF reactor power greater than 35%, THEN trip the reactor.

2.1.1.1 Go to FNP-1-EEP-0, REACTOR TRIP OR SAFETY INJECTION.

2.1.1.2 Perform the remainder of this procedure in conjunction with FNP-1-EEP-0, REACTOR TRIP OR SAFETY INJECTION.

Step 2 continued on next page

__Page Completed

Step	Action/Expected Response	Response Not Obtained

Reactor power is 28%, so these are the actions required.

2.1.2 IF reactor power less than 35%, THEN place MAIN TURB EMERG TRIP to TRIP for ≥ 5 seconds.

2.1.2.1 Perform FNP-1-AOP-3.0, TURBINE TRIP BELOW P-9 SETPOINT in parallel with this procedure.

2.1.3 Proceed to step 3.

NOTE:
- Loss of the 12Kv line will result in the loss of 16 cooling tower fans. See FIGURE 1.
- On a loss of cooling tower fans, condenser Circ Water inlet temperature should be monitored as a leading indicator for condenser vacuum impact. These points may be found on the Circ Water system mimic on the IPC.
- Any ramp in progress should not be stopped until condenser outlet temperature is less than 120F

__ 3 **Stabilize condenser vacuum using any or all of the following actions based on plant conditions, and the rate at which vacuum is worsening.**

3.1 IF the rate of condenser pressure increase is significant and approaching annunciator KK1, TURB COND VAC LO setpoint, THEN reduce load prior to reaching annunciator KK1 setpoint,.

3.2 IF condenser pressure increases above annunciator KK1, TURB COND VAC LO setpoint, THEN reduce turbine load as necessary to maintain pressure at or below annunciator KK1 setpoint.

3.3 IF available, THEN start additional cooling tower fans.

Step 3 continued on next page

__Page Completed

Step	Action/Expected Response		Response Not Obtained
3.4	IF the loss of condenser vacuum is due to the loss of the electrical ring bus, THEN notify ACC to restore the ring bus.		
3.5	IF the loss of condenser vacuum is due to loss of the electrical ring bus, AND condenser vacuum has been restored, THEN return to procedure and step in effect.		

NOTE: Normal SJAE alignment is one section per SJAE. Starting a second section on a SJAE may worsen vacuum if SJAEs are malfunctioning.

Step	Action/Expected Response		Response Not Obtained
3.6	Verify proper operation of on service SJAEs.	3.6	Swap SJAEs or place additional SJAE sections in service as required to obtain proper SJAE operation using FNP-1-SOP-28.5, CONDENSER AIR REMOVAL SYSTEM.
3.7	IF available, THEN start an additional CW PUMP.		
__ 4	**Dispatch personnel to check main turbine gland sealing steam pressures.**		
4.1	Check HP Gland seal header pressure maintained at ~125 psig. GS STM PRESS [ ] PI 4069B	4.1	Perform the following: 4.1.1 IF HP gland seal header pressure abnormal due to HP regulator malfunction, THEN transfer control to the HP regulator control valve bypass.

° Step 4 continued on next page

__Page Completed

Step	Action/Expected Response	Response Not Obtained

a) Open N1N32V527, HP Regulator Control Vlv Bypass breaker (MCC located South of SJAE's).

[ ] Gland Seal HP Bypass MOV N1R17BKRHBBD2

b) Manually control HP gland sealing steam pressure. (east side of HP turbine)

[ ] HP Regulator Control Vlv Bypass N1N32V527 throttled open (east side of HP turbine)

[ ] GS HP Reg Control Vlv Outlet Iso N1N32V538 - throttled closed (east side of HP turbine)

[ ] Control HP gland sealing steam pressure 120-130 psig. N1N32PI505 (east side of HP turbine)

° Step 4 continued on next page

__Page Completed

Step	Action/Expected Response	Response Not Obtained

4.1.2 IF supply pressure low due to lack of steam supply,
THEN verify gland sealing steam supply alignment based on intended supply source.

- For main steam supply as the intended supply source, verify main steam aligned.

[ ] N1N11V606, MN STEAM ISO TO GLAND SEAL HP REG - OPEN (Turbine Bldg overhead above 155’, above purity monitor)

- For Unit 1 auxiliary steam supply as the intended source, verify auxiliary steam aligned.

[ ] N1N11V612, MS TO AS HDR MANUAL ISO - OPEN (Turb bldg 155’ south side)

[ ] N1P20V907, MAIN STEAM TO AUX STM HDR PCV - ADJUSTED to maintain ~185 psig (Turb bldg 155’ south side)

[ ] N1P20V525, MS TO AS ISO (MOV) - OPEN

[ ] N1P20V519, ASB STEAM SUPP TO AUX BLDG (MOV) - OPEN

[ ] N1P20V549, AS SUPPLY TO GS STEAM SYSTEM - OPEN (Turb bldg 155’ above spillover valve)

[ ] N1P20V905, AS SUPPLY TO GS STEAM SYSTEM - OPEN

- For Unit 2 Auxiliary steam supply as the intended source verify proper alignment using FNP-1-SOP-55.1, AUXILIARY STEAM AND CONDENSATE SYSTEM.

° Step 4 continued on next page

Step	Action/Expected Response	Response Not Obtained
4.2	Check individual low pressure gland seal regulators maintain 1-5 psig gland seal pressures.	4.2 IF any gland sealing steam regulator failed, THEN perform the following:
	These are the actions being performed at 10:00 - 1st part of the question	4.2.1 Bypass the affected gland seal regulator (reference FNP-1-SOP-28.4, GLAND SEALING STEAM SYSTEM or posted operator guidance).

NOTE: The high-pressure turbine becomes self-sealing at higher loads (about 25% load). At higher loads, the GS regulator closes off and the spill over valve opens to dump the excess steam leaking out of the HP turbine.

Step	Action/Expected Response	Response Not Obtained
4.3	Check HP gland steam supply pressure maintained GREATER THAN 2 psig (normal pressure 2-10 psig).	4.3 Perform the following:
		4.3.1 Verify gland sealing steam spillover operation. (155' Turb bldg behind MCC 1AA)
	HP CYL HDR [ ] PI 4069A Plausible Distracter	[ ] N1N32V528, SPILLOVER BYPASS - THROTTLED CLOSED as necessary to maintain 2-10 psig on HP gland seals
		[ ] ~~N1N32V544 SPILLOVER VLV~~ - THROTTLED CLOSED as necessary to maintain 2-10 psig on HP gland seals
		4.3.2 IF gland steam spillover isolated and HP gland seal regulator not maintaining pressure, THEN transfer control to HP gland seal regulator bypass (Turb bldg 189' east side of HP turbine).
		[ ] N1N32V543, HP REGULATOR BYPASS - THROTTLED OPEN to maintain 2-10 psig on HP gland seals
		[ ] N1N32V541, HP REGULATOR INLET ISO - THROTTLED CLOSED while bypass throttled open to maintain 2-10 psig on HP gland seals

Step 4 continued on next page

__ Page Completed

Step	Action/Expected Response	Response Not Obtained
4.4	Check HP gland steam supply pressure maintained LESS THAN 10 psig.	4.4 Verify proper operation of gland sealing steam HP regulator and spillover valve using FNP-1-SOP-28.4, GLAND SEALING STEAM SYSTEM
__ **5**	**Dispatch personnel to verify SJAE steam supply regulator - OPERATING PROPERLY. (155 ft, TURB BLDG)** [ ] N1N51PI569A ~120 psig for steam jet air ejector A on service (155’ Turb Bldg) [ ] N1N51PI569B ~120 psig for steam jet air ejector B on service (155’ Turb Bldg)	5 Manually adjust regulator to maintain greater than 120 psig. [ ] N1N51V595A for steam jet air ejector A on service (155’ Turb Bldg) [ ] N1N51V595B for steam jet air ejector B on service (155’ Turb Bldg)
__ **6**	**Dispatch personnel to verify on service GSSC EXH FAN - OPERATING PROPERLY. (155 ft, TURB BLDG)** [ ] N1N32PI503 ~16-22.5 inches water vacuum (155’ Turb Bldg)	6 Start standby GSSC EXH FAN using FNP-1-SOP-28.4, GLAND SEALING STEAM SYSTEM.
__ **7**	**Verify condenser vacuum breakers closed.**	
7.1	Verify COND VAC BKR VLVS N1N51V519A/519B - CLOSED.	
7.2	Verify COND VAC BKR MAN ISO N1N51V518A and N1N51V518B - CLOSED. (155 ft, TURB BLDG)	
7.3	Verify condenser vacuum breaker water seal - ESTABLISHED.	
__ **8**	**Dispatch personnel to inspect main condenser for leaks.**	
__ **9**	**Dispatch personnel to vent condenser water boxes.**	
__ **10**	**Check hotwell level - LESS THAN 4 ft.**	10 Manually control hotwell level.

° Step 10 continued on next page

__Page Completed

Step	Action/Expected Response	Response Not Obtained
		10.1 Verify hotwell fill valve controlling properly. HOTWELL FILL [ ] CP 4055F adjusted 10.2 <u>IF</u> required, <u>THEN</u> establish hotwell flush using FNP-1-SOP-21.0, CONDENSATE AND FEEDWATER SYSTEM.
__ **11**	**<u>IF</u> condenser vacuum returned to normal, <u>THEN</u> go to procedure and step in effect.**	11 Return to step 1.

-END-

__Page Completed

FIGURE 1

NOTE: Cooling tower fans within the bold borders will be deenergized if the electrical ring bus is deenergized.

West Tower Fan # Breaker #	East Tower Fan # Breaker #
1A9 EV07	1A10 EU07
1A8 EU06	1A11 EV08
1A7 EV06	1A12 EU08
1A6 EU05	1A13 52-E103
1A5 EV05	1A14 52-E104
1A4 EU04	1A15 52-E105
1A3 EV04	1A16 52-E106
1A2 EU03	1A17 52-E107
1A1 EV03	1A18 52-E108

Cooling Tower A

West Tower Fan # Breaker #	East Tower Fan # Breaker #
1B9 EX07	1B10 EW07
1B8 EW06	1B11 EX08
1B7 EX06	1B12 EW08
1B6 EW05	1B13 52-E203
1B5 EX05	1B14 52-E204
1B4 EW04	1B15 52-E205
1B3 EX04	1B16 52-E206
1B2 EW03	1B17 52-E207
1B1 EX03	1B18 52-E208

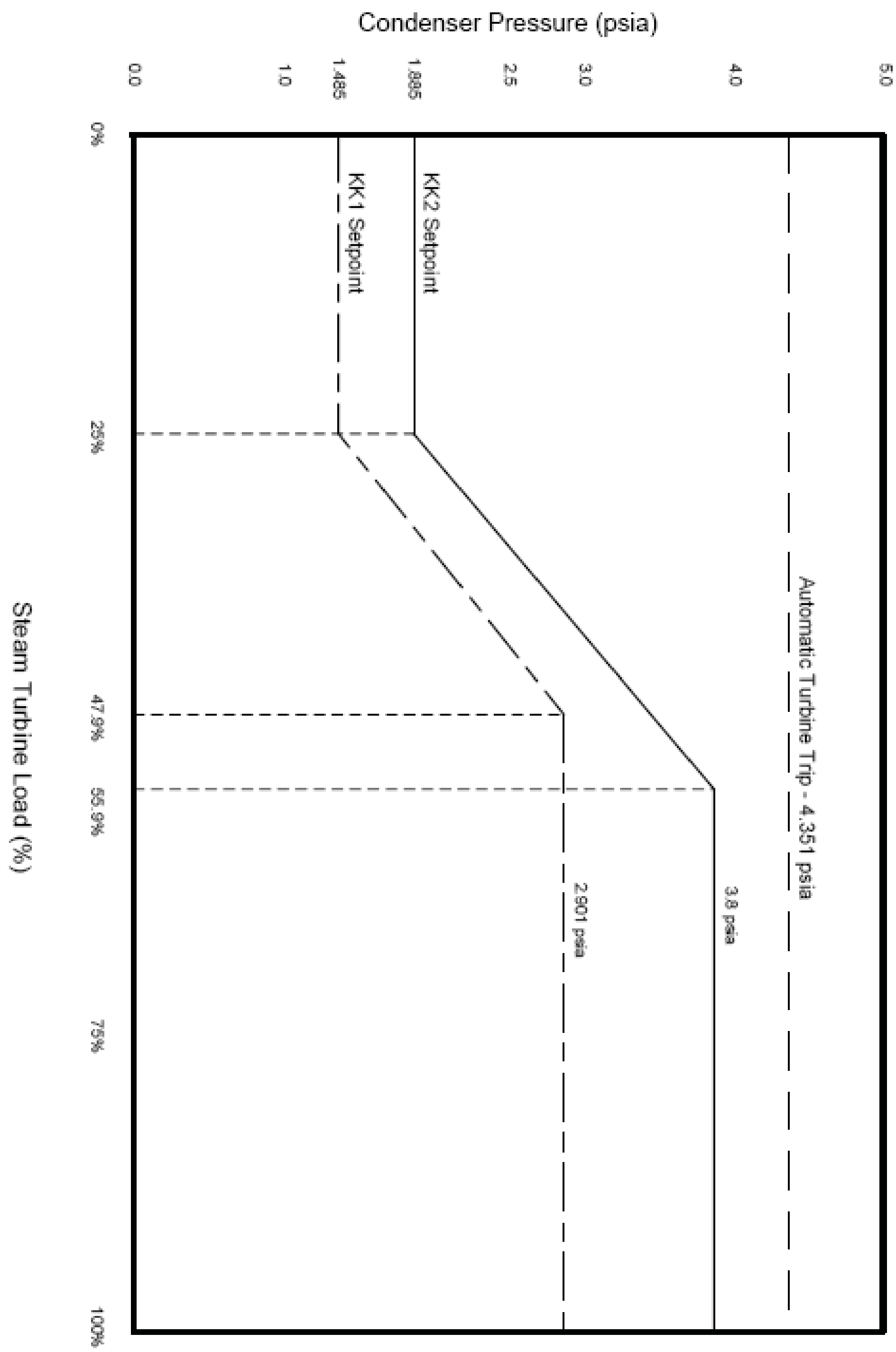
Cooling Tower B

West Tower Fan # Breaker #	East Tower Fan # Breaker #
1C8 EY06	1C9 EZ07
1C7 EZ06	1C10 EY07
1C6 EY05	1C11 EZ08
1C5 EZ05	1C12 EY08
1C4 EY04	1C13 52-E303
1C3 EZ04	1C14 52-E304
1C2 EY03	1C15 52-E305
1C1 EZ03	1C16 52-E306

Cooling Tower C

NORTH

FIGURE 2


Condenser Pressure (psia)
0.0
1.0
1.485
1.885
2.5
3.0
4.0
5.0
KK1 Setpoint
KK2 Setpoint
Automatic Turbine Trip - 4.351 psia
2.901 psia
3.8 psia
0%
25%
47.9%
55.9%
75%
100%
Steam Turbine Load (%)

84. 054AA2.01 084

Unit 1 is at 37% power with the following conditions:

- FCV-488, 1B SG FW FLOW, fails open and sticks open.

Given the following Tech Spec title:

- 3.7.3, Main Feedwater Stop Valves and Main Feedwater Regulation Valves (MFRVs) and Associated Bypass Valves

With NO OPERATOR ACTIONS, which one of the following completes the statements below?

A Reactor Trip __(1)__ occur.

Per the BASES of Tech Spec 3.7.3, the primary reason for automatic closure of the Main Feedwater Regulating valves is to prevent __(2)__ .

	(1)	(2)
A.	will NOT	an excessive mass addition to the Steam Generator during a Steamline Break event
B.	will NOT	a radiological release through the feedline penetration during a Steam Generator Tube Rupture event
C.✓	WILL	an excessive mass addition to the Steam Generator during a Steamline Break event
D.	WILL	a radiological release through the feedline penetration during a Steam Generator Tube Rupture event

For the conditions in the stem, the SG high level setpoint of 82% will be exceeded and this initiates a Turbine trip, SGFP trip, and FW isolation. Since Reactor power is >35%, an automatic Reactor trip occurs due to the Turbine trip. If Reactor power was <35% an automatic Reactor trip would not occur due to the Turbine trip.

It is plausible that a candidate would recall the AMSAC Turbine Impulse enabling setpoint of 40% as being the setpoint associated with a Turbine trip initiating a Reactor trip.

A. Incorrect - 1) Incorrect, an automatic Reactor trip would occur due to a Turbine trip when above 35% power.
Plausible since power is 37% and AMSAC system enabling setpoint is 40% power. A candidate may incorrectly conclude that an automatic Reactor trip would not occur since Reactor power is <40%.

2) Correct, the Bases for TS 3.7.3 states "The design basis of the MFRVs and Main FW Stop Valves is primarily established by the analyses for the large SLB. Failure of a Main FW Stop Valve and MFRV, or Main FW Stop Valve and MFRV bypass valve to close following an SLB or an excess feedwater event can result in additional mass and energy being delivered to the steam generators, contributing to cooldown. This failure also results in additional mass and energy releases following an SLB or FWLB event."

B. Incorrect - 1) Incorrect, see A.1.

2) Incorrect,
Plausible since most valves that isolate Containment are required to close due to radiological release concerns during a LOCA. Previous question statistics indicate that this response is plausible.

C. Correct - 1) Correct, SG high-high level of 82% initiates a Turbine trip, which initiates a Reactor trip when >35% power.

2) Correct, see A.2.

D. Incorrect - 1) Correct, see C.1.

2) Incorrect, see B.2.

K/A: 054AA2.01

Loss of Main Feedwater (MFW)
Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW):
(CFR: 43.5 / 45.13)
AA2.01 Occurrence of reactor and/or turbine trip 4.3 4.4

Importance Rating:	4.3	4.4

Technical Reference: Tech Specs v190/186
Tech Spec Bases v58

References provided: None

Learning Objective: Given a set of Plant Conditions ACCESS those conditions and DETERMINE the ability of plant equipment and structures to meet their intended, designated function (OPS-52302A06)

ANALYZE plant conditions and DETERMINE if actuation or reset of any Engineered Safety Features Actuation Signal (ESFAS) is necessary. (OPS-52530A05)

Question History: Modified FNP Bank AOP-13.0-62520M01 001

K/A match: A FW supply valve has failed open. This causes a high-high level on the associated SG. The high-high level trips the SGFPs and causes a FW isolation signal (Loss of Main Feedwater), as well as a Turbine trip. The candidate has to determine if an automatic Reactor trip occurs due to the high-high SG level.

SRO justification: Facility operating limitations in the TS and their bases. [10 CFR 55.43(b)(2)]

- Knowledge of TS bases that is required to analyze TS required actions and terminology.

Tech Spec Bases provides the background information that the primary reason for the FW isolation signal is to minimize the mass in Containment that can turn to steam and potentially challenge the Containment barrier. The FW Isolation signal minimizes the mass of water added to a SG during accident conditions.

2013 NRC exam

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(2)

1) can **NOT** be answered by knowing less than 1 hour Tech Specs.
2) can **NOT** be answered by knowing information listed "above-the-line".
3) can **NOT** be answered by knowing the TS Safety Limits or their bases.
4) Does involve **one or** more of the following for TS, TRM or ODCM:

- Knowledge of TS bases that are required to analyze TS required actions and terminology.

BASES

BACKGROUND (continued)

MFRVs and associated bypass valves, or the Main FW Stop Valves isolate the feedwater line penetrating containment, and ensure that the consequences of events do not exceed the capacity of the containment heat removal systems.

The MFRVs and the Main FW Stop Valves are part of the Condensate and Feedwater System as described in the FSAR, Section 10.4.7 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The design basis of the MFRVs and Main FW Stop Valves is primarily established by the analyses for the large SLB. Although the Main FW Stop Valves are not specifically credited in the accident analyses, these islation valves provide a diverse backup isolation function to the MFRVs. Closure of the MFRVs and associated bypass valves, or Main Feedwater Stop Valves, may also be relied on to terminate an SLB for core response analysis and excess feedwater event upon the receipt of a steam generator water level — high high signal.

Failure of a Main FW Stop Valve and MFRV, or Main FW Stop Valve and MFRV bypass valve to close following an SLB or an excess feedwater event can result in additional mass and energy being delivered to the steam generators, contributing to cooldown. This failure also results in additional mass and energy releases following an SLB or FWLB event.

The MFRVs satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

This LCO ensures that the MFRVs and their associated bypass valves or Main FW Stop Valves will isolate MFW flow to the steam generators, following an excess feedwater event or main steam line break. These valves will also isolate the nonsafety related portions from the safety related portions of the system.

This LCO requires that three MFRVs and associated bypass valves and three Main FW Stop Valves be OPERABLE. The MFRVs and the associated bypass valves and the Main FW Stop Valves are considered OPERABLE when isolation times are within limits and they close on the appropriate signal(s).

(continued)

Original FNP Bank question that was modified to develop 054AA2.01.

Unit 1 is in Mode 3 with a Startup in progress, when the following event occurs:

- FCV-489, 1B SG FW BYP FLOW, air line is severed between the controller and the positioner.

Which one of the following completes the statements below?

Per SOP-0.13, Recording Limiting Conditions For Operations, a(n) __(1)__ be written.

The safety related function of the Main Feedwater Regulating Bypass valve is to prevent __(2)__ during accident conditions.

__(1)__	__(2)__
A. Administrative LCO may	radiological release through the feedline penetration
B.✓ Administrative LCO may	excessive mass added to the steam generator
C. Mandatory LCO must	radiological release through the feedline penetration
D. Mandatory LCO must	excessive mass added to the steam generator

85. 055EG2.2.12 085

Unit 1 is in Mode 3 with the following conditions:

- A Grid disturbance caused a loss of all offsite power.
- During the event, the 1-2A DG started and then tripped.
- Operating DG status is as follows:
  - 1C DG is supplying Unit 1.
  - 1B DG is supplying Unit 1.
  - 2B DG is supplying Unit 2.
- ACC reports that the following lines have been **restored**:
  - Webb 230 KV line
  - Snowdoun 500KV line
- #1 Auto Bank Transformer is **out of service**.

Which one of the following completes the statements below for an evaluation of **Unit 1** Tech Specs for the **current conditions**?

Perform REQUIRED ACTION of Tech Spec 3.8.1, AC Sources - Operating, __(1)__ .

A 25% extension of the COMPLETION TIME __(2)__ allowed for the initial performance of SR 3.8.1.1 (STP-27.1, A.C. Source Verification).

Reference Provided

	(1)	(2)
A.	CONDITION A	IS
B.	CONDITION B	IS
C.	CONDITION A	is NOT
D.✓	CONDITION B	is NOT

A Station Blackout has occurred due to a loss of grid event. Once the plant has been stabilized, Tech Specs have to be evaluated for the 1-2A DG trip and for the loss of offsite power supplies to the plant. For the evaluation of offsite power supplies, see Figure 1 of STP-27.1. The 4 Startup Transformers (2 for Unit 1 and 2 for Unit 2) are all powered from the 230KV side of the High Voltage Switchyard (HVSYD) .
There are 4 offsite lines on the 230KV side of the HVSYD, and 2 offsite lines on the 500KV side of the HVSYD. For the two 500KV offsite lines to be considered available, there has to be two Autotransformers to step down voltage from 500KV to 230KV. If only one of the Autotransformers is out of service, then only one of the 500KV offsite lines can be counted as available for offsite sources.

For the given conditions, there is one 230KV line in service and one 500KV line in service. There are normally two Auto bank transformers that will allow flow between the

230KV and 500KV sides of the High Voltage Switchyard, but for this situation there is only one Auto bank transformer available. When only one Auto bank transformer is available, only one 500KV line can be used as an off-site source. Therefore, two off-site sources are available, one from the 230KV side and one from the 500KV side.

A. Incorrect - 1) Incorrect, plausible since CONDITION A is entered if there is only one offsite line available in the HVSYD (at least two are required). For the conditions given, the candidate may think that there is only one Autotransformer available, and it is out of service. In addition, since the Startup Transformers are powered from the 230KV side of the Switchyard, a candidate may think that only the 230KV source is available and that the 500KV sources cannot be counted as offsite sources. This question requires detailed knowledge of the SR evaluation methodology, STP-27.1.

Selection of CONDITION A may be more plausible than CONDITION B because there are two DG's supplying Unit 1 power. That may lead a candidate to conclude that both DG sets are OPERABLE for Unit 1, so CONDITION B can't be correct and CONDITION A has to be correct.

2) Incorrect, plausible since a 25% grace is allowed for each subsequent performance of the SR. A candidate may not know that it is not allowed for the first performance. There is OE from our plant where there was a misconception that the 25% grace was always applicable.

B. Incorrect - 1) Correct, the 1-2A DG trip makes the Unit 1 'A' Train DG set INOPERABLE.

2) Incorrect, see A.2.

C. Incorrect - 1) Incorrect, see A.1.

2) Correct, per Tech Spec Bases for 3.0.2, a 25% grace is available for SR's that are required to be performed on a "once per X amount of time" basis. This is not applicable for the first performance of the SR.

D. Correct - 1) Correct, see B.1.

2) Correct, see C.2.

K/A: 055EG2.2.12 Loss of Offsite and Onsite Power (Station Blackout):
2.2.12 Knowledge of surveillance procedures.
(CFR: 41.10 / 45.13)
IMPORTANCE RO 3.7 SRO 4.1

Importance Rating: 3.7 4.1

Technical Reference:	FNP-1-STP-27.1, A.C. Source Verification, v37.1 Tech Specs v190/186 Tech Spec Bases v58
References provided:	Tech Specs 3.8.1, pages 3.8.1-1 to 3.8.1-3 (with Conditon A & B only)
Learning Objective:	RECALL AND APPLY the information of the generic LCO requirements (LCO 3.0.1 thru 3.0.7; SR 4.0.1 thru 4.0.4) including the BASES of the generic section , for any Technical Specifications or TRM requirements (OPS-62302A02): 10CFR55.43 (b) 2
Question History:	New question
K/A match:	A Station Blackout event has occurred with component failures. Once the transient is controlled, the candidate is required to evaluate Tech Specs for the current conditions and determine if the required surveillance procedure has to be completed within the stated time, or if a 25% grace is allowed. The Tech Spec evaluation requires knowledge of the methodology of the STP-27.1 evaluation of offsite sources available.
SRO justification:	Facility operating limitations in the TS and their bases. [10 CFR 55.43(b)(2)] • Knowledge of TS bases that is required to analyze TS required actions and terminology. Tech Spec Bases provides the background and explicit instructions for implementation of the 25% grace period allowed for certain performances of SR's.

2013 NRC exam

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(2)

1) can **NOT** be answered by knowing less than 1 hour Tech Specs.
2) can **NOT** be answered by knowing information listed "above-the-line".
3) can **NOT** be answered by knowing the TS Safety Limits or their bases.
4) Does involve **one or** more of the following for TS, TRM or ODCM:

- Knowledge of TS bases that are required to analyze TS required actions and terminology.

Reference provided to candidate for this question - TS 3.8.1

3.8 ELECTRICAL POWER SYSTEMS

3.8.1 AC Sources — Operating

LCO 3.8.1 The following AC electrical sources shall be OPERABLE:

a. Two qualified circuits between the offsite transmission network and the onsite Class 1E AC Electrical Power Distribution System; and

b. Two diesel generator (DG) sets capable of supplying the onsite Class 1E power distribution subsystem(s); and

c. Automatic load sequencers for Train A and Train B.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

--NOTE--

LCO 3.0.4b is not applicable to DGs.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required offsite circuit inoperable.	A.1 Perform SR 3.8.1.1 for required OPERABLE offsite circuit.	2 hours <u>AND</u> Once per 8 hours thereafter
	<u>AND</u>	
	A.2 Declare required feature(s) with no offsite power available inoperable when its redundant required feature(s) is inoperable.	24 hours from discovery of no offsite power to one train concurrent with inoperability of redundant required feature(s)
	<u>AND</u>	
		(continued)

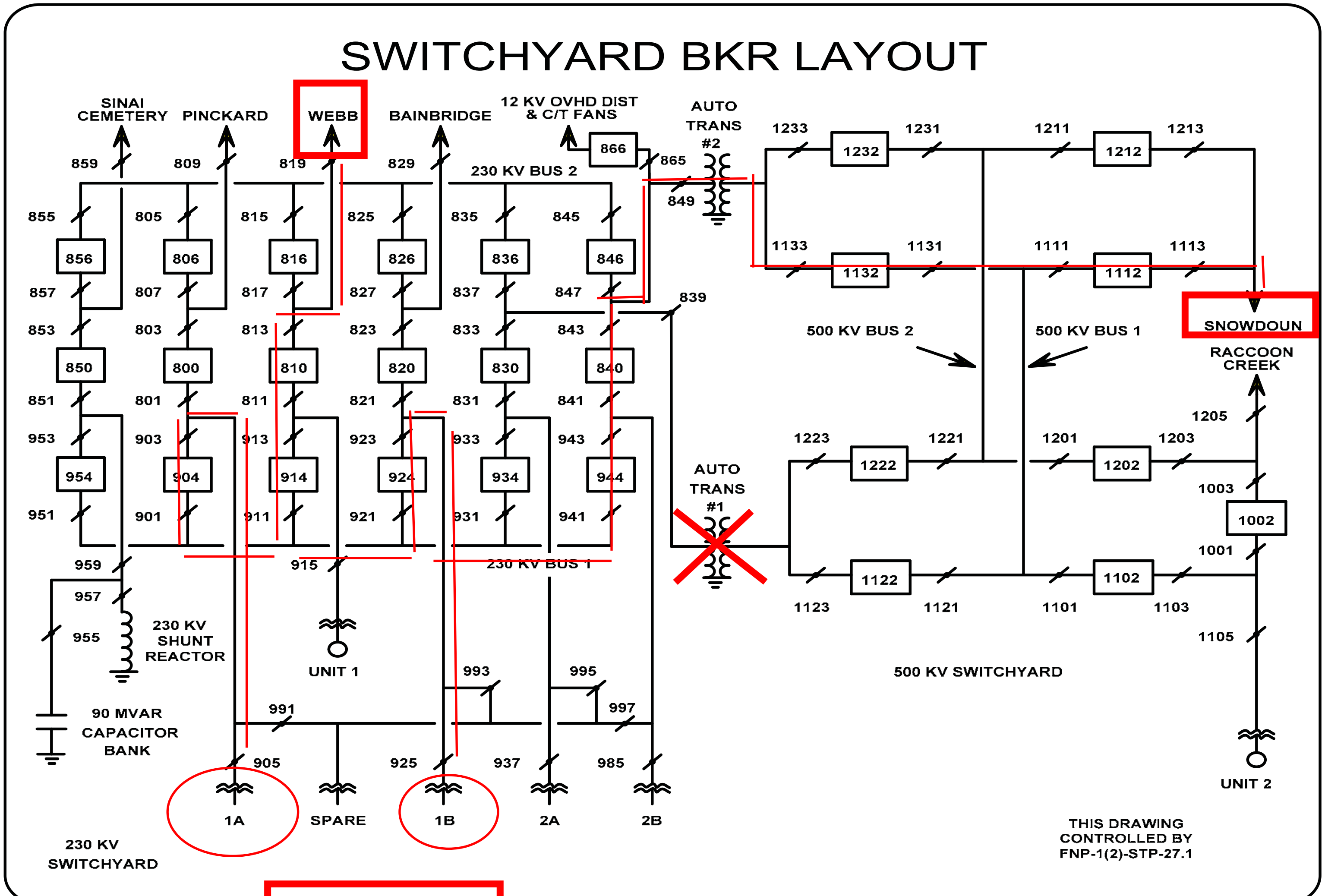
ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.3 Restore required offsite circuit to OPERABLE status.	72 hours <u>AND</u> 13 days from discovery of failure to meet LCO
B. One DG set inoperable.	------------------NOTE------------------- LCO 3.0.4c is applicable when only one of the three DGs is inoperable. --- B.1 Perform SR 3.8.1.1 for the required offsite circuit(s). <u>AND</u> B.2 Declare required feature(s) supported by the inoperable DG set inoperable when its required redundant feature(s) is inoperable. <u>AND</u> B.3.1 Determine OPERABLE DG set is not inoperable due to common cause failure. <u>OR</u>	 2 hours <u>AND</u> Once per 8 hours thereafter 4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s) 24 hours (continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.3.2 Perform SR 3.8.1.6 for OPERABLE DG set. AND	24 hours
	B.4 Restore DG set to OPERABLE status.	10 days AND 13 days from discovery of failure to meet LCO

FIGURE 1



Onsite Startup Transformers 1A and 1B

3.8 ELECTRICAL POWER SYSTEMS

3.8.1 AC Sources — Operating

LCO 3.8.1 The following AC electrical sources shall be OPERABLE:

a. Two qualified circuits between the offsite transmission network and the onsite Class 1E AC Electrical Power Distribution System; and

b. Two diesel generator (DG) sets capable of supplying the onsite Class 1E power distribution subsystem(s); and

c. Automatic load sequencers for Train A and Train B.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

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

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required offsite circuit inoperable.	A.1	Perform SR 3.8.1.1 for required OPERABLE offsite circuit.	2 hours <u>AND</u> Once per 8 hours thereafter
This surveillance is also performed when Condition A is required	<u>AND</u>		
	A.2	Declare required feature(s) with no offsite power available inoperable when its redundant required feature(s) is inoperable.	24 hours from discovery of no offsite power to one train concurrent with inoperability of redundant required feature(s)
	<u>AND</u>		
			(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.3 Restore required offsite circuit to OPERABLE status.	72 hours <u>AND</u> 13 days from discovery of failure to meet LCO
B. One DG set inoperable.	------------------NOTE------------------ LCO 3.0.4c is applicable when only one of the three DGs is inoperable. --	
	B.1 Perform SR 3.8.1.1 for the required offsite circuit(s).	2 hours <u>AND</u> Once per 8 hours thereafter
	<u>AND</u>	
	B.2 Declare required feature(s) supported by the inoperable DG set inoperable when its required redundant feature(s) is inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)
	<u>AND</u>	
	B.3.1 Determine OPERABLE DG set is not inoperable due to common cause failure. <u>OR</u>	24 hours
		(continued)

Condition B is required because the 1-2A DG is tripped. For the "A" Train DG's to be OPERABLE, both 1C and 1-2A DGs must be OPERABLE.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.3.2 Perform SR 3.8.1.6 for OPERABLE DG set. AND B.4 Restore DG set to OPERABLE status.	24 hours 10 days AND 13 days from discovery of failure to meet LCO

BASES

SR 3.0.1 (continued)

Surveillances, including Surveillances invoked by Required Actions, do not have to be performed on inoperable equipment because the ACTIONS define the remedial measures that apply. Surveillances have to be met and performed in accordance with SR 3.0.2, prior to returning equipment to OPERABLE status.

Upon completion of maintenance, appropriate post maintenance testing is required to declare equipment OPERABLE. This includes ensuring applicable Surveillances are not failed and their most recent performance is in accordance with SR 3.0.2. Post maintenance testing may not be possible in the current MODE or other specified conditions in the Applicability due to the necessary unit parameters not having been established. In these situations, the equipment may be considered OPERABLE provided testing has been satisfactorily completed to the extent possible and the equipment is not otherwise believed to be incapable of performing its function. This will allow operation to proceed to a MODE or other specified condition where other necessary post maintenance tests can be completed.

SR 3.0.2

SR 3.0.2 establishes the requirements for meeting the specified Frequency for Surveillances and any Required Action with a Completion Time that requires the periodic performance of the Required Action on a "once per . . ." interval.

SR 3.0.2 permits a 25% extension of the interval specified in the Frequency. This extension facilitates Surveillance scheduling and considers plant operating conditions that may not be suitable for conducting the Surveillance (e.g., transient conditions or other ongoing Surveillance or maintenance activities).

The 25% extension does not significantly degrade the reliability that results from performing the Surveillance at its specified Frequency. This is based on the recognition that the most probable result of any particular Surveillance being performed is the verification of conformance with the SRs. The exceptions to SR 3.0.2 are those Surveillances for which the 25% extension of the interval specified in the Frequency does not apply. These exceptions are stated in the individual Specifications. An example of where SR 3.0.2 does not apply is the Containment Leakage Rate Testing Program.

(continued)

BASES

SR 3.0.2 (continued)

As stated in SR 3.0.2, the 25% extension also does not apply to the initial portion of a periodic Completion Time that requires performance on a "once per ..." basis. The 25% extension applies to each performance after the initial performance. The initial performance of the Required Action, whether it is a particular Surveillance or some other remedial action, is considered a single action with a single Completion Time. One reason for not allowing the 25% extension to this Completion Time is that such an action usually verifies that no loss of function has occurred by checking the status of redundant or diverse components or accomplishes the function of the inoperable equipment in an alternative manner.

The provisions of SR 3.0.2 are not intended to be used repeatedly merely as an operational convenience to extend Surveillance intervals (other than those consistent with refueling intervals) or periodic Completion Time intervals beyond those specified.

SR 3.0.3

SR 3.0.3 establishes the flexibility to defer declaring affected equipment inoperable or an affected variable outside the specified limits when a Surveillance has not been completed within the specified Frequency. A delay period of up to 24 hours or up to the limit of the specified Frequency, whichever is greater, applies from the point in time that it is discovered that the Surveillance has not been performed in accordance with SR 3.0.2, and not at the time that the specified Frequency was not met.

This delay period provides adequate time to complete Surveillances that have been missed. This delay period permits the completion of a Surveillance before complying with Required Actions or other remedial measures that might preclude completion of the Surveillance.

The basis for this delay period includes consideration of unit conditions, adequate planning, availability of personnel, the time required to perform the Surveillance, the safety significance of the delay in completing the required Surveillance, and the recognition that the most probable result of any particular Surveillance being performed is the verification of conformance with the requirements.

(continued)

86. 058AA2.02 086

Unit 1 is at 100% power when the following conditions occur:

- VC4, 1B BATT CHG FAULT OR DISC, alarms.
- EEO5, 1B BATTERY CHARGER SUPPLY BREAKER, has tripped open.
- 1B DC Bus Voltage is 130 Volts.

Given the following Tech Spec titles:
- 3.8.4, DC Sources-Operating
- 3.8.9, Distribution Systems-Operating

Which one of the following completes the statement below?

________ is(are) required to be implemented.

Reference Provided

A. **NEITHER** Tech Spec 3.8.4 **nor** Tech Spec 3.8.9

B.✓ **ONLY** Tech Spec 3.8.4

C. **ONLY** Tech Spec 3.8.9

D. **BOTH** Tech Spec 3.8.4 and Tech Spec 3.8.9

The Bases of TS 3.8.4 in the LCO section states:
An OPERABLE DC electrical power subsystem requires all required batteries and respective chargers to be operating and connected to the associated DC bus(es).

The Bases of TS 3.8.9 in the LCO section states:
OPERABLE DC electrical power distribution subsystems require the associated buses to be energized to their proper voltage from either the associated battery or charger.

A. Incorrect - REQUIRED ACTIONS of TS 3.8.4 are required to be implemented. Plausible that a candidate could determine that no LCO is required since the bus has power available and the Batteries are rated to carry the bus for a minimum of 2 hours with no Charger aligned. There are questions on this exam and in our exam bank where the correct answer is neither or no action, however in this case this is not correct.

B. Correct - Both a Battery and Charger in operation and supplying proper voltage and connected to the DC bus are required to ensure OPERABILITY per TS 3.8.4.

C. Incorrect - Both a Battery and Charger in operation and supplying proper voltage and connected to the DC bus are required to ensure OPERABILITY per TS 3.8.4. Per TS 3.8.9. **Either** a Battery **or** Charger supplying proper voltage is required to ensure OPERABILITY per TS 3.8.9. It is plausible that a candidate may determine the wrong requirements for this Tech Specs.

D. Incorrect - This is a plausible answer choice since both of these TS's have requirements for the DC system OPERABILITY.

K/A: 058AA2.02 — Loss of DC Power
Ability to determine and interpret the following as they apply to the Loss of DC Power:
(CFR: 43.5 / 45.13)
AA2.02 125V dc bus voltage, low/critical low, alarm . . . . . .
3.3* 3.6

Importance Rating: 3.3 3.6

Technical Reference: Tech Specs v190/186
Tech Spec Bases v58

References provided: Tech Specs 3.8.4 and 3.8.9 (the TS only and not the SR's), pages 3.8.4-1, 3.8.9-1, and 3.8.9-2

Learning Objective: RECALL AND APPLY the information from the LCO BASES sections: BACKGROUND, APPLICABLE SAFETY ANALYSIS, ACTIONS, SURVEILLENCE REQUIREMENTS, for any Technical Specifications or TRM requirements

associated with the DC Distribution System components and attendant equipment alignment, to include the following: (OPS-62103C01) 10CFR55.43 (b) 2
3.8.4, DC Sources - Operating
3.8.5, DC Sources – Shutdown
3.8.6, Battery Cell Parameters
3.8.9, Distribution Systems – Operating
3.8.10, Distribution Systems - Shutdown

Question History: 058AA2.02 89 from Farley Test Bank

K/A match: A Battery Charger has tripped off causing an alarm and a loss of Operability per the TS for DC Sources - Operating. The candidate has to interpret the effects of the loss of a Battery Charger with bus voltage still being maintained by the Battery, and determine the proper application of Tech Spec requirements per TS Bases.

SRO justification: Facility operating limitations in the TS and their bases. [10 CFR 55.43(b)(2)]

- Knowledge of TS bases that is required to analyze TS required actions and terminology.

Both of these Tech Specs have a portion related to the DC electrical system. The requirements for OPERABILITY are not defined in the TS. TS Bases knowledge is required to be able to determine the TS applicability.

2013 NRC exam

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(2)

1) can **NOT** be answered by knowing less than 1 hour Tech Specs.
2) can **NOT** be answered by knowing information listed "above-the-line".
3) can **NOT** be answered by knowing the TS Safety Limits or their bases.
4) Does involve **one or** more of the following for TS, TRM or ODCM:

- Knowledge of TS bases that are required to analyze TS required actions and terminology.

Reference provided to candidate for this question - TS 3.8.4 & 3.8.9

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources — Operating

LCO 3.8.4 The Train A and Train B Auxiliary Building and Service Water Intake Structure (SWIS) DC electrical power subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One Auxiliary Building DC electrical power subsystem inoperable.	A.1 Restore the Auxiliary Building DC electrical power subsystem to OPERABLE status.	2 hours
B. One Auxiliary Building DC electrical power subsystem with battery connection resistance not within limit.	B.1 Restore the battery connection resistance to within limit.	24 hours
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 3. <u>AND</u> C.2 Be in MODE 5.	6 hours 36 hours
D. One required SWIS DC electrical power subsystem battery connection resistance not within limit.	D.1 Restore the battery connection resistance to within the limit.	24 hours
E. One required SWIS DC electrical power subsystem inoperable. <u>OR</u> Required Action and associated Completion Time of Condition D not met.	E.1 Declare the associated Service Water System train inoperable.	Immediately

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems — Operating

LCO 3.8.9 Train A and Train B AC, DC, and AC vital bus electrical power distribution subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more AC electrical power distribution subsystems inoperable.	A.1 Restore AC electrical power distribution subsystem(s) to OPERABLE status.	8 hours <u>AND</u> 16 hours from discovery of failure to meet LCO
B. One or more AC vital buses inoperable.	B.1 Restore AC vital bus subsystem(s) to OPERABLE status.	8 hours <u>AND</u> 16 hours from discovery of failure to meet LCO
C. One Auxiliary Building DC electrical power distribution subsystem inoperable.	C.1 Restore Auxiliary Building DC electrical power distribution subsystem to OPERABLE status.	2 hours <u>AND</u> 16 hours from discovery of failure to meet LCO

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Be in MODE 3. <u>AND</u> D.2 Be in MODE 5.	6 hours 36 hours
E. One Service Water Intake Structure (SWIS) DC electrical power distribution subsystem inoperable.	E.1 Declare the associated Service Water train inoperable.	Immediately
F. Two trains with inoperable distribution subsystems that result in a loss of safety function.	F.1 Enter LCO 3.0.3.	Immediately

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources — Operating

LCO 3.8.4 The Train A and Train B Auxiliary Building and Service Water Intake Structure (SWIS) DC electrical power subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One Auxiliary Building DC electrical power subsystem inoperable. CONDITION A of TS 3.8.4 is reqired due to the loss of the 1B Battery Charger (see Bases)	A.1 Restore the Auxiliary Building DC electrical power subsystem to OPERABLE status.	2 hours 12 hours for 1B Auxiliary Building DC electrical power subsystem inoperable due to inoperable battery for cycle 19 only
B. One Auxiliary Building DC electrical power subsystem with battery connection resistance not within limit.	B.1 Restore the battery connection resistance to within limit.	24 hours
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 3. <u>AND</u> C.2 Be in MODE 5.	6 hours 36 hours
D. One required SWIS DC electrical power subsystem battery connection resistance not within limit.	D.1 Restore the battery connection resistance to within the limit.	24 hours
E. One required SWIS DC electrical power subsystem inoperable. <u>OR</u> Required Action and associated Completion Time of Condition D not met.	E.1 Declare the associated Service Water System train inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is ≥ 127.8 V on float charge.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.2	Verify no visible corrosion at battery terminals and connectors. <u>OR</u> Verify post-to-post battery connection resistance of each cell-to-cell and terminal connection is ≤ 150 microhms for the Auxiliary Building batteries and ≤ 1500 microhms for the SWIS batteries.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.3	Verify battery cells, cell plates, and racks show no visual indication of physical damage or abnormal deterioration.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.4	Remove visible terminal corrosion, verify battery cell- to-cell and terminal connections are coated with anti-corrosion material.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.5	Verify post-to-post battery connection resistance of each cell-to-cell and terminal connection is ≤ 150 microhms for the Auxiliary Building batteries and ≤ 1500 microhms for the SWIS batteries	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.4.6	------------------------------NOTE------------------------------ This Surveillance may be performed in MODE 1, 2, 3, 4, 5, or 6 provided spare or redundant charger(s) placed in service are within surveillance frequency to maintain DC subsystem(s) OPERABLE. --- Verify each required Auxiliary Building battery charger supplies ≥ 536 amps at ≥ 125 V for ≥ 4 hours and each required SWIS battery charger supplies ≥ 3 amps at ≥ 125 V for ≥ 4 hours.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.7	----------------------------NOTES------------------------------ 1. The performance discharge test in SR 3.8.4.8 may be performed in lieu of the service test in SR 3.8.4.7 once per 60 months. 2. The modified performance discharge test in SR 3.8.4.8 may be performed in lieu of the service test at any time. 3. This Surveillance shall not be performed for the Auxiliary Building batteries in MODE 1, 2, 3, or 4. --- Verify battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design load profile described in the Final Safety Analysis Report, Section 8.3.2, by subjecting the battery to a service test.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.8.4.8	-------------------------------NOTE------------------------------ This Surveillance shall not be performed for the Auxiliary Building batteries in MODE 1, 2, 3, or 4. -- Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test.	In accordance with the Surveillance Frequency Control Program <u>AND</u> 18 months when battery shows degradation or has reached 85% of expected life or 17 years, whichever comes first

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources — Operating

BASES

BACKGROUND

The station DC electrical power system provides the AC emergency power system with control power. It also provides both motive and control power to selected safety related equipment and preferred AC vital bus power (via inverters). As required by 10 CFR 50, Appendix A, GDC 17 (Ref. 1), the DC electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure. The DC electrical power system also conforms to the recommendations of Regulatory Guide 1.6 (Ref. 2) and IEEE-308 (Ref. 3).

The 125 VDC electrical power system consists of two main systems. The Auxiliary Building System and the Service Water Intake Structure (SWIS) System. The Auxiliary Building 125 VDC system consists of two independent and redundant subsystems (Train A and Train B) which supply DC power to various ESF systems throughout the plant. Each Auxiliary Building subsystem (train) consists of a 125 VDC battery, an associated full capacity battery charger and all associated control equipment and interconnecting cabling. Each Auxiliary Building 125 VDC train is normally supplied by the associated battery charger (A or B). In the event of an A or B battery charger failure, battery charger C, the full capacity swing battery charger, may supply power to either train. Either train may be considered OPERABLE when supplied from battery charger C. Battery charger C input and output breakers are interlocked to prevent supplying power to a DC bus from the opposite train. Both the Auxiliary Building 125 VDC source subsystems (Train A and B) are required OPERABLE by this LCO.

The SWIS 125 VDC system provides a reliable source of power for controls, power loads, annunciation and alarms primarily for the safety-related Service Water System. The SWIS 125 VDC system consists of four battery/battery charger subsystems. Each subsystem consists of a 125 VDC battery and full capacity battery charger. The subsystems are divided into Train A and Train B which are shared between the two units. Each of the 4 subsystems can supply 100% of the required capacity for the associated train. Subsystems 1 and 2 are associated with Train A, with subsystem 1 being the normal

(continued)

BASES

BACKGROUND (continued)

supply, and subsystem 2 the standby supply. Subsystems 3 and 4 are associated with Train B, with subsystem 3 being the normal supply and subsystem 4 the standby supply. Each train has a manual transfer switch which is used to select which of the two available SWIS subsystems supplies that train. One SWIS subsystem is required OPERABLE for each train.

During normal operation, the 125 VDC load is powered from the battery chargers with the batteries floating on the system. In case of loss of normal power to the battery charger, the DC load is automatically powered from the station batteries.

The Train A and Train B DC electrical power subsystems provide the control power for its associated Class 1E AC power load group, 4.16 kV switchgear, and 600 V load centers. The DC electrical power subsystems also provide DC electrical power to the inverters, which in turn power the AC vital buses.

The DC power distribution system is described in more detail in Bases for LCO 3.8.9, "Distribution System — Operating," and LCO 3.8.10, "Distribution Systems — Shutdown."

Each train of 125 VDC batteries is separately housed in a ventilated room apart from its charger and distribution centers. Each subsystem is located in an area separated physically and electrically from the other subsystem to ensure that a single failure in one subsystem does not cause a failure in a redundant subsystem. There is no sharing between redundant Class 1E subsystems, such as batteries, battery chargers, or distribution panels.

The Auxiliary Building batteries are stationary type consisting of 60 individual lead-calcium cells electrically connected in series to establish a nominal 125VDC power supply. Under both normal and accident conditions the batteries are capable of providing the required voltage for component operation considering an aging factor of 25% and minimum electrolyte temperature of 60°F. The battery float voltage is 2.20V per cell average and 132V total terminal voltage. During an LOSP or LOSP with SI, the Auxiliary Building batteries supply safety-related loads for a period of less than one minute duration without charger support. The design is such that subsequent to LOSP, the battery chargers are re-energized by the Diesel Generators within one minute.

(continued)

BASES

BACKGROUND (continued)

Although not a requirement for the mitigation of design basis events, each battery is capable of providing LOSP or LOSP plus SI loads for a period of 2 hours assuming the single failure loss of the battery charger aligned at the onset of the event. During such an occurrence, the redundant train battery with its connected charger remains fully capable of providing DC power to redundant train safety-related loads. The batteries also have the capacity to supply normal operating loads for a period of 2 hours without charger support as discussed in the FSAR Chapter 8.3 (Ref. 4). The 2 hour period of time is adequate to allow alignment of the spare battery charger to the affected battery without disrupting continued operation.

The SWIS batteries are stationary type consisting of individual lead-calcium cells electrically connected in series to establish a nominal 125 VDC power supply. They are sized to furnish the anticipated vital loads without dropping below a total battery voltage of 105 V. Under both normal and accident conditions the batteries are capable of providing the required voltage for component operation considering an aging factor of 25% and a minimum electrolyte temperature of 35°F. The battery float voltage is 2.20 V per cell average and 132 V total. Each SWIS battery subsystem has adequate capacity to carry its loads without charger support for a period of at least 2 hours as discussed in the FSAR, Chapter 8.3 (Ref. 4).

Each Train A and Train B DC electrical power subsystem has ample power output capacity for the steady state operation of connected loads required during normal operation, while at the same time maintaining its battery bank fully charged. Each battery charger has adequate capacity to restore its battery to full charge after the battery has been discharged while carrying steady-state normal or emergency loads. The time required to recharge the battery to full charge is compatible with the recommendation of the battery manufacturer (Ref. 4).

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 6 (Ref. 6), and in the FSAR, Chapter 15 (Ref. 7), assume that Engineered Safety Feature (ESF) systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the DGs, emergency auxiliaries, and control and switching during all MODES of operation.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The OPERABILITY of the DC sources is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining the DC sources OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite AC power or all onsite AC power; and

b. A worst case single failure.

The DC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Both the Auxiliary Building 125 VDC source subsystems (Train A and B) and two SWIS 125 VDC source subsystems (one in each train) including a battery charger for each Auxiliary Building and SWIS battery and the corresponding control equipment and interconnecting cabling supplying power to the associated bus within the train are required to be OPERABLE to ensure the availability of the required power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. Loss of any train DC electrical power subsystem does not prevent the minimum safety function from being performed (Ref. 4).

An OPERABLE DC electrical power subsystem requires all required batteries and respective chargers to be operating and connected to the associated DC bus(es).

APPLICABILITY

The DC electrical power sources are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure safe unit operation and to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided, and containment integrity and other vital functions are maintained in the event of a postulated DBA.

The DC electrical power requirements for MODES 5 and 6 are addressed in the Bases for LCO 3.8.5, "DC Sources — Shutdown."

BASES

ACTIONS

A.1

Condition A represents one train of Auxiliary Building DC electrical power with a loss of ability to completely respond to an event, and a potential loss of ability to remain energized during normal operation. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for complete loss of DC power to the affected train. The 2 hour limit is consistent with the allowed time for an inoperable DC distribution system train.

[For Unit 1 only for cycle 19] The second Completion time for Condition A represents the 1B train of Auxiliary Building DC electrical power subsystem due to an inoperable battery. With the 1B Auxiliary Building battery inoperable, the DC bus is being supplied by the OPERABLE battery charger. Any event that results in a loss of the AC bus supporting the battery charger will also result in the loss of DC to that train. Recovery of the AC bus, especially if it is due to a loss of offsite power, will be hampered by the fact that many of the components necessary for the recovery (e.g., diesel generator control and field flash, AC load shed and diesel generator output breakers, etc.) rely upon the battery. The 12 hour limit allows sufficient time to effect restoration of the inoperable battery given that the majority of the conditions that lead to battery inoperability (e.g., loss of battery charger, battery cell voltage less than 2.02 volts, etc.) are identified in Specifications 3.8.4, 3.8.5, and 3.8.6 together with additional specific completion times.

If one of the required DC electrical power subsystems is inoperable (e.g., inoperable battery, inoperable battery charger(s), or inoperable battery charger and associated inoperable battery), the remaining DC electrical power subsystem has the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent worst case single failure would, however, result in the complete loss of the remaining 125 VDC electrical power subsystems with attendant loss of ESF functions, in the case of the Auxiliary Building DC power subsystem, continued power operation should not exceed 2 hours. The 2 hour Completion Time is based on Regulatory Guide 1.93 (Ref. 8) and reflects a reasonable time to assess unit status as a function of the inoperable DC electrical power subsystem and, if the Auxiliary Building DC electrical power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown.

(continued)

BASES

ACTIONS (continued)

B.1 and D.1

Conditions B and D represent one Auxiliary Building or SWIS DC electrical power subsystem with connection resistance not within the specified limit. Consistent with the guidance in IEEE-450, connection resistance not within the limit is an indication that the affected battery requires attention to restore the resistance to within the limit but is not a basis on which to declare the battery inoperable. Therefore, the 24 hour Completion Time allowed to restore the battery connection resistance to within the required limit is a reasonable time considering that variations in connection resistance do not mean the battery is incapable of performing its required safety function, but is an indication that the battery requires maintenance.

C.1 and C.2

If the inoperable Auxiliary Building DC electrical power subsystem cannot be restored to OPERABLE status or the connection resistance restored to within the limit within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems. The Completion Time to bring the unit to MODE 5 is consistent with the time required in Regulatory Guide 1.93 (Ref. 8).

E.1

If a required SWIS DC electrical power subsystem is inoperable or the connection resistance is not restored to within the limit and the associated Completion Time has expired, the Service Water System train supported by the affected SWIS DC electrical power subsystem must be declared inoperable. The capability of the affected SWIS DC electrical power subsystem to fully support the associated train of Service Water is not assured. Therefore, consistent with the definition of OPERABILITY, the associated train of Service Water must be declared inoperable immediately, thereby limiting operation in this condition to the Completion Time associated with the affected Service Water System train.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1

Verifying battery terminal voltage while on float charge for the batteries helps to ensure the effectiveness of the charging system and the ability of the batteries to perform their intended function. Float charge is the condition in which the charger is applying a voltage to the battery to maintain it in a fully charged condition during normal operation. The float voltage of 2.2 V per cell or 132 V overall is higher than the nominal design voltage of 125 V and is consistent with the manufacturer's recommendations for maintaining a full charge. Verifying that terminal voltage is ≥ 127.8 V provides assurance that the average of all cell voltages is maintained greater than 2.13 V. Maintaining float voltage at the higher value of 2.2 V per cell prolongs cell life expectancy. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.4.2

Visual inspection to detect excessive corrosion on the battery terminals or connectors, or measurement of the post to post resistance of these items provides an indication of the need for cleaning and/or retorqueing.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.4.3

Visual inspection of the battery cells, cell plates, and battery racks provides an indication of physical damage or abnormal deterioration that could potentially degrade battery performance. The presence of physical damage or deterioration does not necessarily represent a failure of this SR, provided an evaluation determines that the physical damage or deterioration does not affect the OPERABILITY of the battery (its ability to perform its design function).

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.4 and SR 3.8.4.5

Visual inspection and post to post resistance measurements of battery terminals or connectors provide an indication of the need for cleaning and/or retorqueing. The anticorrosion material is used to help ensure good electrical connections and to reduce terminal deterioration. The visual inspection for corrosion is not intended to require removal of and inspection under each terminal connection. The removal of visible corrosion is a preventive maintenance SR. The presence of visible corrosion does not necessarily represent a failure of this SR provided visible corrosion is removed during performance of SR 3.8.4.4.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR requires that each required battery charger be capable of supplying 536 amps (Auxiliary Building chargers) and 3 amps (SWIS chargers) at 125 V for ≥ 4 hours. These requirements are based on the design capacity of the chargers (Ref. 4). According to Regulatory Guide 1.32 (Ref. 10), the battery charger supply is required to be based on the largest combined demands of the various steady state loads and the charging capacity to restore the battery from the design minimum charge state to the fully charged state, irrespective of the status of the unit during these demand occurrences. The minimum required amperes and duration ensures that these requirements can be satisfied.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This surveillance is modified by a Note which clarifies that it may be performed in any mode of operation provided certain conditions are met. The design is such that any battery charger may be tested while a spare or redundant battery and/or charger is in service in its place. The spare or redundant battery and/or charger must be within the 18 month surveillance frequency to maintain the DC subsystem(s) to which they are aligned OPERABLE. This operational flexibility maintains TS OPERABILITY of the applicable battery and DC train while testing the normally aligned charger.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.7

A battery service test is a special test of battery capability, as found, to satisfy the design requirements (design load profile) of the DC electrical power system. The discharge rate and test length should correspond to the design load profile requirements as specified in Reference 4.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by three Notes. Note 1 allows the performance of a performance discharge test in lieu of a service test once per 60 months. Note 2 allows the performance of a modified performance discharge test in lieu of a service test at any time.

The modified performance discharge test is a simulated duty cycle consisting of just two rates: the one minute rate published for the battery or the largest current load of the duty cycle, followed by the test rate employed for the performance test, both of which envelop the duty cycle of the service test. Since the ampere-hours removed by a rated one minute discharge represents a very small portion of the battery capacity, the test rate can be changed to that for the performance test without compromising the results of the performance discharge test. The battery terminal voltage for the modified performance discharge test should remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test.

A modified discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for a service test.

The reason for Note 3 is that performing the Surveillance for the Auxiliary Building batteries would perturb the electrical distribution system and challenge safety systems.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.8

A battery performance discharge test is a test of constant current capacity of a battery, after having been in service, to detect any change in the capacity determined by the acceptance test. The test is intended to determine overall battery degradation due to age and usage.

A battery modified performance discharge test is described in the Bases for SR 3.8.4.7. Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.4.8. The modified performance discharge test may be used to satisfy SR 3.8.4.8 while simultaneously satisfying the requirements of SR 3.8.4.7 at any time. The performance discharge test may be used to satisfy 3.8.4.8 while simultaneously satisfying the requirements of SR 3.8.4.7 once per 60 months.

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 9). This reference recommends that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery rate of deterioration is increasing, even if there is ample capacity to meet the load requirements.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. If the battery shows degradation, or if the battery has reached 85% of its expected life or 17 years, whichever comes first, the Surveillance Frequency is reduced to 18 months. Degradation is indicated, according to IEEE-450 (Ref. 9), when the battery capacity drops by more than 10% relative to its capacity on the previous performance test or when it is > 10% below the manufacturer's rating.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance for the Auxiliary Building batteries would perturb the electrical distribution system and challenge safety systems.

(continued)

BASES (continued)

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. Regulatory Guide 1.6, March 10, 1971.
3. IEEE-308-1971.
4. FSAR, Section 8.3.
5. None.
6. FSAR, Chapter 6.
7. FSAR, Chapter 15.
8. Regulatory Guide 1.93, December 1974.
9. IEEE-450-1980.
10. Regulatory Guide 1.32, February 1972.

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems — Operating

LCO 3.8.9 Train A and Train B AC, DC, and AC vital bus electrical power distribution subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more AC electrical power distribution subsystems inoperable.	A.1 Restore AC electrical power distribution subsystem(s) to OPERABLE status.	8 hours AND 16 hours from discovery of failure to meet LCO
B. One or more AC vital buses inoperable.	B.1 Restore AC vital bus subsystem(s) to OPERABLE status.	8 hours AND 16 hours from discovery of failure to meet LCO
C. One Auxiliary Building DC electrical power distribution subsystem inoperable.	C.1 Restore Auxiliary Building DC electrical power distribution subsystem to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO

This provides plausibility that this TS requires an LCO as well as TS 3.8.4

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Be in MODE 3. <u>AND</u> D.2 Be in MODE 5.	6 hours 36 hours
E. One Service Water Intake Structure (SWIS) DC electrical power distribution subsystem inoperable.	E.1 Declare the associated Service Water train inoperable.	Immediately
F. Two trains with inoperable distribution subsystems that result in a loss of safety function.	F.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.9.1	Verify correct breaker alignments and voltage to required AC, DC, and AC vital bus electrical power distribution subsystems.	In accordance with the Surveillance Frequency Control Program

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.9 Distribution Systems — Operating

BASES

BACKGROUND

The onsite Class 1E AC, DC, and AC vital bus electrical power distribution systems are divided into two redundant and independent AC, DC, and AC vital bus electrical power distribution trains.

The AC electrical power subsystem for each train consists of a primary Engineered Safety Feature (ESF) 4.16 kV bus and secondary 600 and 208/120 V buses, distribution panels, motor control centers and load centers. Each train of 4.16 kV ESF buses has at least one separate and independent offsite source of power as well as an onsite diesel generator (DG) source. Each 4.16 kV ESF bus is normally connected to a preferred offsite source. If all offsite sources are unavailable, the onsite emergency DG supplies power to the 4.16 kV ESF bus(es). Control power for the 4.16 kV breakers is supplied from the Class 1E batteries. Additional description of this system may be found in the Bases for LCO 3.8.1, "AC Sources — Operating," and the Bases for LCO 3.8.4, "DC Sources — Operating."

The secondary AC electrical power distribution system for each train includes the safety related load centers, motor control centers, and distribution panels shown in Table B 3.8.9-1.

The 120 VAC vital buses are arranged in two load groups per train and are normally powered from the inverters. The alternate power supply for the vital buses are Class 1E constant voltage source transformers powered from the same train as the associated inverter, and its use is governed by LCO 3.8.7, "Inverters — Operating." Each constant voltage source transformer is powered from a Class 1E AC bus.

There are two independent 125 VDC electrical power distribution subsystems (one for each train).

The list of all required distribution buses is presented in Table B 3.8.9-1.

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 6 (Ref. 1), and in the FSAR, Chapter 15 (Ref. 2), assume ESF systems are OPERABLE. The AC,

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

DC, and AC vital bus electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the AC, DC, and AC vital bus electrical power distribution systems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining power distribution systems OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite power or all onsite AC electrical power; and

b. A worst case single failure.

The distribution systems satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The required power distribution subsystems listed in Table B 3.8.9-1 ensure the availability of AC, DC, and AC vital bus electrical power for the systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. The AC, DC, and AC vital bus electrical power distribution subsystems are required to be OPERABLE.

Maintaining the Train A and Train B AC, DC, and AC vital bus electrical power distribution subsystems OPERABLE ensures that the redundancy incorporated into the design of ESF is not defeated. Therefore, a single failure within any system or within the electrical power distribution subsystems will not prevent safe shutdown of the reactor.

This TS is not required because of this statement. As long as the DC bus is energized, it doesn't matter if the Charger is available.

OPERABLE AC electrical power distribution subsystems require the associated buses, load centers, motor control centers, and distribution panels to be energized to their proper voltages. OPERABLE DC electrical power distribution subsystems require the associated buses to be energized to their proper voltage from either the associated

(continued)

BASES

LCO (continued)

battery or charger. OPERABLE vital bus electrical power distribution subsystems require the associated buses to be energized to their proper voltage from the associated inverter via inverted DC voltage or Class 1E constant voltage transformer.

In addition, tie breakers between redundant safety related AC, DC, and AC vital bus power distribution subsystems, if they exist, must be open. This prevents any electrical malfunction in any power distribution subsystem from propagating to the redundant subsystem, that could cause the failure of a redundant subsystem and a loss of essential safety function(s). If any tie breakers are closed, the affected redundant electrical power distribution subsystems are considered inoperable. This applies to the onsite, safety related redundant electrical power distribution subsystems. It does not, however, preclude redundant Class 1E 4.16 kV buses from being powered from the same offsite circuit.

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

Electrical power distribution subsystem requirements for MODES 5 and 6 are covered in the Bases for LCO 3.8.10, "Distribution Systems — Shutdown."

ACTIONS

A.1

With one or more required AC buses, load centers, motor control centers, or distribution panels, except AC vital buses, inoperable, and a loss of safety function has not yet occurred, the remaining AC electrical power distribution subsystems are capable of supporting the

(continued)

BASES

ACTIONS

A.1 (continued)

minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses, load centers, motor control centers, and distribution panels must be restored to OPERABLE status within 8 hours.

Condition A worst scenario is one train without AC power (i.e., no offsite power to the train and the associated DG inoperable). In this Condition, the unit is more vulnerable to a complete loss of AC power. It is, therefore, imperative that the unit operator's attention be focused on minimizing the potential for loss of power to the remaining train by stabilizing the unit, and on restoring power to the affected train. The 8 hour time limit before requiring a unit shutdown in this Condition is acceptable because of:

a. The potential for decreased safety if the unit operator's attention is diverted from the evaluations and actions necessary to restore power to the affected train, to the actions associated with taking the unit to shutdown within this time limit; and

b. The potential for an event in conjunction with a single failure of a redundant component in the train with AC power.

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition A is entered while, for instance, a DC bus is inoperable and subsequently restored OPERABLE, the LCO may already have been not met for up to 2 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the AC distribution system. At this time, a DC circuit could again become inoperable, and AC distribution restored OPERABLE. This could continue indefinitely.

The Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in

(continued)

BASES

ACTIONS

A.1 (continued)

establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition A was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

B.1

With one or more AC vital buses inoperable, and a loss of safety function has not yet occurred, the remaining OPERABLE AC vital buses are capable of supporting the minimum safety functions necessary to shut down the unit and maintain it in the safe shutdown condition. Overall reliability is reduced, however, since an additional single failure could result in the minimum required ESF functions not being supported. Therefore, the required AC vital bus must be restored to OPERABLE status within 8 hours by powering the bus from the associated inverter via inverted DC or Class 1E constant voltage transformer.

Condition B represents one or more AC vital buses without power; potentially both the DC source and the associated AC source are nonfunctioning. In this situation, the unit is significantly more vulnerable to a complete loss of all noninterruptible power. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for loss of power to the remaining vital buses and restoring power to the affected vital bus.

This 8 hour limit is more conservative than Completion Times allowed for the vast majority of components that are without adequate vital AC power. Taking exception to LCO 3.0.2 for components without adequate vital AC power, that would have the Required Action Completion Times shorter than 8 hours if declared inoperable, is acceptable because of:

a. The potential for decreased safety by requiring a change in unit conditions (i.e., requiring a shutdown) and not allowing stable operations to continue;

(continued)

BASES

ACTIONS

B.1 (continued)

b. The potential for decreased safety by requiring entry into numerous Applicable Conditions and Required Actions for components without adequate vital AC power and not providing sufficient time for the operators to perform the necessary evaluations and actions for restoring power to the affected train; and

c. The potential for an event in conjunction with a single failure of a redundant component.

The 8 hour Completion Time takes into account the importance to safety of restoring the AC vital bus to OPERABLE status, the redundant capability afforded by the other OPERABLE vital buses, and the low probability of a DBA occurring during this period.

The second Completion Time for Required Action B.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, an AC bus is inoperable and subsequently returned OPERABLE, the LCO may already have been not met for up to 8 hours. This could lead to a total of 16 hours, since initial failure of the LCO, to restore the vital bus distribution system. At this time, an AC train could again become inoperable, and vital bus distribution restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition B was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

C.1

With Auxiliary Building DC bus(es) in one train inoperable, the remaining Auxiliary Building DC electrical power distribution subsystems are capable of supporting the minimum safety functions

(continued)

BASES

ACTIONS

C.1 (continued)

necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining DC electrical power distribution subsystem could result in the minimum required ESF functions not being supported. Therefore, the required DC buses must be restored to OPERABLE status within 2 hours by powering the bus from the associated battery or charger.

Condition C represents one train without adequate DC power; potentially both with the battery significantly degraded and the associated charger nonfunctioning. In this situation, the unit is significantly more vulnerable to a complete loss of all DC power. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for loss of power to the remaining trains and restoring power to the affected train.

This 2 hour limit is more conservative than Completion Times allowed for the vast majority of components that would be without power. Taking exception to LCO 3.0.2 for components without adequate DC power, which would have Required Action Completion Times shorter than 2 hours, is acceptable because of:

a. The potential for decreased safety by requiring a change in unit conditions (i.e., requiring a shutdown) while allowing stable operations to continue;

b. The potential for decreased safety by requiring entry into numerous applicable Conditions and Required Actions for components without DC power and not providing sufficient time for the operators to perform the necessary evaluations and actions for restoring power to the affected train; and

c. The potential for an event in conjunction with a single failure of a redundant component.

The 2 hour Completion Time for DC buses is consistent with Regulatory Guide 1.93 (Ref. 3).

(continued)

BASES

ACTIONS

C.1 (continued)

The second Completion Time for Required Action C.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition C is entered while, for instance, an AC bus is inoperable and subsequently returned OPERABLE, the LCO may already have been not met for up to 8 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the DC distribution system. At this time, an AC train could again become inoperable, and DC distribution restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition C was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

D.1 and D.2

If the inoperable distribution subsystem(s) addressed by Conditions A, B, or C cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

E.1

With one SWIS DC electrical power distribution subsystem inoperable, the Service Water System train supported by the affected SWIS DC electrical power distribution subsystem must be declared inoperable. The capability of the affected SWIS DC electrical power distribution subsystem to fully support the associated train of Service Water is not assured. Therefore, consistent with the definition of OPERABILITY, the associated train of Service Water must be declared inoperable immediately, thereby limiting operation in this condition to the Completion Time associated with the affected Service Water System train.

(continued)

BASES

ACTIONS (continued)

F.1

With two trains with inoperable distribution subsystems that result in a loss of safety function, adequate core cooling, containment OPERABILITY and other vital functions for DBA mitigation would be compromised, and immediate plant shutdown in accordance with LCO 3.0.3 is required.

SURVEILLANCE REQUIREMENTS

SR 3.8.9.1

This Surveillance verifies that the required AC, DC, and AC vital bus electrical power distribution systems are functioning properly, with the correct circuit breaker alignment. The correct breaker alignment ensures the appropriate separation and independence of the electrical divisions is maintained, and the appropriate voltage is available to each required bus. The verification of proper voltage availability on the buses ensures that the required voltage is readily available for motive as well as control functions for critical system loads connected to these buses. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. FSAR, Chapter 6.
2. FSAR, Chapter 15.
3. Regulatory Guide 1.93, December 1974.

Table B 3.8.9-1 (page 1 of 1)
AC and DC Electrical Power Distribution Systems

TYPE	VOLTAGE	TRAIN A*	TRAIN B*
AC Safety Buses	4160 V SWGR	1/2 F and 1/2 K	1/2 G and 1/2 L
	600 V LC	1/2 D, K**, and R**	1/2 E, L**, and S**
DC Buses	125 V SWGR	1/2 A	1/2 B
	125 V Dist. Panels	1/2 M	1/2 N
Vital AC Buses	120	1/2 A and 1/2 B	1/2 C and 1/2 D

* Each train of the AC and DC electrical power distribution systems is a subsystem.

** Indicates buses shared between Units 1 and 2.

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Unit 1 tripped from 100% power with the following conditions:

- A Safety Injection occurred due to a Steam Dump malfunction.
- Status of AFW pumps is as follows:
  - 1A MDAFW pump is Tagged Out.
  - 1B MDAFW pump is tripped.
  - The TDAFW pump trip/throttle linkage is broken.
- The Safety Injection signal has been reset.
- FRP-H.1, Response to Loss of Secondary Heat Sink, is in progress with the crew attempting to restore SG level using a Condensate pump.

Which one of the following completes the statements below?

Implementation of FRP-H.1, Attachment 1, Main Feedwater Bypass Valves Automatic Closure Defeat, __(1)__ required to open the Main Feedwater Bypass valves.

Criteria to exit FRP-H.1 is met __(2)__ .

	(1)	(2)
A.	IS	ONLY after at least one SG NR level is > 31%
B.	is NOT	ONLY after at least one SG NR level is > 31%
C.✓	IS	when stable Condensate flow is established and SG wide range level is rising
D.	is NOT	when stable Condensate flow is established and SG wide range level is rising

FRP-H.1 is in progress with no AFW pumps available. MSIV closure has occurred due to a Steam Line low pressure MSIV closure signal. The normal course of FRP-H.1 is to attempt to establish condensate flow using a Condensate pump. These actions will continue until either a) Condensate flow is established and SG level is rising or B) Bleed and Feed criteria is met.

A. Incorrect - 1) Correct, Attachment 1 is required to be implemented due to the SI signal in progress. Feed Reg Bypass valves will not open unless this attachment is implemented..

2) Incorrect, plausible since step 10.2 RNO of FRP-H.1 states to continue feeding SGs to restore at least one SG narrow range level to greater than 31%, it gives the impression that 31% level is required to exit the procedure.

B. Incorrect - 1) Incorrect, plausible since SI has been reset. The candidate may think that resetting SI will allow the operator to take control of Feed Reg Bypass valves, thus implementation of Attachment 1 is not required. In addition, if there was no SI, this could be a correct answer. At one time Attachment 1 was only implemented if an SI had occurred.

2) Incorrect, see A.2.

C. Correct - 1) Correct, see A.1.

2) Correct, per step 10.1 -10.3 of FRP-H.1 and the associated note, as long as stable feed flow has been established and SG wide range level is rising, the heat sink critical safety function is satisfied and FRP-H.1 can be exited.

D. Incorrect - 1) Incorrect, see B.2.

2) Correct, see C.2.

K/A: 059A2.12 Main Feedwater (MFW) System

Ability to (a) predict the impacts of the following malfunctions or operations on the MFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:
(CFR: 41.5 / 43.5 / 45.3 / 45.13)
A2.12 Failure of feedwater regulating valves 3.1* 3.4*

Importance Rating: 3.1 3.4

Technical Reference: OPS Lesson Plan - Reactor Protection, Fig. 17
OPS-62201I/52201I/40302F/ESP-52201, v2.0
FNP-1-FRP-H.1, v27.0

References provided: None

Learning Objective: ASSESS the facility conditions associated with the (1) FRP-H.1, Response to Loss of Secondary Heat Sink; (2) FRP-H.2, Response to SG Overpressure; (3) FRP-H.3, Response to SG High Level; (4) FRP-H.4, Response to Loss of Normal Steam Release Capabilities; (5) FRP-H.5, Response to SG Low Level, and based on that assessment: (OPS-62533F01)

• SELECT the appropriate procedures during normal, abnormal and emergency situations. 10CFR55.43 (b) 5
• DETERMINE if transition to another section of the procedure or to another procedure is required
• DETERMINE if the critical safety functions are satisfied

Question History: Modified from September 2009 Sequoyah NRC Exam Retake #89

K/A match: For the conditions given in FRP-H.1, Feed Reg valves and bypass valves are failed closed due to the SI signal. They are required to be opened to be able to mitigate the accident and feed the SG's from Condensate flow. Candidate has to determine if any additional actions are required to open the valves (implementation of Attachment 1) after the SI signal has occurred and been reset. In addition, candidate has to display knowledge of how to use FRP-H.1 and when the procedure can be exited.

SRO justification: 10 CFR 55.43(b)(5)
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations [10 CFR 55.43(b)(5)]

One area of SRO level knowledge is knowledge of content of the procedure vs. the procedure's overall mitigative strategy or purpose. The applicant’s knowledge can be evaluated at the level of 10 CFR55.43(b)(5) by ensuring that the additional knowledge of the procedure’s
content is required to correctly answer the written test item, for example:
• Knowledge of diagnostic steps and decision points in the emergency operating procedures (EOP) that involve transitions to event specific subprocedures or emergency contingency procedures.

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From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(5) :
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations [10 CFR 55.43(b)(5)], involving BOTH:

1) assessing plant conditions and then
2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

Using the flowchart, this question can:

- **NOT** be answered **solely** by knowing "systems knowledge", i.e., how the system works, flowpath, logic, component location.
- **NOT** be answered solely by knowing immediate operator actions.
- **NOT** be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry to major EOPs.
- **NOT** be answered **solely** by knowing the purpose, overall sequence of events, or **overall mitigative strategy** of a procedure.
- **CAN** be answered with knowledge of ONE or **MORE** of the following:

— **Knowledge of when to implement** attachments **and** appendices, including how to **coordinate** these items with procedure steps. (the first part of the question relates to this, but is not clearly SRO)

— **Knowledge of diagnostic steps and decision points** in the EOPs that involve **transitions to event specific subprocedures** or emergency contingency procedures (the second part of the question relates to this and is clearly SRO)

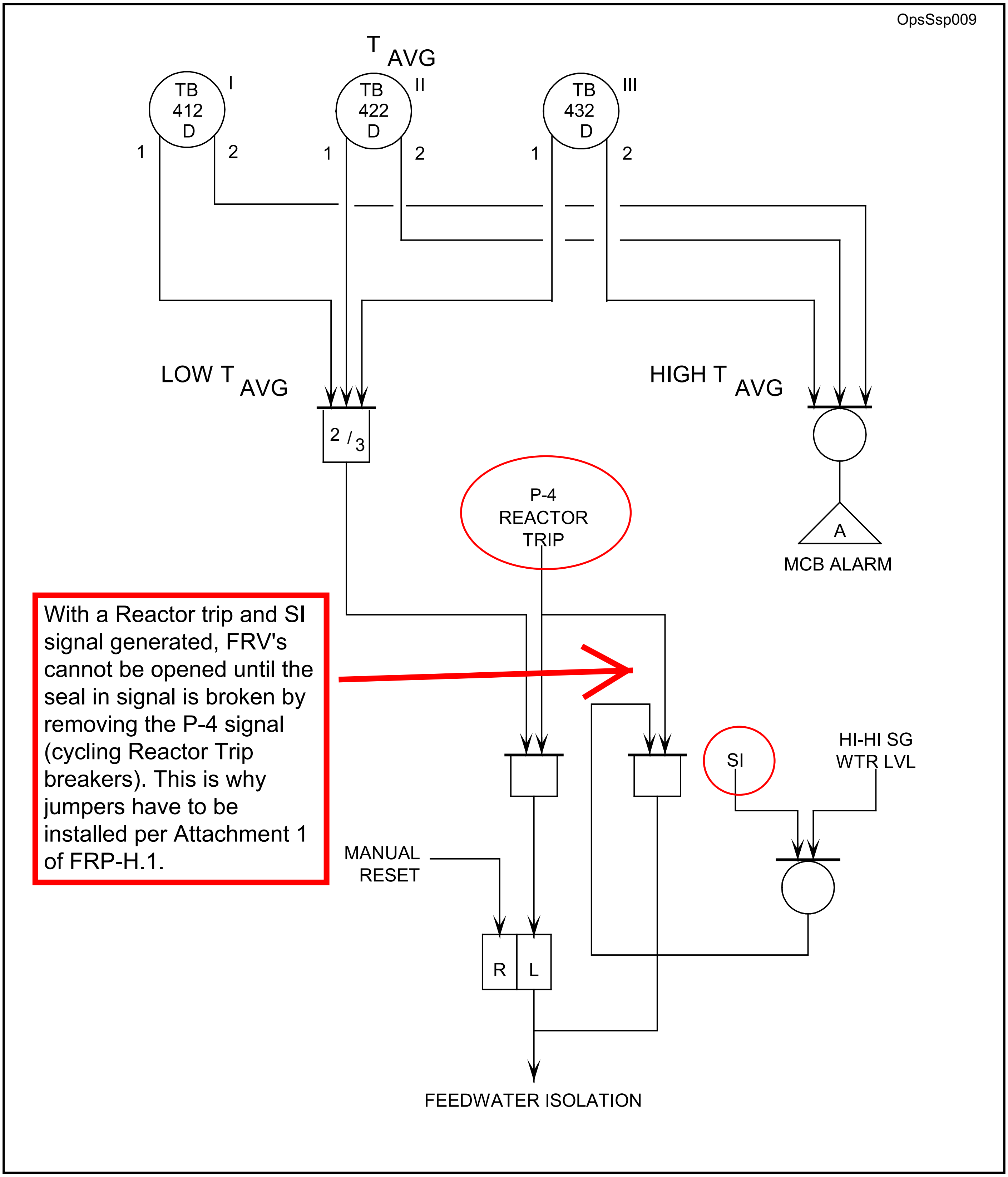


FIGURE 17 - Tavg Protection (Low Tavg Feedwater Isolation, High Tavg Alarm)

Step **Action/Expected Response** **Response NOT Obtained**

****

CAUTION: [CA] Following block of automatic SI actuation, manual SI actuation may be required if conditions degrade.

****

___ **9 [CA] Try to establish condensate flow to intact SGs.**

The section for establishing Condensate flow is included here. Last page has the H.1 transition criteria.

9.1 IF SI has NOT actuated since reactor trip, THEN reset FW ISO.

RNO 9.1 Verify SI RESET.

- [] MLB-1 1-1 not lit
- [] MLB-1 11-1 not lit

NOTE:

- Step 9.8, pressurizer pressure reduction, should be performed in conjunction with steps 9.2 through 9.7.
- If SI has not actuated since Reactor Trip, defeating the feedwater isolation signal to main feedwater regulating bypass valves will ensure the main feedwater flow path remains open.

9.2 Check feedwater isolation signal to intact SGs main feedwater regulating bypass valves defeated per ATTACHMENT 1.

9.3 Verify all main feedwater flow control and bypass valves - CLOSED IN MANUAL.

1A(1B,1C) SG
FW FLOW
- [] FK 478
- [] FK 488
- [] FK 498

1A(1B,1C) SG
FW BYP FLOW
- [] FK 479
- [] FK 489
- [] FK 499

RNO 9.3 Verify all main feedwater stop valves - CLOSED.

MAIN FW TO 1A(1B,1C) SG
STOP VLV
- [] Q1N21MOV3232A
- [] Q1N21MOV3232B
- [] Q1N21MOV3232C

Step 9 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
9.4	Verify backup cooling aligned to condensate pumps per FNP-1-SOP-21.0.	9.4 Ensure all condensate pump handswitches positioned to STOP. CNDS PUMP [] 1A [] 1B [] 1C
9.5	Locally open SGFP BYP N1N21V509. (155 ft, TURB BLDG)	9.5 Open and deenergize 1A(1B) SGFP discharge valve. SGFP 1A(1B) DISCH VLV [] N1N21V503A [] N1N21V503B

SGFP DISCH VLV	1A	1B
BKR (TB155)	[]EP-08	[]EQ-10

Step	Action/Expected Response	Response NOT Obtained
9.6	Locally isolate SGFP miniflow valves. (155 ft, TURB BLDG) SGFP 1A(1B) RECIRC FCV INLET ISO [] N1N21V502A closed [] N1N21V502B closed	

Step 9 continued on next page.

Step **Action/Expected Response** | **Response NOT Obtained**

9.7 Perform the following.

9.7.1 Dispatch personnel to 1V 600 V MCC. (139 ft, AUX BLDG electrical penetration room)

9.7.2 Place handswitch for main feedwater stop valves to intact SGs to OPEN and hold in that position.

Intact SG	1A	1B	1C
MAIN FW TO 1A(1B,1C) SG STOP VLV Q1N21MOV	[]3232A	[]3232B	[]3232C

9.7.3 WHEN main feedwater stop valves to intact SGs open, THEN direct personnel to open associated breakers. (139 ft, AUX BLDG electrical penetration room)

Intact SG	1A	1B	1C
BKR	[]FV-K2	[]FV-K3	[]FV-L2

9.7.4 WHEN associated breaker open, THEN allow main feedwater stop valve handswitch to spring return.

Response NOT Obtained:

9.7 Perform the following.

a) Direct personnel to open associated breakers. (139 ft, AUX BLDG electrical penetration room)

Intact SG	1A	1B	1C
BKR	[]FV-K2	[]FV-K3	[]FV-L2

b) Locally open main feedwater stop valves to intact SGs with handwheels. (127 ft. AUX BLDG main steam valve room)

Intact SG	1A	1B	1C
MAIN FW TO 1A(1B,1C) SG STOP VLV Q1N21MOV	[]3232A	[]3232B	[]3232C

Step 9 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
9.8	Reduce PRZR pressure to less than 1950 psig.	
9.8.1	Check either condition for using auxiliary spray satisfied. • Normal letdown in service. OR • No PRZR PORV available.	9.8.1 Perform the following. • If normal letdown secured and a PRZR PORV available, THEN open only one PRZR PORV to reduce PRZR pressure to less than 1950 psig. AND • Proceed to step 9.9.
9.8.2	Manually open both normal pressurizer spray valves. 1A(1B) LOOP SPRAY VLV [] PK 444C [] PK 444D	
9.8.3	Open auxiliary spray valve. RCS PRZR AUX SPRAY [] Q1E21HV8145 open	
9.8.4	Verify flow path aligned CHG FLOW [] FK 122 manually open CHG PUMPS TO REGENERATIVE HX [] Q1E21MOV8107 open [] Q1E21MOV8108 open RCS NORMAL CHG LINE [] Q1E21HV8146 closed RCS ALT CHG LINE [] Q1E21HV8147 closed	

Step 9 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

9.8.5 Operate the following valves as required to reduce PRZR pressure to less than 1950 psig.

CHG FLOW
[] FK 122 manually open

1A(1B) LOOP
SPRAY VLV
[] PK 444C manually open/closed
[] PK 444D manually open/closed

RCS PRZR
AUX SPRAY
[] Q1E21HV8145 open/closed

RCS NORMAL
CHG LINE
[] Q1E21HV8146 open/closed

RCS ALT
CHG LINE
[] Q1E21HV8147 open/closed

Step 9 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
9.9	Maintain PRZR pressure at 1900-1950 psig.	
9.9.1	IF using auxiliary spray, THEN operate the following valves as required to control PRZR pressure. CHG FLOW [] FK 122 manually open 1A(1B) LOOP SPRAY VLV [] PK 444C manually open/closed [] PK 444D manually open/closed RCS PRZR AUX SPRAY [] Q1E21HV8145 open/closed RCS NORMAL CHG LINE [] Q1E21HV8146 open/closed RCS ALT CHG LINE [] Q1E21HV8147 open/closed	9.9.1 IF using a PRZR PORV, THEN open only one PRZR PORV to control PRZR pressure.

Step 9 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: SI actuation circuits will automatically unblock if RCS average temperature rises to greater than 543°F or PRZR pressure rises to greater than 2000 psig.

****

9.10 WHEN pressurizer pressure less than 2000 psig, THEN perform the following.

9.10.1 Block low pressurizer pressure SI.

PRZR PRESS SI
BLOCK - RESET
[] A TRN to BLOCK
[] B TRN to BLOCK

9.10.2 Verify blocked indication.

BYP & PERMISSIVE
PRZR. SAFETY
INJECTION
[] TRAIN A BLOCKED light lit
[] TRAIN B BLOCKED light lit

Step 9 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
9.11	WHEN P-12 light lit (543°F), THEN perform the following.	
9.11.1	Block low steam line pressure SI. STM LINE PRESS SI BLOCK - RESET [] A TRN to BLOCK [] B TRN to BLOCK	
9.11.2	Verify blocked indication. BYP & PERMISSIVE STM LINE ISOL. SAFETY INJ. [] TRAIN A BLOCKED light lit [] TRAIN B BLOCKED light lit	
9.11.3	Bypass the steam dump interlock. STM DUMP INTERLOCK [] A TRN to BYP INTLK [] B TRN to BYP INTLK	

Step 9 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

NOTE:
- The steam dumps will be interlocked closed when RCS TAVG reaches P-12 (543°F). This interlock may be bypassed for A and E steam dumps with the STM DUMP INTERLOCK switches.
- Excessive opening of steam dumps can cause a high steam flow LO-LO TAVG main steam line isolation signal.

Step	Action/Expected Response	Response NOT Obtained
9.12	IF condenser available, THEN dump steam to condenser from intact SGs at maximum attainable rate. BYP & PERMISSIVE COND AVAIL [] C-9 status light lit STM DUMP [] MODE SEL A-B TRN in STM PRESS STM DUMP INTERLOCK [] A TRN in ON [] B TRN in ON STM HDR PRESS [] PK 464 adjusted	9.12 Dump steam to atmosphere. 9.12.1 Direct counting room to perform FNP-0-CCP-645, MAIN STEAM ABNORMAL ENVIRONMENTAL RELEASE. 9.12.2 IF normal air available, THEN control atmospheric relief valves to dump steam from at least one intact SG at maximum attainable rate, IF NOT, dump steam using FNP-1-SOP-62.0, EMERGENCY AIR SYSTEM. 1A(1B,1C) MS ATMOS REL VLV [] PC 3371A adjusted [] PC 3371B adjusted [] PC 3371C adjusted

NOTE: The intent of the pressure reduction is to reduce at least one SG pressure below the pressure supplied by the condensate pumps. SG pressure reduction below 540 psig may be needed to establish feed to the SG(s) from the condensate pumps.

Step	Action/Expected Response	Response NOT Obtained
9.13	WHEN SG(s) pressure reduced to less than 540 psig, THEN stop pressure reduction.	
9.14	Maintain SG(s) pressure - STABLE AT EXISTING VALUE.	

Step 9 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

NOTE: Starting more than one CNDS PUMP may be needed to raise discharge pressure and feed the SG(s).

9.15 Verify at least one CNDS PUMP - STARTED.

9.16 Check SGFP BYP N1N21V509 - OPEN. (155 ft, TURB BLDG)

RNO 9.16 Verify SGFP BYP N1N21V509 - OPEN prior to opening a feedwater regulating valve or bypass valve to minimize water hammer potential.

9.17 Initially open feedwater regulating bypass valves just off the closed seat to initiate flow and minimize any water hammer.

Intact SG	1A	1B	1C
1A(1B,1C) SG FW BYP FLOW FK	[] 479 adjusted	[] 489 adjusted	[] 499 adjusted

RNO 9.17 Initially locally remove seal and open feedwater regulating valves with handwheels just off the closed seat to initiate flow and minimize any water hammer. (127 ft, AUX BLDG main steam valve room)

Intact SG	1A	1B	1C
1A(1B,1C) SG FEED FLOW Q1C22FCV	[]478	[]488	[]498

9.18 Control feedwater regulating bypass valves to supply main feedwater to at least one intact SG.

RNO 9.18 Control main feedwater regulating valves with handwheels to supply main feedwater to at least one intact SG. (127 ft, AUX BLDG main steam valve room)

Step	Action/Expected Response	Response NOT Obtained
___10	**Check SG levels.**	

NOTE: IF core exit T/C temperatures are falling due to SG pressure reduction performed by step 9.12, THEN verification of feed flow should be based on rising SG level only.

Step	Action/Expected Response	Response NOT Obtained
10.1	Verify feed flow to at least one SG. • Check SG wide range level - RISING. OR • Check core exit T/C temperature - FALLING.	10.1 Proceed to Step 11.
10.2	Check at least one SG narrow range level - GREATER THAN 31%{48%}.	10.2 Continue feeding SGs to restore at least one SG narrow range level greater than 31%{48%}.

NOTE: [CA] Continuing verification of sufficient feed flow is adequate to ensure that the heat sink critical safety function is satisfied.

The NOTE above allows the procedure to be exited without raising SG level above 31%

Step	Action/Expected Response	Response NOT Obtained
10.3	Go to procedure and step in effect.	
___11	**Check for loss of secondary heat sink.**	11 Return to Step 1. OBSERVE CAUTIONS PRIOR TO STEP 1.
11.1	Check at least two SG wide range levels - LESS THAN 12%{31%}. OR	
11.2	Check pressurizer pressure due to loss of secondary heat sink - GREATER THAN 2335 psig.	

Modified this question from 2009 Sequoyah NRC Exam to develop 059A2.12 question

89. Given the following:

- Unit 1 has experienced a Safety Injection due to a steam line break inside containment.
- MSIVs closed automatically.
- Subsequently, all AFW has been lost.
  - Containment pressure has peaked at 1.2 psig and is lowering.
  - WR S/G levels are as follows:

S/G 1	S/G 2	S/G 3	S/G 4
23% WR	27% WR	25% WR	5% WR

- FR-H.1, "Loss of Secondary Heat Sink" is being implemented with the crew attempting to restore MFW flow to at least one S/G in accordance with EA-2-2, "Establishing Secondary Heat Sink Using Main Feedwater or Condensate System."

Which ONE of the following identifies...

(1) the mitigating strategy to be used,
and
(2) if MIG support would be required to block auto SI signals?

A. (1) Establish RCS feed and bleed per FR-H.1.
(2) MIG support is required for blocking auto SI signals.

B. (1) Establish RCS feed and bleed per FR-H.1.
(2) **No** MIG support is required for blocking auto SI signals.

C. (1) Continue to establish feed flow from the condensate system per EA-2-2.
(2) MIG support is required for blocking auto SI signals.

D. (1) Continue to establish feed flow from the condensate system per EA-2-2.
(2) **No** MIG support is required for blocking auto SI signals.

88. 064G2.2.44 088

Unit 1 is at 100% power when the following occurs:

- WE1, 1F, 1H, OR 1K 4KV BUS BKR AUTO TRIP, is in alarm.
- WE3, 1H 4KV BUS UV OR LOSS OF DC, is in alarm.
- The following indications are noted on the handswitch for 4160V Breaker DF-13-1, SUPPLY TO 1H 4160V BUS:
  - The amber light is lit.
  - The green light is lit.
- The AC PWR AVAIL lights for 1F 4160V bus are illuminated.
- The AC PWR AVAIL lights for 1H 4160V bus are <u>NOT</u> illuminated.

Which one of the following completes the statements below?

The 1C DG _(1)_ autostart due to the DF-13-1 malfunction.

For Unit 1, a REQUIRED ACTION statement of Tech Spec 3.8.1, AC Sources - Operating, _(2)_ required to be implemented.

	(1)	(2)
A.	WILL	is NOT
B.✓	WILL	IS
C.	will NOT	is NOT
D.	will NOT	IS

This is a difficult question due to the complexity of the DG autostart design and operation.

<u>For the first part of the question:</u> There is one dedicated 4075kw DG available for B Train on each Unit (1B DG and 2B DG). Each DG will tie to the G 4160V bus of its respective Unit. Their operation is simple and clearly defined.

For the A Train, there is one 2850kw DG (1C DG) and one 4075kw DG (1-2A DG), both of which are shared between the Units. They can each go to Unit 1 or Unit 2 based on the conditions on each Unit, i.e. LOSP, SI with LOSP, which Unit had the LOSP first etc. The 1C DG will go to the opposite Unit from the 1-2A DG. When powering the busses, they can even divorce from one Unit and tie to the other Unit based on conditions. The 1C DG will tie to U-1 or U-2 H 4160V bus, which is in turn tied to the F 4160V bus by breaker DF-13. The 1-2A DG will tie to U-1 or U-2 F 4160V bus. The intent is to ensure the F 4160V bus is energized to supply safety related loads.

The autostart for the DG's can be even more complicated since the DG operation is different now than from the original design of the plant . For the A Train DGs' autostart

for a Unit 1 LOSP, the 1-2A DG gets an autostart signal from the UV relays located on the B1F Sequencer. The 1C DG will autostart from the UV relays located on the B1H Sequencer. It is a common misconception that both A Train DG's start from an UV signal on the B1F Sequencer. This is because the B1H Sequencer has very few functions any more (original design was to power River Water pumps that used to be safety related, but are no longer safety related and are not powered up during an LOSP). Once the **B1H** Sequencer starts the 1C DG, the **B1F** Sequencer tells 1C DG where to go and sequences the starting of loads. Essentially **B1F** Sequencer takes over all other functions. As a result, the misconception is that the B1F Sequencer performs all actions associated with starting both DG's, deciding which Unit each DG ties to, and sequencing all loads.

For this question, the 1C DG will start due to the LOSP sensed by the B1H Sequencer, 1-2A DG will not start because there is no LOSP sensed by the B1F Sequencer. The 1C DG will start and run unloaded since the B1F Sequencer has not told it to do anything, and the 1H 4160V bus will remain de-energized.

For the second part of the question: this is also difficult to evaluate. The 1H bus is no longer considered safety related, but it is required as a support system for operation of the A Train DG set. The 1C DG output breaker will tie to the 1H bus, which has to be able to be tied to the 1F 4160V bus through breaker DF-13-1, to power up safety related loads. The plausibility for no Tech Spec entry required is due to the fact that 1H bus is no longer safety related, but is a support system for operability of the 1C DG. Tech Spec 3.8.1 Bases knowledge or Surveillance test (STP-27.2) knowledge is required to be able to evaluate and answer this question correctly.

A. Incorrect - 1) Correct, 1C DG will autostart. See detailed information above.

2) Incorrect, plausible since the 1H 4160V bus is no longer safety related and not required, except for the fact that it is a support system for the 1C DG. In addition, a candidate may incorrectly determine that the more appropriate LCO would be Electrical Power Systems TS 3.8.9, Distribution Systems - Operating. Since there is no cascading of TS, there would be no LCO for TS 3.8.1.

B. Correct - 1) Correct, see A.1.

2) Correct, a REQUIRED ACTION statement would be implemented since the A Train DG set (composed of 1-2A DG and the 1C DG) is INOPERABLE due to a loss of a support system to the 1C DG.

C. Incorrect - 1) Incorrect, plausible because of the common misconception that the DGs start based on a LOSP on the F 4160V bus and not the H 4160V bus. See detailed information above.

2) Incorrect, see A.2.

D. Incorrect - 1) Incorrect, see C.1.

2) Correct, see B.2.

K/A: 064G2.2.44	Emergency Diesel Generator (ED/G) System Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions. | (CFR: 41.5 / 43.5 / 45.12) IMPORTANCE RO 4.2 SRO 4.4
Importance Rating:	4.2 4.4
Technical Reference:	OPS Lesson Plans - Diesel Generators and Auxiliaries, v1 Figure 17 - OPS-62102I/52102I/40102C/ESP-52102I OPS Lesson Plans - Diesel Generator Sequencers, v3 Figure 10 - 62103F/52103F/40102D/ESP-52103F FNP-1-STP-27.2 v26 Tech Specs v190 Tech Spec Bases v58
References provided:	None
Learning Objective:	RECALL AND APPLY the information from the LCO BASES sections: BACKGROUND, APPLICABLE SAFETY ANALYSIS, ACTIONS, SURVEILLENCE REQUIREMENTS, for any Technical Specifications or TRM requirements associated with the Diesel Generator and Auxiliaries System components and attendant equipment alignment, to include the following (OPS-62102I01): 10CFR55.43 (b) 2 3.8.1, AC Sources – Operating 3.8.2, AC Sources – Shutdown 3.8.3, Diesel Fuel Oil, Lube Oil, Starting Air
Question History:	New question
K/A match:	This question requires the candidate to interpret Control Room indications for a tripped breaker supplying the 1H 4160V bus. An evaluation has to be performed to understand how that affects the operation of 1C DG, and then when TS are evaluated, understand how that affects the operability of the DG system.
SRO justification:	Facility operating limitations in the TS and their bases. [10 CFR 55.43(b)(2)] • Knowledge of TS bases that is required to analyze TS required actions and terminology.

Surveillance Requirements (SR) (Section 4) in *accordance with rules of application* requirements (Section 1).

Tech Spec Bases knowledge is required to understand that although the 1H 4160V bus is not safety related and not required by TS, it is a support system for the 1C DG and is required for operability of the 1C DG.

In addition, STP-27.2 provides guidance that the 1H 4160V bus is a support system for the 1C DG.

2013 NRC exam

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(2)

1) can **NOT** be answered by knowing less than 1 hour Tech Specs.
2) can **NOT** be answered by knowing information listed "above-the-line".
3) can **NOT** be answered by knowing the TS Safety Limits or their bases.
4) Does involve **one or** more of the following for TS, TRM or ODCM:

- Application of Required Actions (Section 3) and Surveillance Requirements (Section 4) in accordance with rules of application requirements (Section 1).
- Knowledge of TS bases that is required to analyze TS required actions and terminology

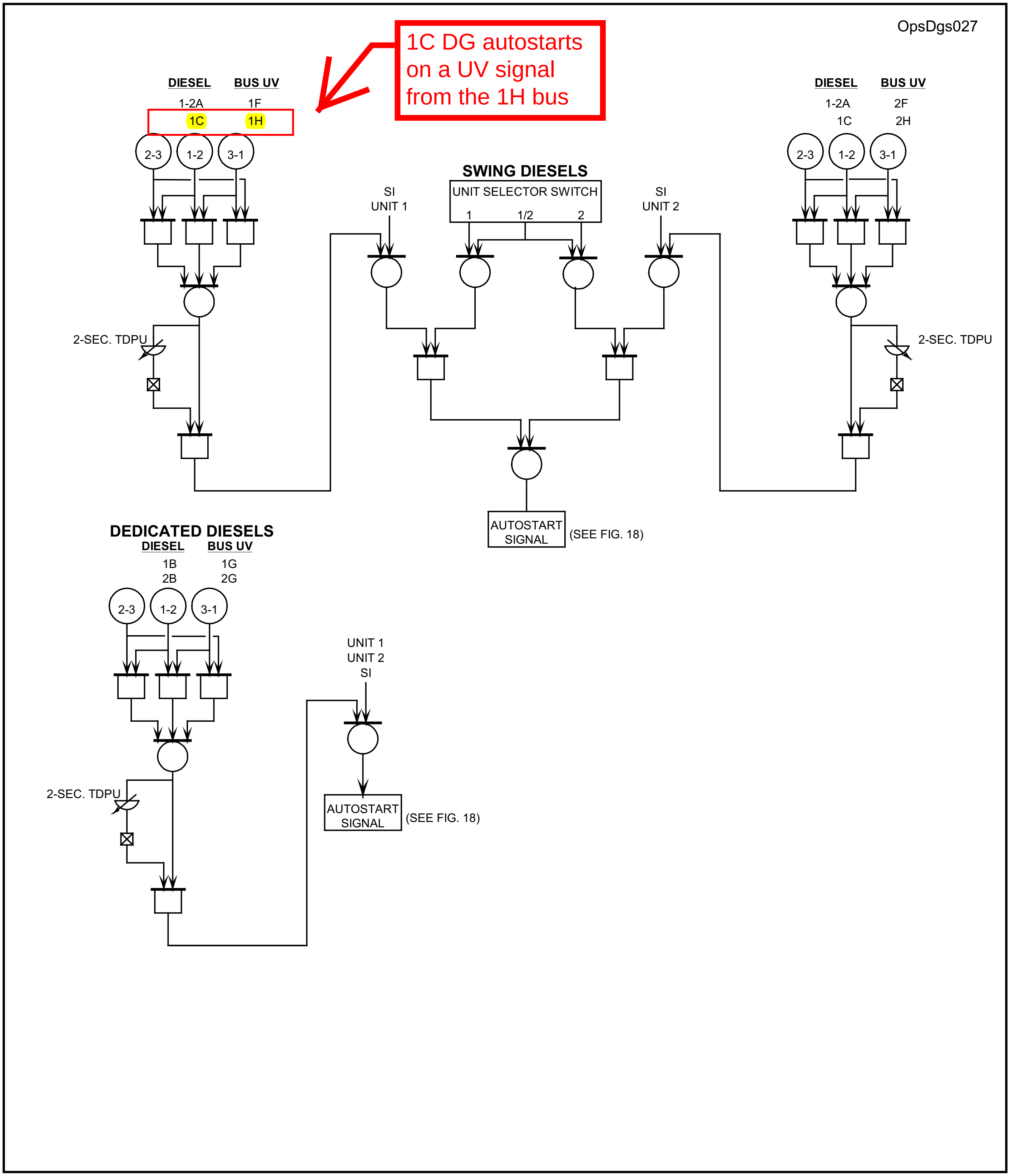
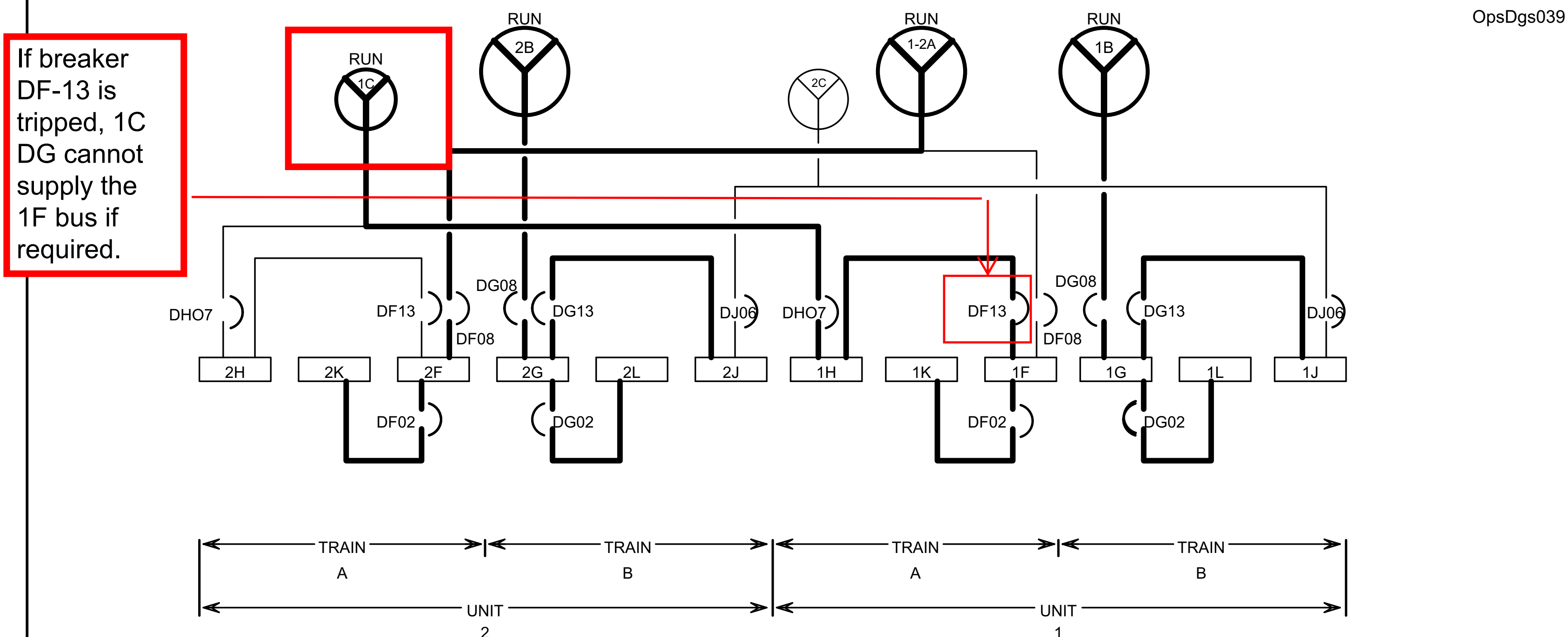


FIGURE 17 - Emergency Diesel-Generator
Auto-Start Logic

DIESEL GENERATOR SEQUENCERS



NOTES

DGs 1-2A, 1B, 2B, AND 1C START. DG 1-2A ALIGNS TO BUS 2F, AND THE B2F ESS SEQUENCER RUNS. BUS 2H REMAINS DEENERGIZED UNTIL MANUALLY ENERGIZED BY THE OPERATOR. DG 1C ALIGNS TO BUS 1F THROUGH DH07-1 AND DF13-1. THE B1F LOSP SEQUENCER RUNS. DG 1B ALIGNS TO BUS 1G, AND THE B1G LOSP SEQUENCER RUNS. DG 2B ALIGNS TO BUS 2G, AND THE B2G ESS SEQUENCER RUNS.

FIGURE 10 - Dual-Unit LOSP, SI Unit 2, No Failures

2.3 Administrative Control

The following AC electrical buses and load centers are not included in Technical Specifications. There are no acceptance criteria associated with these buses and load centers. Verification of availability of these buses and load centers is included to maintain administrative control only.

2.3.1 4160 volt Buses H and J (3850-4220V)

2.3.2 600 volt Load Centers A, C, 1-2H, and 1-2J (550-605V)

3.0 Initial Conditions

_____ 3.1 The revision of this procedure has been verified to be the current revision. (OR 1-98-498)

_____ 3.2 This procedure has been verified to be the correct unit for the task. (OR 1-98-498)

_____ 3.3 The electrical distribution system is energized for normal operation per FNP-1-SOP-36.0, PLANT ELECTRICAL DISTRIBUTION LINE-UP, with exceptions noted.

4.0 Precautions and Limitations

4.1 To prevent an inadvertent de-energization of the electrical buses , permission must be obtained from the Shift Supervisor prior to operating any circuit breaker.

If the 1H bus is unavailable, the 1C DG cannot perform its safety function to energize the 1F and 1K 4160V busses.

4.2 1H and 1J 4160V buses are required support equipment for the 1C and 2C diesel generators. Any operability issues regarding the 1H or 1J 4160V buses should be evaluated against the requirements for the 1C or 2C diesel generator, as appropriate.

4.3 1F 600 V LC will not receive a load shed signal when aligned to supply 1D (1E) 600 V LC. This signal to DF12 (DG12) is blocked when breaker ED12 (EE12) is racked in and closed. If 1F 600 V LC is aligned to supply a 600 V LC other than 1D or 1E, the load shed signal to 1F 600 V LC will not be blocked.

4.4 When locally verifying a breaker position, the following items should also be checked:

- Proper light bulb illuminated
- Spring charge indication
- No obvious physical damage to breaker

3.8 ELECTRICAL POWER SYSTEMS

3.8.1 AC Sources — Operating

LCO 3.8.1 The following AC electrical sources shall be OPERABLE:

a. Two qualified circuits between the offsite transmission network and the onsite Class 1E AC Electrical Power Distribution System; and

b. Two diesel generator (DG) sets capable of supplying the onsite Class 1E power distribution subsystem(s); and

c. Automatic load sequencers for Train A and Train B.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

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

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required offsite circuit inoperable.	A.1	Perform SR 3.8.1.1 for required OPERABLE offsite circuit.	2 hours <u>AND</u> Once per 8 hours thereafter
	<u>AND</u>		
	A.2	Declare required feature(s) with no offsite power available inoperable when its redundant required feature(s) is inoperable.	24 hours from discovery of no offsite power to one train concurrent with inoperability of redundant required feature(s)
	<u>AND</u>		
			(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.3 Restore required offsite circuit to OPERABLE status.	72 hours AND 13 days from discovery of failure to meet LCO
B. One DG set inoperable. The "A" Train DG set consists of the 1C DG and the 1-2A DG. The "B" Train DG set consists of the 1B DG.	------------------NOTE------------------ LCO 3.0.4c is applicable when only one of the three DGs is inoperable. ---	
	B.1 Perform SR 3.8.1.1 for the required offsite circuit(s).	2 hours AND Once per 8 hours thereafter
	AND	
	B.2 Declare required feature(s) supported by the inoperable DG set inoperable when its required redundant feature(s) is inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)
	AND	
	B.3.1 Determine OPERABLE DG set is not inoperable due to common cause failure. OR	24 hours
		(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.3.2 Perform SR 3.8.1.6 for OPERABLE DG set. AND B.4 Restore DG set to OPERABLE status.	24 hours 10 days AND 13 days from discovery of failure to meet LCO
C. Two required offsite circuits inoperable.	C.1 Declare required feature(s) inoperable when its redundant required feature(s) is inoperable. AND C.2 Restore one required offsite circuit to OPERABLE status.	12 hours from discovery of Condition C concurrent with inoperability of redundant required features 24 hours

89. 071G2.2.25 089

Which one of the following describes TRM 13.12.4, Gas Storage Tanks, limitations on the quantity of radioactivity permitted in the Waste Gas Decay Tank(s) and the basis for the limit?

The quantity contained in each Waste Gas Decay Tank shall be ≤ __(1)__ to ensure an uncontrolled release will not exceed a whole body dose of 0.5 REM to __(2)__ .

A. 1) 10 curies, excluding tritium and dissolved or entrained noble gases

2) an operator at the Waste Gas Control Panel

B. 1) 70,500 curies of noble gases (considered as Xe-133)

2) an operator at the Waste Gas Control Panel

C. 1) 10 curies, excluding tritium and dissolved or entrained noble gases

2) an individual at the exclusion area boundary

D.✓ 1) 70,500 curies of noble gases (considered as Xe-133)

2) an individual at the exclusion area boundary

TR 13.12.2 The quantity of radioactive material contained in any outside temporary tank, excluding liners being used to solidify radioactive wastes, shall be limited to ≤ 10 curies, excluding tritium and dissolved or entrained noble gases.

TR 13.12.4 Gas Storage Tanks
TR 13.12.4 The quantity of radioactivity contained in each gas storage tank shall be limited to ≤ 70,500 curies of noble gases (considered as Xe-133).

A. Incorrect - 1) Incorrect, plausible since the limit for TR 13.12.2 is ≤ 10 curies. The candidate could confuse this curie limit with the correct one.

2) Incorrect, plausible since minimizing dose to operators in the field is a concern. If a WGDT were to rupture, an operator in the field at the Waste Gas Control Panel could receive significant dose.

B. Incorrect - 1) Correct, this is the TRM limit for curie content of a WGDT.

2) Incorrect, see A.2.

C. Incorrect - 1) Incorrect, see A.1.

2) Correct, this is correct as stated in the Bases of TRM 13.12.4. This is the dose limit to protect an individual at the exclusion area boundary.

D. Correct - 1) Correct, see B.1.

2) Correct, see C.2.

K/A: 071G2.2.25	Waste Gas Disposal System (WGDS) Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits. (CFR: 41.5 / 41.7 / 43.2) IMPORTANCE RO 3.2 SRO 4.2
Importance Rating:	3.2 4.2
Technical Reference:	Technical Requirements Manual v24 Technical Requirements Manual Bases v9
References provided:	None
Learning Objective:	RECALL AND APPLY the information from the LCO BASES sections: BACKGROUND, APPLICABLE SAFETY ANALYSIS, ACTIONS, SURVEILLENCE REQUIREMENTS,

for any Technical Specifications or TRM requirements associated with Waste Gas System components and attendant equipment alignment, to include the following (OPS-62106B01): 10CFR55.43 (b) 2
13.12.1, Waste Gas Monitoring Instrumentation
13.12.3, Waste Gas Monitoring
13.12.4, Gas Storage Tanks

Question History: New question

K/A match: This question tests the knowledge of an SRO on the information contained in the bases of TRM 13.12.4.

SRO justification: Facility operating limitations in the TS and their bases. [10 CFR 55.43(b)(2)]

- Knowledge of TS bases that is required to analyze TS required actions and terminology.
- Same items listed above for the Technical Requirements Manual (TRM) and Offsite Dose Calculation Manual (ODCM).

Knowledge of the TRM Bases is required to determine the maximum dose to a member of the public during a WGDT rupture.

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2013 NRC exam

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(2) :

1) can NOT be answered by knowing less than 1 hour Tech Specs.
2) can NOT be answered by knowing information listed "above-the-line".
3) can NOT be answered by knowing the TS Safety Limits or their bases.
4) Does involve one or more of the following for TS, TRM or ODCM:

- Knowledge of TS bases that is required to analyze TS required actions and terminology.
- Same items listed above for the Technical Requirements Manual (TRM) and Offsite Dose Calculation Manual (ODCM).

13.12 Explosive Gas and Storage Tank Radioactivity Monitoring (EGSTRAM) Program

TR 13.12.4 Gas Storage Tanks

TR 13.12.4 The quantity of radioactivity contained in each gas storage tank shall be limited to ≤ 70,500 curies of noble gases (considered as Xe-133).

APPLICABILITY: At all times.

ACTIONS

--NOTES--

1. TR 13.0.3 is not applicable.
2. TR 13.0.4c is applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A.1 Quantity of radioactive material in any gas storage tank exceeding limit.	A.1 Suspend all additions of radioactive material to the tank.	Immediately
	AND	
	A.2 Reduce the tank contents to within the limit.	48 hours

TECHNICAL REQUIREMENT SURVEILLANCES

SURVEILLANCE		FREQUENCY
TRS 13.12.4.1	Verify quantity of radioactive material contained in each gas storage tank to be less than the limit.	Once per 7 days when radioactive materials have been added to the tank during the previous 7 days.

TECHNICAL REQUIREMENT SURVEILLANCES

SURVEILLANCE		FREQUENCY
TRS 13.12.4.2	In the event of confirmed major fuel failure (> 1%), verify quantity of radioactive material contained in each waste gas storage tank to be less than the limit.	Once per 24 hours when radioactive materials have been added to the tank during the previous 24 hours.

B 13.12 EXPLOSIVE GAS AND STORAGE TANK RADIOACTIVITY MONITORING (EGSTRAM) PROGRAM

BASES

TR 13.12.1 Waste Gas Monitoring Instrumentation

This instrumentation monitors (and controls) the concentrations of potentially explosive gas mixtures in the waste gas holdup system. The FUNCTIONALITY and use of this instrumentation are consistent with the requirements of General Design Criteria 60 and 63 of Appendix A to 10 CFR Part 50.

TR 13.12.2 Liquid Holdup Tanks

Restricting the quantity of radioactive material contained in the specified tanks provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting concentrations would be less than the limits of 10 CFR Part 20, Appendix B, (to paragraphs 20.1001 -20.2401), Table 2, Column 2, at the nearest potable water supply and the nearest surface water supply in an unrestricted area.

TR 13.12.3 Waste Gas Monitoring

This Technical Requirement is provided to ensure that the concentration of potentially explosive gas mixtures contained in the waste gas holdup system is maintained below the flammability limits of hydrogen and oxygen. During recombiner operation, an automatic control feature is included in the system to prevent the oxygen concentration from reaching these flammability limits. The automatic control feature includes isolation of the source of oxygen (the recombiner oxygen supply), to reduce the concentration below the flammability limit. When the recombiner is not operating and thus the recombiner oxygen supply is isolated, a grab sample can be taken to measure oxygen levels in the waste gas system. Maintaining the concentration of oxygen below the flammability limit when hydrogen is above 4% by volume provides assurance that the releases of radioactive materials will be controlled in conformance with the requirements of General Design Criterion 60 of Appendix A to 10 CFR Part 50.

TR 13.12.4 Gas Storage Tanks

Restricting the quantity of radioactivity contained in each gas storage tank provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting total body exposure to an individual at the nearest exclusion area boundary will not exceed 0.5 rem. This is consistent with Standard Review Plan 15.7.1, "Waste Gas System Failure".

90. 073A2.01 090

Unit 1 is at 100% power with the following conditions:

- #4 Waste Gas Decay Tank (WGDT) release is in progress.
- CTMT Mini-purge supply and exhaust fans are running.
- The Radwaste Ventilation system is running.

Subsequently, the following occurs:

- R-14, PLANT VENT, radiation monitor is oscillating erratically.
- The HIGH ALARM and LOW ALARM lights are LIT.
- The Shift Supervisor has declared R-14 INOPERABLE.

Which one of the following completes the statements below?

The WGDT release __(1)__ terminated.

Per the ODCM, __(2)__ is(are) Applicable.

REFERENCE PROVIDED

	(1)	(2)
A.✔	IS	ACTION 35 ONLY
B.	IS	ACTION 35 and ACTION 37
C.	is NOT	ACTION 35 ONLY
D.	is NOT	ACTION 35 and ACTION 37

Per the ODCM, Table 3-1, Condition 2a, either R-14 or R-22 has to be operable for a Continuous release from the Plant Vent Stack. That is met by R-22 being operable, so Action 37 is not required -
ACTION 37 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are taken at least once per 8 hours and these samples are analyzed for gross activity within 24 hours.

Per the ODCM, Table 3-1, Condition 3 is not met due to R-14 being out of service, so Action 35 is required at all times -
ACTION 35 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the tank(s) may be released to the environment provided that prior to initiating the release:
a. At least two independent samples of the tank's contents are analyzed, and
b. At least two technically qualified members of the Facility Staff independently verify the discharge line valving, and
(1) Verify the manual portion of the computer input for the release rate calculations performed on the computer, or
(2) Verify the entire release rate calculations if such calculations are performed

manually.
Otherwise, suspend release of radioactive effluents via this pathway.

This question targets the actions required per the ODCM for a normal release of Radwaste Vent, Ctmt Minipurge, and Waste Gas Decay Tanks with a failed radiation monitor, along with systems knowledge of the isolation of a WGDT.

A. Correct - 1) Correct, R-14 going into alarm whether the monitor is failed or erratic will cause RCV-14 to close and the release to be terminated.

2) Correct, ACTION 35 is applicable at all times, but is only required when releasing a WGDT. The candidate has to determine that **either** R-14 **or** R-22 will fulfill the requirements of the Plant Vent Stack Noble Gas Activity Monitor for evaluation of the requirement to implement ACTION 37. It is also applicable at all times, but either monitor operable will meet the requirement. R-22 is operable.

B. Incorrect- 1) Correct, see A.1.

2) Incorrect, but plausible if the applicant were to misread Table 3-1 and either miss or not properly apply the "Minimum Channels OPERABLE" column properly, this would be selected. **Either** R-14 **or** R-22 will fulfill the requirements of the Plant Vent Stack Noble Gas Activity Monitor for evaluation of the requirement to implement ACTION 37.

C. Incorrect- 1) Incorrect, the release will terminate. Plausible since the R-14 is reading erratically and both the high and low lights are LIT. The LOW alarm light will cause a MCB alarm and not isolate RCV-14, but the HIGH alarm light being lit should trigger a MCB alarm and an auto-isolation of RCV-14. The applicant may not understand how this condition affects the automatic functions of the rad monitor, which is to close RCV-14.

2) Correct, see A.2.

D. Incorrect- 1) Incorrect, see C.1.

2) Incorrect, see B.2.

K/A: 073A2.01 Process Radiation Monitoring (PRM) System

Ability to (a) predict the impacts of the following malfunctions or operations on the PRM system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:
(CFR: 41.5 / 43.5 / 45.3 / 45.13)
A2.01 Erratic or failed power supply....................... 2.5 2.9*

Importance Rating: 2.5 2.9*

Technical Reference: FNP-ODCM, v24

References provided: FNP-ODCM , Table 3-1 (page 3-3)

Learning Objective: RECALL AND APPLY the information from the LCO BASES sections: BACKGROUND, APPLICABLE SAFETY ANALYSIS, ACTIONS, SURVEILLENCE REQUIREMENTS, for any Technical Specifications or TRM requirements associated with Waste Gas System components and attendant equipment alignment, to include the following (OPS-62106B01): 10CFR55.43 (b) 2
13.12.1, Waste Gas Monitoring Instrumentation
13.12.3, Waste Gas Monitoring
13.12.4, Gas Storage Tanks

Question History: New question

Basis for meeting K/A: R-14, a Process Radiation Monitor, has failed and is INOPERABLE. The RO portion of this question asks if the release is terminated which is the "predict the impacts of the erratic rad monitor" KA match. The SRO must display knowledge of how to read and apply the ODCM to ensure the correct actions are applied. This question provides a scenario in which a normal release will be in progress with a failed rad monitor and the actions, if any, required.

SRO justification: 10 CFR 55.43(b)(2):
Application of Required Actions (Section 3) and Surveillance Requirements (SR) (Section 4) in accordance with rules of application requirements (Section 1).

Same items listed above for the Technical Requirements Manual (TRM) and Offsite Dose Calculation Manual (ODCM).

Requires application of REQUIRED ACTIONS of the ODCM.

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From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(2)

1) can **NOT** be answered by knowing less than 1 hour Tech Specs.
2) can **NOT** be answered by knowing information listed "above-the-line".
3) can **NOT** be answered by knowing the TS Safety Limits or their bases.
4) Does involve **one or** more of the following for TS, TRM or ODCM:

- Application of Required Actions (Section 3) and Surveillance Requirements (SR) (Section 4) in accordance with rules of application requirements (Section 1)..

Reference provided to candidate for this question - ODCM Table 3-1

Table 3-1 Radioactive Gaseous Effluent Monitoring Instrumentation

Instrument	OPERABILITY Requirements[b] Minimum Channels OPERABLE	Applicability	ACTION
1. Steam Jet Air Ejector Noble Gas Activity Monitor (RE-15)	1	MODES 1,2,3,4	37
2. Plant Vent Stack a. Noble Gas Activity Monitor (RE-14 or RE-22)	1	At all times	37[a]
b. Iodine Sampler	1	At all times	39
c Particulate Sampler	1	At all times	39
d. Flowrate Monitor	1	At all times	36
3. GASEOUS RADWASTE TREATMENT SYSTEM Noble Gas Activity Monitor (RE-14), with Alarm and Automatic Termination of Release	1	At all times	35

a. For continuous releases.

b. All requirements in this table apply to each unit.

FIGURE 2 - Waste Gas System

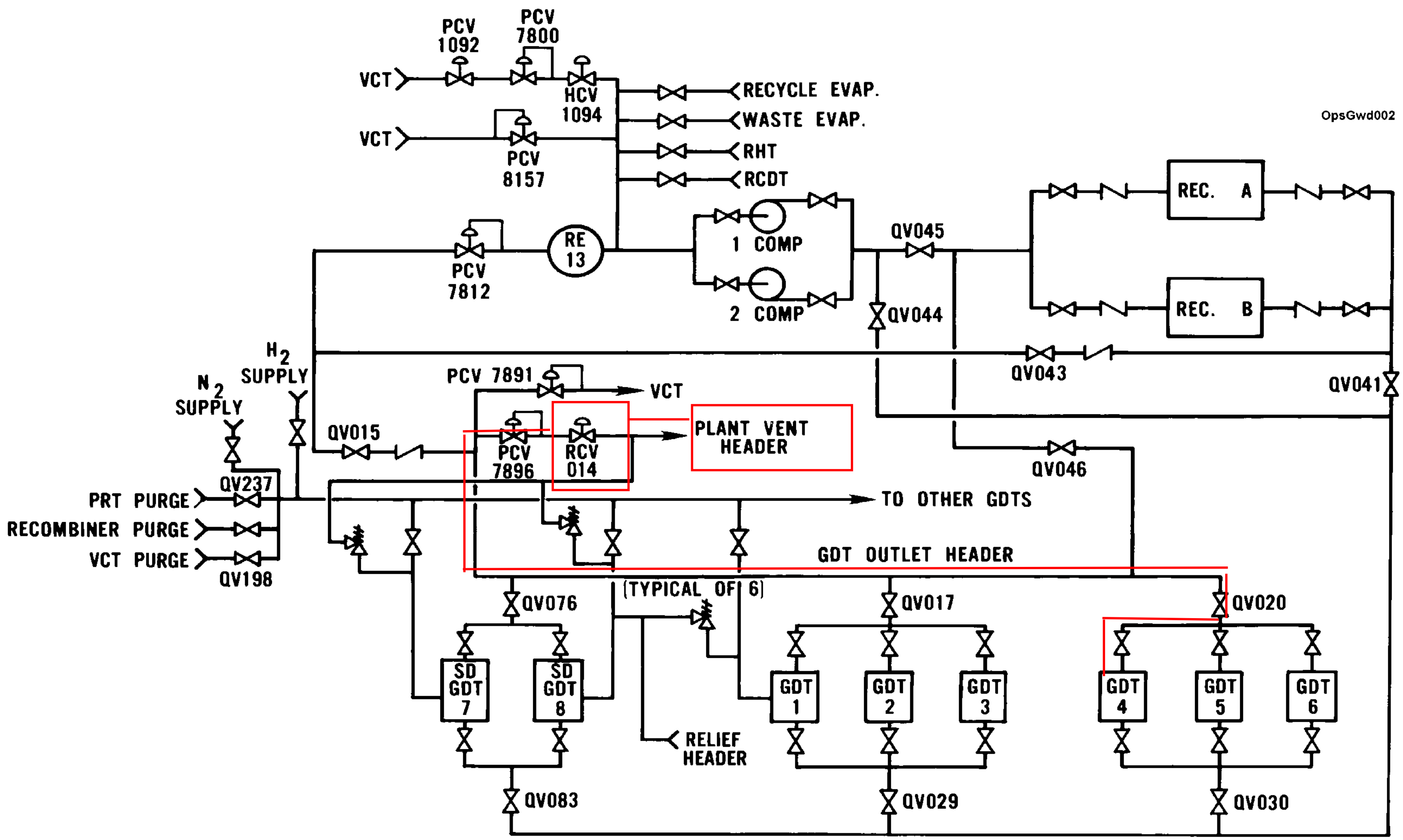

Table 3-1 Radioactive Gaseous Effluent Monitoring Instrumentation

Instrument	OPERABILITY Requirements[b]		
	Minimum Channels OPERABLE	Applicability	ACTION
1. Steam Jet Air Ejector Noble Gas Activity Monitor (RE-15)	1	MODES 1,2,3,4	37
2. Plant Vent Stack a. Noble Gas Activity Monitor (RE-14 or RE-22)	1	At all times	37[a]
b. Iodine Sampler	1	At all times	39
c Particulate Sampler	1	At all times	39
d. Flowrate Monitor	1	At all times	36
3. GASEOUS RADWASTE TREATMENT SYSTEM Noble Gas Activity Monitor (RE-14), with Alarm and Automatic Termination of Release	1	At all times	35

a. For continuous releases.

b. All requirements in this table apply to each unit.

Table 3-1 (contd) Notation for Table 3-1 – ACTION Statements

ACTION 35 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the tank(s) may be released to the environment provided that prior to initiating the release:

a. At least two independent samples of the tank's contents are analyzed, and

b. At least two technically qualified members of the Facility Staff independently verify the discharge line valving, and

  (1) Verify the manual portion of the computer input for the release rate calculations performed on the computer, or

  (2) Verify the entire release rate calculations if such calculations are performed manually.

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 36 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the flowrate is estimated at least once per 4 hours.

ACTION 37 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are taken at least once per 8 hours and these samples are analyzed for gross activity within 24 hours.

ACTION 39 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via the affected pathway may continue provided samples are continuously collected with auxiliary sampling equipment as required in Table 3-3.

91. 077AG2.4.31 091

Unit 1 is at 100% power with the following conditions:

Several substations are separated from the grid resulting in the following plant conditions:

- Unit 1 Generator Voltage is 20.45 kV.
- The following alarms have actuated:
  — WE2, 1F 4KV BUS OV-OR-UV OR LOSS OF DC.
  — VE2, 1G 4KV BUS OV-OR-UV OR LOSS OF DC.
- Grid frequency has fallen to 59.6 hertz and is stable.
- 4160V Bus voltages are 3840 Volts.
- This condition has existed for the past hour.

Which one of the following completes the statements below?

The Generator temperatures will __(1)__ .

AOP-5.2, Degraded Grid, will require the crew to __(2)__ .

	(1)	(2)
A.	RISE	immediately enter AOP-17.1, Rapid Turbine Power Reduction
B.	LOWER	immediately enter AOP-17.1, Rapid Turbine Power Reduction
C.✓	RISE	place the unit in mode 3 in the next 6 hours using UOP-3.1, POWER OPERATION
D.	LOWER	place the unit in mode 3 in the next 6 hours using UOP-3.1, POWER OPERATION

AOP-5.2 v14.0

The FNP HV switchyard is connected to the Grid at a location where there is limited generation, and a loss of "various substations" could result in either a loss of load OR a loss of supporting generation (supply).

Generator (and Bus) voltage and frequency display that an OVERLOAD condition has occurred (more load than generation capacity), this would result in HIGHER currents on the Main Generator windings, and VR thus resulting in Greater I^2R losses (MORE HEAT generation). If the condition were to persist, the insulation within the Main Generator begins to break down resulting in a reduction in its RESISTANCE and eventual failure.

Annunciator response procedures for NA1 & NB1, v18, provides the following direction:

UNIT 1 procedures state: unlimited operation is allowed between 57 Hz and 61.8 Hz.

Both WE2 and VE2 will direct AOP-5.2 entry, and both are ENTRY CONDITIONS for AOP-5.2. (RO knowledge).

AOP-5.2, v14.0, step 3 will evaluate bus voltage.

IF <3850V then logging voltage **every 30 mins** is required per step 3.2 RNO actions. and aligning equipment for the most reliable conditions. IF the conditions persist for > 1 hour, then **step 11 will require a planned shutdown** to be conducted **within the next 6 hours.**

UNIT 2 contains the following guidance:

NOTE: Per FNP-2-SOP-28.1, Turbine Generator Operation, the accumulated time operating between 58.5 Hz and 59.5 Hz should not exceed 60 minutes.

IF the frequency remains above 57 Hz and approaches the time band limits (see above note), THEN operator action is required to prevent turbine damage by removing the turbine from the grid.

A. Incorrect 1) Correct, temperatures will rise due to the high current conditions. See above.

2) Incorrect, reducing Reactor power per AOP-17, would exasperate the Grid voltage condition; Reducing Turbine load would result in reducing Grid voltage further and <u>potentially causing a Degraded Grid LOSP condition</u>. The potential damage to the Generator is NOT instantaneous and delaying or slowing the progression of the degraded grid would permit more time for ACC/PCC to correct the condition, before increasing the risk to the plant and/or the public by dropping a significant power supply thus potentially causing an LOSP condition for FNP and a Blackout condition for the grid. (See TS B3.3.5 discussion).

Plausible: The low frequency condition may lead one to believe that the conditions are dire and that immediate action is required to protect the main generator. An immediate load reduction **might be warranted for a HIGH voltage** condition (although only by the direction of PCC/ACC; not directed by AOP-5.2 for a high voltage condition). Also, **if examinee properly assesses the temp impact, then one might believe a rapid load reduction is required to protect the Main Turbine from damage.**

NOTE: immediately is part of answer choice A & B since AOP-17.1 could be required AFTER UOP-3.1 is initiated if a delay is encountered to comply with TS 3.3.5)

B. Incorrect 1) Incorrect, temperatures would go up.
Plausible: This would be the correct temperature response and ACTION **if 4160V bus voltages were >4220 Volts;** caused by a loss of LOAD vs Generation. Lower current flows from the generator and from the voltage

regulator would reduce I^2R losses.

2) Incorrect, see A.2
Plausible: **The low voltage conditions on the 4160V bus would result in an increased current draw on each of the loads** within the plant therefore, sustained operation with degraded voltage, one might believe that the downpower is necessary to protect the **plant components if they had incorrectly assessed the temperature impact** on the Main Generator.

C. Correct 1) Correct, see A.1.

2) Correct, see above procedure quotes/summary. Although it would appear that an immediate response is required for protection of the Main Generator, TS and the procedure direct a more orderly approach to try to restore proper voltage and frequency, and then if necessary take the Unit offline and prevent a challenge to safety systems by inducing an LOSP.

D. Incorrect 1) Incorrect, see B.1.

2) Correct, see C.2.
Plausible: This would be selected if one were to improperly asses the temperature impact, and properly recall the transition requirement within the procedure.

K/A: 077AG2.4.31 Generator Voltage and Electric Grid Disturbances
Knowledge of annunciator alarms, indications, or response procedures.
(CFR: 41.10 / 45.3)
IMPORTANCE RO 4.2 SRO 4.1

Importance Rating: 4.2 4.1

Technical Reference: FNP-0-ARP-2.1, v35.0
FNP-0-ARP-2.2, v32.2
FNP-1-ARP-1.13, v18.1
FNP-1-AOP-5.2, v15.0

References provided: NONE

Learning Objective: EVALUATE plant conditions and DETERMINE if transition to another section of AOP AOP-5.1, Contingency Electrical Alignments and AOP-5.2, Degraded Grid or to another procedure is required. (OPS-62521N02)

Question History: 2011 HLT-34 NRC Exam question # 90

K/A match: Generator Voltage is degraded below operational limits of SOP-36.8, the candidate must interpret these indications and determine that the Main Generator is overloaded vs underloaded and a generator overheat condition will occur.

The candidate must evaluate the indications and determine the actions required by the required procedures.

SRO justification: 10 CFR 55.43(b)(5)
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations [10 CFR 55.43(b)(5)], involving BOTH:
1) assessing plant conditions and then
2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

One area of SRO level knowledge is knowledge of content of the procedure vs. the procedure's overall mitigative strategy or purpose.

AOP-5.1 has two different strategies; based on the conditions of the degraded grid (HI or LOW). To answer this correctly the candidate must have knowledge of:
—the fundamental temperature response to an overload on the Generator.
—the transitions required

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From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 **flowchart for 10 CFR 55.43(b)(5)** :
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations [10 CFR 55.43(b)(5)], involving BOTH:
1) **assessing plant conditions** and then
2) **selecting** a procedure or section of a procedure to mitigate, recover, or with which to proceed.

Using the flowchart, this question can:
Using the flowchart, this question can:
- **NOT** be answered **solely** by knowing “systems knowledge”, i.e., how the system works, flowpath, logic, component location. **(PT 1 IS sys/fund knowledge, but PT 2 requires procedural knowledge)**
- **NOT** be answered solely by knowing immediate operator actions.
- **NOT** be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry to major EOPs.
- **NOT** be answered **solely** by knowing the purpose, overall sequence of events, or **overall mitigative strategy** of a procedure. **(PT 2 is procedure selections based on evaluation of conditions and not the generic overall mitigative**

strategy of the procedure.

- **CAN** be answered with knowledge of ONE or **MORE** of the following:

— **Assessing plant conditions** (normal, abnormal, or emergency) and then **selecting a procedure** or section of a procedure to mitigate, recover, or with which to proceed. **(Yes).**

— **Knowledge of when to implement** attachments **and** appendices, including how to **coordinate** these items with procedure steps. (Requires knowledge of the TIME requirements for the implementation of the transitions (using transition as equivalent to attachment and appendices of same procedure since AOP-5.2 will be conducted in parallel to UOP-3.1).

— **Knowledge of diagnostic steps and decision points** in the EOPs that involve transitions **to event specific sub-procedures** or emergency contingency procedures. **(Where "event specific" in this case is the Shutdown guidance)**

— **Knowledge of administrative procedures that specify** hierarchy, implementation, and/or **coordination** of plant normal, abnormal, and emergency procedures. **(The plant shutdown time requirements vs immediately are incorporated within the decision point.)**

Step	Action/Expected Response	Response Not Obtained
__ 9	**Contact Alabama Control Center For Voltage Control Strategies**	

NOTE: Step 10 is a continuing action step.

Step	Action/Expected Response	Response Not Obtained
__ 10	**[CA] Check Status of 4160 V Buses 1F And 1G:**	
	10.1 4160 V Buses 1F and 1G voltages - LESS THAN 4200 V	10.1 Return to step 2.
	10.2 4160 V Buses 1F and 1G voltages - LESS THAN 3850 V	10.2 Perform the following: 10.2.1 <u>IF</u> no PCC notification exists, <u>THEN</u> go to procedure and step in effect. 10.2.2 Return to step 2.
__ 11	**Evaluate need for plant shutdown (refer to TS 3.3.5, Action F.1):**	
	11.1 Check reactor - MODE 1 <u>OR</u> 2	11.1 Proceed to Step 12.
	11.2 Check duration of degraded voltage - GREATER THAN ONE HOUR	11.2 Return to Step 2.
	11.3 Initiate actions to place Reactor in MODE 3 within the next 6 Hours using: • FNP-1-UOP-3.1, POWER OPERATION • FNP-1-UOP-2.1, SHUTDOWN OF UNIT FROM MINIMUM LOAD TO HOT STANDBY	

__Page Completed

92. G2.1.20 092

Unit 1 had an extended Loss of all AC power with the following conditions:

At 1000:

- Power has been restored to the 1F and 1K 4160V busses.
- The Shift Supervisor is preparing to exit ECP-0.0, Loss of ALL AC Power, and is at the step to "Evaluate plant conditions".
- SCMM is 39°F.
- Pressurizer level is 16% and slowly falling.
- CTMT pressure is 5.8 psig.
- SI equipment did **NOT** automatically actuate when power was restored.

At 1002:

- ECP-0.0 has been exited and the applicable recovery procedure has been entered.
- The Shift Supervisor is informed that a RED path exists for Heat Sink on the IPC CSF status trees.

Which one of the following completes the statements below?

At 1000, entry into _(1)_ is required.

At 1002, per the applicable procedure in effect, the Control Room crew __(2)__ required to enter FRP-H.1, Loss of Secondary Heat Sink.

Procedure titles are as follows:
ECP-0.1, Loss of All AC Power Recovery Without SI Required.
ECP-0.2, Loss of All AC Power Recovery With SI Required.

	(1)	(2)
A.	ECP-0.1	IS
B.	ECP-0.1	is NOT
C.	ECP-0.2	IS
D.✓	ECP-0.2	is NOT

ECP-0.0 Step 31

31 Evaluate plant conditions.

31.1 Check SI not required. • Check SUB COOLED MARGIN MONITOR indication - GREATER than 16F{45F} SUBCOOLED IN CETC MODE. • Check Pressurizer level - GREATER THAN 13%{43%}. • Check SI equipment - HAS NOT ACTUATED UPON AC POWER RESTORATION such that SI flow occurred.	**31.1** Go to FNP-1-ECP-0.2, LOSS OF ALL AC POWER RECOVERY WITH SI REQUIRED.

31.2 Go to FNP-1-ECP-0.1, LOSS OF ALL AC POWER RECOVERY WITHOUT SI REQUIRED.

A. Incorrect - 1) Incorrect, plausible since SI equipment has not actuated and other parameters at 10:00 would direct a transition to ECP-0.1 if NON-Adverse numbers were applied (See step 31 of ECP-0.0). This would be a correct answer if Containment pressure were < 4 psig.

2) Incorrect, plausible since this is the normal strategy when a FRP red path condition is detected. There is a note above step 1 of ECP-0.2 that states FRP's are not implemented until after completion of step 13.

B. Incorrect - 1) Incorrect, see A.1.

2) Correct, there is a note above step 1 of ECP-0.2 that states FRP's are not implemented until after completion of step 13..

C. Incorrect - 1) Correct, entry into ECP-0.2 is required (See step 31 of ECP-0.0).

2) Incorrect, see A.2.

D. Correct - 1) Correct, see C.1.

2) Correct, see B.2.

K/A: G2.1.20	Ability to interpret and execute procedure steps. (CFR: 41.10 / 43.5 / 45.12) IMPORTANCE RO 4.6 SRO 4.6
Importance Rating:	4.6 4.6
Technical Reference:	FNP-1-ECP-0.0 v26 FNP-1-ECP-0.2 v19
References provided:	None
Learning Objective:	ASSESS the facility conditions associated with the (1) ECP-0.0, Loss of All AC Power; (2) ECP-0.1, Loss of All AC Power Recovery, Without SI Required; (3) ECP-0.2, Loss of All AC Power Recovery, With SI Required, and based on that assessment: (OPS-62532A01) • SELECT the appropriate procedures during normal, abnormal and emergency situations. 10CFR55.43 (b) 5 • DETERMINE if transition to another section of the procedure or to another procedure is required • DETERMINE if the critical safety functions are satisfied
Question History:	New question
K/A match:	This question requires the candidate to interpret the conditions given and choose the correct recovery procedure. In addition, once the procedure transition is made, the candidate has to properly execute implementation of the recovery procedure, ECP-0.2.
SRO justification:	10 CFR 55.43(b)(5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations. [10 CFR 55.43(b)(5)] This 10 CFR 55.43 topic involves both 1) assessing plant conditions (normal, abnormal, or emergency) and then 2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed. One area of SRO level knowledge (with respect to selecting a procedure) is knowledge of the content of the procedure versus knowledge of the procedure's overall mitigative strategy or purpose. Assessing plant conditions (normal, abnormal, or emergency) and then selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed. - Procedure selection is required on the first and second parts of this question.

Knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event specific sub-procedures or emergency contingency procedures.
- Knowledge of diagnostic steps is required on the first part of this question.

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From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(5) :
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations [10 CFR 55.43(b)(5)], involving BOTH:

1) assessing plant conditions and then
2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

Using the flowchart, this question can:

- NOT be answered solely by knowing "systems knowledge", i.e., how the system works, flowpath, logic, component location.
- NOT be answered solely by knowing immediate operator actions.
- NOT be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry to major EOPs.
- NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure.
- Be answered with knowledge of ONE or MORE of the following:
  - **Assessing plant conditions (normal, abnormal, or emergency) and then selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.**
  - **Knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event specific sub-procedures or emergency contingency procedures.**

Step	Action/Expected Response	Response NOT Obtained

NOTE: If RCP seal cooling was previously isolated, further cooling of the RCP seals will be established by natural circulation cooldown as directed in subsequent procedures.

___31 **Evaluate plant conditions.**

31.1 Check SI not required.

- Check SUB COOLED MARGIN MONITOR indication - GREATER than 16°F{45°F} SUBCOOLED IN CETC MODE.
- Check pressurizer level - GREATER THAN 13%{43%}.
- Check SI equipment - HAS NOT ACTUATED UPON AC POWER RESTORATION such that SI flow occurred.

RESPONSE NOT OBTAINED: 31.1 Go to FNP-1-ECP-0.2, LOSS OF ALL AC POWER RECOVERY WITH SI REQUIRED.

Transition is required, based on conditions, to ECP-0.2

31.2 Go to FNP-1-ECP-0.1, LOSS OF ALL AC POWER RECOVERY WITHOUT SI REQUIRED.

-END-

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: Critical safety function status trees should be monitored for information only. No Function Restoration Procedure should be implemented until completion of step 13.

****

Once transition is made to ECP-0.2, FRP's are not implemented until some recovery actions are performed.

___ 1 **Reset SI signals.**

1.1 Verify SI - RESET.

[] MLB-1 1-1 not lit (A TRN)
[] MLB-1 11-1 not lit (B TRN)

1.1 Perform the following:

1.1.1 IF any train will NOT reset using the MCB SI RESET pushbuttons, THEN place the affected train S821 RESET switch to RESET. (SSPS TEST CAB.)

1.1.2 IF a failure exists in SSPS such that SI cannot be reset, THEN reset SI using FNP-1-SOP-40.0, RESPONSE TO INADVERTENT SI AND INABILITY TO RESET OR BLOCK SI, Appendix 2.

1.2 IF DF08-1 is closed AND LOSP has occurred, THEN place B1F Sequencer Test Trip Override Switch (TTOS)in OFF:

1.2.1 Obtain B1F Sequencer TTOS key from SSS office.

1.2.2 Insert key into B1F Sequencer Test Trip Override Switch.

1.2.3 Place B1F Sequencer Test Trip Override Switch in OFF.

1.3 Reset B1F sequencer. (139 ft, AUX BLDG A train SWGR room)

Step 1 continued on next page.

93. G2.1.37 093

Unit 1 is at 75% power and ramping up with the following conditions:

- A reactivity plan has been developed and approved for the reactivity additions.
- A Reactivity Management SRO has been stationed due to frequent reactivity additions.

Which one of the following completes the statements below per NMP-OS-001, Reactivity Management Program?

During the ramp up, the limit for Control Rod withdrawal is a maximum of __(1)__ per rod pull.

The Reactivity Management SRO __(2)__ authorize changes to the reactivity plan.

	(1)	(2)
A.✓	three steps	CANNOT
B.	three steps	CAN
C.	four steps	CANNOT
D.	four steps	CAN

From NMP-OS-001

Step 6.3.9.3 -
Plant Farley and Plant Vogtle 1&2:
When withdrawing control rods in MODE 1, the OATC shall stop rod withdrawal **at least every three steps** and check for expected response on NIs, DRPI, and reactor coolant temperature (i.e. pull and wait).

Step 6.4.2-
While the Reactivity Management SRO provides direct oversight and approval of the planned reactivity additions, the SS must approve the reactivity plan as well as any changes to the plan.

A. Correct - 1) Correct, the limit for Control Rod withdrawal is 3 steps per rod pull.

2) Correct, the Reactivity Management SRO cannot modify the reactivity plan. The SS has to approve the reactivity plan in addition to any changes to the reactivity plan.

B. Incorrect- 1) Correct, see A.1.

2) Incorrect, plausible since the candidate may think the Reactivity Management SRO has taken over the total responsibility for reactivity management.

C. Incorrect- 1) Incorrect, plausible because NMP-OS-001 has a 4 step per rod pull limit for Vogtle 3 & 4 (see step 6.3.9.4 of NMP-OS-001).

2) Correct, see A.2.

D. Incorrect- 1) Incorrect, see C.1.

2) Incorrect, see B.2.

K/A: G2.1.37	Knowledge of procedures, guidelines, or limitations associated with reactivity management. (CFR: 41.1 / 43.6 / 45.6) IMPORTANCE RO 4.3 SRO 4.6	
Importance Rating:	4.3	4.6
Technical Reference:	NMP-OS-001, v17	
References provided:	None	
Learning Objective:	STATE and EXPLAIN the responsibilities of the Reactivity Management SRO as described in NMP-OS-001, Reactivity Management Program. (OPS-62303P03)	

Question History:	Modified from Farley Bank question RX MGMT-53203P02 04
K/A match:	The candidate is questioned on the limitations for Control Rod withdrawal during a routine ramp, and also the responsibilities of the Reactivity Management SRO during reactivity manipulations during a ramp.
SRO justification:	This question meets the criteria for SRO by requiring the candidate to have knowledge of administrative procedures (NMP-OS-001, Reactivity Management Program) that specifies the responsibilities of the SRO (Reactivity Management SRO) during a ramp when reactivity manipulations are being performed.

10 CFR 55.43(b)(5)
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations. [10 CFR 55.43(b)(5)] This 10 CFR 55.43 topic involves both 1) assessing plant conditions (normal, abnormal, or emergency) and then 2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed. One area of SRO level knowledge (with respect to selecting a procedure) is knowledge of the content of the procedure versus knowledge of the procedure's overall mitigative strategy or purpose.

The applicant's knowledge can be evaluated at the level of 10 CFR55.43(b)(5) by ensuring that the additional knowledge of the procedure's content is required to correctly answer the written test item, for example:

<u>Knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures.</u>

10 CFR 55.43(b)(6)
Procedures and limitations involved in initial core loading, alterations in core configuration, control rod programming, and determination of various internal and external effects on core reactivity. [10 CFR 55.43(b)(6)]

Could also fall under the SRO criteria of this CFR, although not specifically listed as one of the examples. The fact that it is not listed does not exclude it from inclusion if it meets the criteria of 10 CFR 55.43(b)(6). The question is about "Procedures and limitations involved in control rod

reactivity".

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Knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures.

NMP-OS-001 is an administrative procedure that provides guidance on reactivity management during a routine ramp up per UOP-3.1.

This question could also meet the SRO criteria under :

Procedures and limitations involved in initial core loading, alterations in core configuration, control rod programming, and determination of various internal and external effects on core reactivity. [10 CFR 55.43(b)(6)]

Although not listed as an example for this category in the "Clarification Guidance for SRO-only Questions", this question does include procedural administrative requirements and controls associated with external effects on core reactivity.

6.3.9.3 Plant Farley and Plant Vogtle 1&2:

When withdrawing control rods in MODE 1, the OATC shall stop rod withdrawal at least every three steps and check for expected response on NIs, DRPI, and reactor coolant temperature (i.e. pull and wait). This requirement may be suspended during evolutions that have adequate procedural direction and oversight during the withdrawal of the control rods (i.e. recovery of a dropped rod, rod control surveillances). It should be noted that many of the fuel-damaging events in the industry have resulted from misoperation of control rods. Careful monitoring of the rod control system is essential.

Peer check for rod manipulations should confirm placement of hand on rod motion switch in a manner that allows physical confirmation of intended direction of rod motion.

6.3.9.4 Plant Vogtle 3&4:

Plausibility for 4 steps for distracter.

During Mode 1 operation, control rods are normally in automatic control. If continuous manual control rod withdrawal is required above the point of adding heat, the OATC shall stop rod withdrawal and check for the expected response on NIs, DRPI, and reactor coolant temperature (i.e. pull and wait). Withdrawal is limited in M1, M2, and AO banks to 4 steps, and MA, MB, MC, MD banks are limited to 20 steps.

The OATC shall monitor/report Gray Bank and Axial Offset automatic rod movement to control temperature (M-banks), power (when rod control is in low power mode) and axial flux position (AO Rods). The OATC shall report Tave-Tref deviation and proper M-Bank rod insertion or Delta Flux Deviation and proper operation of the AO banks as they withdraw or insert.

Peer check for manual rod manipulations should confirm the mouse pointer is placed over the desired direction (i.e. in or out). Control rods will move in or out based on the current sequence. If moving a bank or group of rods, the peer checker will also confirm that the proper bank or group is selected.

6.4 Reactivity Management SRO

6.4.1 An additional active licensed SRO shall be dedicated to provide direct and intrusive oversight of reactivity manipulations allowing the SS to maintain the overall perspective of unit operation. A Reactivity Management SRO may also be stationed at the request of the Shift Supervisor during power maneuvers involving frequent reactivity manipulations.

6.4.2 While the Reactivity Management SRO provides direct oversight and approval of the planned reactivity additions, the SS must approve the reactivity plan as well as any changes to the plan.

Modified this question from FNP Bank to develop G2.1.37 question

1. RX MGMT-53203P02 004

Unit 2 is performing a Rx Startup using UOP-1.2, Startup of Unit from Hot Standby to Minimum Load.

Which one of the following describes the the requirements of stationing and the authority given to a Reactivity Management SRO as stated in NMP-OS-001, Reactivity Management Program?

The Reactivity Managment SRO is **REQUIRED** to be stationed while power is ________

A. being raised from the POAH to stable at power operations, and

may authorize reactivity additions and changes to the reactivity plan; the SS is **not REQUIRED** to approve the changes.

B.✓ being raised from the POAH to stable at power operations, and

may **ONLY** approve adding positive reactivity that complies with that already briefed with the SS; Changes can not be approved by the Reactivity Management SRO.

C. approaching criticality,

may authorize reactivity additions and changes to the reactivity plan; the SS is **not REQUIRED** to approve the changes.

D. approaching criticality,

may **ONLY** approve adding positive reactivity that complies with that already briefed with the SS; Changes can not be approved by the Reactivity Management SRO.

94. G2.2.21 094

Unit 1 is at 100% power with the following conditions:

- The packing was replaced on MOV-8812B, CTMT SUMP TO 1B RHR PUMP.
- The MOV was left in the closed position.
- The Return to Service Tagout is in progress and power has been restored to the MOV.

Which one of the following states the **minimum** action(s) required to restore MOV-8812B to OPERABLE after the valve packing replacement?

MOV-8812B is OPERABLE when ______ .

A. the MOV's auto open function is tested per its Surveillance Test Procedure

B.✓ the MOV has been satisfactorily time stroked per its Surveillance Test Procedure

C. the MOV is stroked open and closed from its remote handswitch per the guidance of the Tagout

D. the MOV is manually stroked open and closed per the guidance of the Tagout, with no leakage verified

A. Incorrect - plausible since this is a safety function of the MOV, and there is a test (STP-11.13) to ensure the valve will auto open when required. Incorrect since no actions have been performed on the MOV that would affect its auto open signal.

B. Correct - Since maintenance was performed on the MOV that could affect its stroke time, and thus the ability to perform its safety function, a Surveillance test that time strokes the valve must be performed.

C. Incorrect - plausible because this is guidance that may be included on the Tagout for a MOV that was manually operated with no maintenance performed that would affect is stroke time. If the MOV had only been manually operated (and no work performed on the MOV), this would be the correct answer.

D. Incorrect - plausible since one of the post maintenance testing actions performed for manual valves that have been repacked is to verify that the valve operates smoothly with no binding, and to also verify no leakage.

K/A: G2.2.21 — Knowledge of pre- and post-maintenance operability requirements.
(CFR: 41.10 / 43.2)

Importance Rating:	2.9 4.1
Technical Reference:	FNP-1-STP-11.6, v40.1 NMP-AD-012, v12.0 FNP-0-SOP-0.13, v26.0
References provided:	None
Learning Objective:	RECALL AND APPLY the information from the LCO BASES sections: BACKGROUND, APPLICABLE SAFETY ANALYSIS, ACTIONS, SURVEILLENCE REQUIREMENTS, for any Technical Specifications or TRM requirements associated with the Residual Heat Removal System components and attendant equipment alignment, to include the following (OPS-62101K01): 10CFR55.43 (b) 2 3.4.3, RCS Pressure and Temperature (P/T) Limits 3.4.6, RCS Loops – MODE 4 3.4.7, RCS Loops - MODE 5, Loops Filled 3.4.8, RCS Loops - MODE 5, Loops Not Filled 3.4.12, Low Temperature Overpressure Protection (LTOP) System 3.4.14, RCS Pressure Isolation Valve (PIV) Leakage 3.5.2, ECCS – Operating 3.5.3, ECCS – Shutdown 3.9.4, Residual Heat Removal (RHR) and Coolant Circulation - High Water Level 3.9.5, Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level 13.5.1, Emergency Core Cooling System (ECCS)
Question History:	New question
K/A match:	This question tests the candidate's knowledge of requirements for return to service of a Safety Related piece of equipment after maintenance has been completed. This tests knowledge of what restores operability to a MOV that has had work performed on it that can affect its stroke time.
SRO justification:	This question meets the criteria for SRO by requiring the candidate to have knowledge of administrative procedures (FNP-0-SOP-0.13, Recording Limiting Conditions for Operations, and NMP-AD-012, Operability Determinations and Functionality Assessments) that specifies how to return a piece of equipment to service after maintenance and how to use that in conjunction with Tech Specs to declare a system OPERABLE.

10 CFR 55.43(b)(5)
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations. [10 CFR 55.43(b)(5)] This 10 CFR 55.43 topic involves both 1) assessing plant conditions (normal, abnormal, or emergency) and then 2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed. One area of SRO level knowledge (with respect to selecting a procedure) is knowledge of the content of the procedure versus knowledge of the procedure's overall mitigative strategy or purpose.

Knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures.

Could also be covered by 10 CFR 55.43(b)(2) as knowledge of Surveillance requirements to return a piece of Safety Related equipment to service.

10 CFR 55.43(b)(2):
Application of Required Actions (Section 3) and Surveillance Requirements (SR) (Section 4) in accordance with rules of application requirements (Section 1).

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Knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures.

Application of Required Actions (Section 3) and Surveillance Requirements (SR) (Section 4) in accordance with rules of application requirements (Section 1).

_____ 5.2.13 **Verify** CTMT SUMP TO 1B RHR PUMP, Q1E11MOV8811B closed.

_____ IV 5.2.14 Independently **verify** CTMT SUMP TO 1B RHR PUMP, Q1E11MOV8811B closed.

NOTE:	Instructions for time stroke of CTMT SUMP TO 1B RHR PUMP, Q1E11MOV8812B during outages can be found in Appendix 1.

_____ *5.2.15 IF the following conditions exist,

[] 1A RCS LOOP TO 1B RHR PUMP Q1E11MOV8702A closed

[] 1A RCS LOOP TO 1B RHR PUMP Q1E11MOV8702B closed

THEN, time **stroke** CTMT SUMP TO 1B RHR PUMP, Q1E11MOV8812B as follows:

- **Open** CTMT SUMP TO 1B RHR PUMP, Q1E11MOV8812B and **record** the opening time in the ACTUAL STROKE TIME column of Table 1.
- **Close** CTMT SUMP TO 1B RHR PUMP, Q1E11MOV8812B and **record** the closing time in the ACTUAL STROKE TIME column of Table 1.

ACCEPTANCE CRITERIA:	Stroke times are less than or equal to the Maximum Allowable Times listed in Table 1.

_____ 5.2.16 **Verify** CTMT SUMP TO 1B RHR PUMP, Q1E11MOV8812B closed.

_____ IV 5.2.17 Independently **verify** CTMT SUMP TO 1B RHR PUMP, Q1E11MOV8812B closed.

3.9 **Immediate Determination of Operability (IDO)** – An initial determination of operability is made after confirming the existence of a degraded, nonconforming or unanalyzed condition. The determination should be made without delay and in a controlled manner using the best available information. The information should be sufficient to conclude that there is a reasonable expectation that the SSC is operable. The IDO provides justification of operability while a PDO is in progress. Instructions for processing an IDO in Maximo are found in NMP-AD-012-GL03. Instructions for processing a PDO are found in NMP-AD-012-GL01.

3.10 **Necessary Support Function** – A function of an SSC that is required to support operability of an SSC described in TSs. SSCs that provide necessary support functions (i.e., Support SSCs) may or may not be described in TSs. If they are described in TS, then the term "operable" applies to them. If they are not described in TSs, then the term "operable" does not apply to them directly; however, these SSCs are still within the scope of the Operability Determination process because their lack of functionality can affect the operability of SSCs described in TS. Refer to Attachment 2, Section 6 of NMP-AD-012-GL01 for instructions.

3.11 **Nonconforming Condition** – A nonconforming condition is a condition of an SSC that involves a failure to meet the CLB or a situation in which quality has been reduced because of factors such as improper design, testing, construction, or modification. The following are examples of nonconforming conditions:

- An SSC fails to conform to one or more applicable codes or standards (e.g., the CFR, operating license, and TSs, UFSAR, and/or licensee commitments).
- An as-built or as-modified SSC does not meet the CLB.
- Operating experience or engineering reviews identify a design inadequacy.
- Documentation required by NRC requirements such as 10 CFR 50.49 is unavailable or deficient.

3.12 **Operability Declaration –** An operability declaration is a decision by a senior licensed operator on the operating shift crew that there is a reasonable expectation that an SSC can perform its specified safety function.

3.13 **Operable/Operability** – In accordance with the TS, a system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its Specified Safety Functions, and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication and other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).

In order to be considered operable, an SSC must be capable of performing the safety functions specified by its design, within the required range of design physical conditions, initiation times, and mission times. In addition, TS operability considerations require that an SSC meet all surveillance requirements (as specified in Surveillance Requirement (SR) Applicability SR 3.0.1). An SSC that does not meet an SR must be declared inoperable. For Operability Determination purposes, the mission time is the duration of SSC operation that is credited in the design basis for the SSC to perform its Specified Safety Function.

3.4 Initiation of LCO/TR Status Sheet For An Admin LCO/TR

These are the actions required to restore OPERABILITY after work is performed. The STP that time strokes the MOV is the functional test.

Complete Section I of the LCO/TR Status Sheet per Section 3.1 except as modified following subsections.

LCO/TR Initiated

Enter date and time of equipment malfunction.

Required Actions

1 **State** any mode restraints or restraints on equipment operation. The completion section will be marked N/A.

3.5 Restoration of LCO/TR s

3.5.1 As a minimum, the following items should be addressed in determining when an LCO/TR may be closed out:

3.5.1.1 Field work on the initiating condition resolved/corrected.

3.5.1.2 A functional test or other method has demonstrated operability.

3.5.2 For certain conditions, an LCO/TR may be closed out based on completion of functional testing without having the applicable WO or surveillance test reviewed by an ATL. The intent is that the extent of field work is understood and that functional testing adequately tests all field work performed. Examples include, but are not limited to:

3.5.2.1 7300 and NI “A” and “B” pack testing, provided acceptance criteria is satisfactorily met as determined by the journeyman prior to coming out of test.

3.5.2.2 Diesel Generator maintenance activities such as 24 month outages and minor leak repairs.

3.5.2.3 Radiation monitor activities such as pump lubes or paper drive inspections provided Control Room drawer alignment is performed satisfactory.

3.5.2.4 Radiation monitor functional test, calibration or isotopic provided acceptance criteria is satisfactorily met as determined by the journeyman.

95. G2.2.23 095

Unit 2 is at 100% power with the following conditions:

- The 2B RHR pump is being Tagged Out for a scheduled oil change and maintenance inspection.
- Maintenance is expected to take 36 hours to complete.

Which one of the following completes the statements below?

The LCO required is a __(1)__ LCO.

In addition to a Control Room LCO Log entry, an LCO/TR Status Sheet __(2)__ required to document the LCO.

	(1)	(2)
A.✔	Voluntary	IS
B.	Voluntary	is NOT
C.	Mandatory	IS
D.	Mandatory	is NOT

SOP-0.13

3.0.1 **Initiation of Hard Copy LCO/TR ACTION statement**
When a unit fails to meet an applicable LCO/TR and requires initiation of an ACTION statement, or equipment malfunction requires an Admin LCO/TR, the SS or a licensed individual shall:
a. Complete Figure 4, "LCO/TR Status Sheet" Section I.

3.0.2 **Short Term LCO's**
Initiation of short term (log or computer entry) LCO/TR ACTION statement Completion of an LCO/TR Status Sheet is NOT required for the performance of surveillances or short term entry into an LCO/TR which will be cleared prior to turning over the Control Room Log for the shift.

3.1.3 **Type of LCO/TR**
IF the LCO/TR becomes effective due to circumstances beyond the Shift Supervisor's control (i.e., a covered piece of equipment breaks), then this will be indicated by entering "Mandatory" (M).
IF the LCO becomes effective due to the Shift Supervisor's decision (i.e., a covered piece of equipment is voluntarily removed from service for maintenance etc.), then this will be indicated by entering "Voluntary" (V).
If a piece of equipment is removed from service that is not required in the present plant mode, but is required in an higher plant mode or if it reduces the redundancy, then an Administrative LCO may be written.

This will be indicated by entering “Administrative” (A).

A. Correct 1) Correct, per SOP-0.13, if a piece of equipment is OPERABLE and voluntarily removed from service, it is a Voluntary LCO.

2) Correct, an LCO/TR Status sheet is required if the LCO will be in effect for longer than one shift. Since the LCO will be in effect for 36 hours, a LCO/TR Status Sheet is required to be filled out.

B. Incorrect 1) Correct, see A.1.

2) Incorrect, plausible because per SOP-0.13 it is acceptable to only make an entry into the Control Room Log for LCO's that are of short duration (will be restored prior to the end of the shift).

C. Incorrect 1) Incorrect, Mandatory LCO's are required when an unplanned event occurs that makes a piece of equipment INOPERABLE. If the equipment was failed when removed from service, it is a Mandatory LCO. Plausible that a candidate may think it is a Mandatory LCO since he may associate Voluntary LCO's with Admin LCO's. Since this is an actual Tech Spec entry, where REQUIRED ACTIONS are implemented, he may determine it is a Mandatory LCO

2) Correct, see A.2.

D. Incorrect 1) Incorrect, see C.1.

2) Incorrect, see B.2.

K/A: G2.2.23 Equipment Control - Ability to track Technical Specification limiting conditions for operations.
(CFR: 41.10 / 43.2 / 45.13)
IMPORTANCE RO 3.1 SRO 4.6

Importance Rating: 3.1 4.6

Technical Reference: FNP-0-SOP-0.13, Recording Limiting Conditions for Operations, v26.0

References provided: None

Learning Objective: STATE AND DESCRIBE the process for recording and tracking the failure to meet the Limiting Condition for Operation and Technical Requirements (OPS-52302A07)

Question History: New question

K/A match: Candidate is given conditions where an LCO is required,

addition the candidate has to determine what tools are acceptable for tracking the status of the LCO.

SRO justification: This question meets the criteria for SRO by requiring the candidate to have knowledge of administrative procedures (FNP-0-SOP-0.13, Recording Limiting Conditions for Operations) that specifies how to document and track Tech Spec LCO's (implementation of Tech Specs).

10 CFR 55.43(b)(5)
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations. [10 CFR 55.43(b)(5)] This 10 CFR 55.43 topic involves both 1) assessing plant conditions (normal, abnormal, or emergency) and then 2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed. One area of SRO level knowledge (with respect to selecting a procedure) is knowledge of the content of the procedure versus knowledge of the procedure's overall mitigative strategy or purpose.

The applicant's knowledge can be evaluated at the level of 10 CFR55.43(b)(5) by ensuring that the additional knowledge of the procedure's content is required to correctly answer the written test item, for example:

Knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures.

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Knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures.

3.0 LCO/TR STATUS SHEET PREPARATION

NOTE

A Shift Support Supervisor (SSS) or a licensed individual can enter the required information on Figures 4, 5, 6, and 7; however, a SS must be informed. ☐

For T.S. LCO Required Actions with completion times less than or equal to 8 hours, an administrative reminder shall be initiated, and the Shift Manager shall be notified of the required action and its associated completion time. ☐

3.1 Initiation of Hard Copy LCO/TR ACTION statement.

When a unit fails to meet an applicable LCO/TR and requires initiation of an ACTION statement, or equipment malfunction requires an Admin LCO/TR, the SS or a licensed individual shall:

3.1.1 **Complete** Figure 4, "LCO/TR Status Sheet" Section I. ☐

3.1.2 For all unplanned LCO entries and emergent work, an **INDEPENDENT VERIFICATION** by a licensed SRO will be performed, and will validate the correct LCO has been entered. ☐

3.1.3 **Notify** the Shift Supervisor (SS) and Shift Manager (SM) ☐

3.1.4 **Log** the status sheet on Figure 7, "LCO/TR Status Log". The LCO/TR Status Sheet shall be located in the LCO Book. ☐

3.1.5 In the Control Room Log, **enter** bracketed (< >) information which is applicable to the Tech Spec/TRM/ODCM entry. ☐

3.1.6 For mandatory LCO entrie**s,** inform, without delay, the Operations Manager or one of the Operations staff superintendents. ☐

3.1.7 For T.S. LCO Required Actions with completion times less than or equal to 8 hours when the LCO is entered, initiate an appropriate administrative reminder to ensure that required actions are completed within the time requirements. (AI 2009208864) ☐

3.1.8 For T.S. LCO Required Actions with completion times less than or equal to 8 hours when the LCO is entered, notify the Shift Manager of the required actions and associated completion times. This does not remove the primary responsibility for implementing T.S. from the Shift Supervisor. (AI 2009208864) ☐

3.1.9 IF required, **notify** Security. ☐

3.1.10 IF required, **update** EOOS. ☐

3.2 Initiation of short term (log or computer entry) LCO/TR ACTION statement.

If the LCO will go past the end of the shift, a hard copy LCO/TR status sheet must be used in addition to the log entry. The CCW pump will be out for 36 hours.

Completion of an LCO/TR Status Sheet is **NOT** required for the performance of surveillances or short term entry into an LCO/TR which will be cleared prior to turning over the Control Room Log for the shift. In this case, the following steps should be performed.

3.2.1 In the Control Room Log, **enter** bracketed (< >) information which is applicable to the Tech Spec/TRM/ODCM entry. ☐

3.2.2 For planned work, the releasing SRO will be responsible and required to write the LCO entered for the specified work when the work order is released. The applicable unit's SS will **peer check** the written LCO. The SS is expected to annotate that the LCO has been peer checked in Control Room Log. [AI 2008202372] ☐

3.2.3 For mandatory LCO entries, inform the Operations Manager or one of the Operations staff superintendents. ☐

3.2.4 To provide a tool to assist in ensuring accurate and timely application of Tech Spec actions, an **INDEPENDENT VERIFICATION** by a licensed SRO will be performed for all unplanned LCO entries and emergent work. This should be completely independent of the preparer, and will validate the correct LCO has been entered. [AI 2009204242] ☐

- Example: The SRO tasked with performing the independent verification should be provided the conditions necessitating the unplanned LCO entry. Using plant knowledge and Technical Specifications, the SRO should arrive at the same conclusion as the person requesting the independent verification.}

3.2.5 For T.S. LCO Required Actions with completion times less than or equal to 8 hours when the LCO is entered, initiate an appropriate administrative reminder to ensure that required actions are completed within the time requirements. (AI 2009208864) ☐

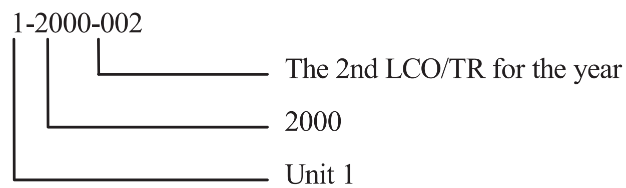
3.2.6 For T.S. LCO Required Actions with completion times less than or equal to 8 hours when the LCO is entered, notify the Shift Manager of the required actions and associated completion times. This does not remove the primary responsibility for implementing T.S. from the Shift Supervisor. (AI 2009208864) ☐

3.3 Initiation of LCO/TR Status Sheet For An LCO/TR.

Complete Section I of the LCO/TR Status Sheet in accordance with the following sections:

3.3.1 LCO/TR Number

The LCO/TR Number is assigned by unit-year-sequence. Unit 1 and Shared LCO's are recorded in the Unit 1 Status Log.
e.g.:



3.3.2 LCO / TR Initiated

The date and time the LCO was not met. If a time cannot be determined for the initiating event, the time of discovery should be used.
Record the date as mm/dd/yyyy. ☐

- Where:
  mm = month (01-12)
  dd = day (01-31)
  yy = year (2000-2099)

Record the time using a 24 hour format (hh-mm). ☐

- Where:
  hh = hours (00-23)
  mm = minute (00-59)

3.3.3 Type of LCO/TR

If the LCO/TR becomes effective due to circumstances beyond the Shift Supervisor's control (i.e., a covered piece of equipment breaks), then this will be indicated by entering "Mandatory" (M). ☐

Type of LCO - Mandatory or Voluntary.

IF the LCO becomes effective due to the Shift Supervisor's decision (i.e., a covered piece of equipment is voluntarily removed from service for maintenance etc.), then this will be indicated by entering "Voluntary" (V). ☐

If a piece of equipment is removed from service that is not required in the present plant mode, but is required in an higher plant mode or if it reduces the redundancy, then an Administrative LCO may be written. This will be indicated by entering "Administrative" (A). ☐

96. G2.3.14 096

Unit 1 is shutdown with the following conditions:

- STP-18.4, Containment Mid-Loop and/or Refueling Integrity Verification and Containment Closure, has been completed to allow refueling operations.
- The Containment Equipment Hatch is open.
- During fuel movement, a spent fuel assembly has dropped from the Manipulator Crane to the bottom of the cavity.
- Both R-24A & B, CTMT PURGE, are in alarm.
- AOP-30, Refueling Accident, actions are in progress.

Which one of the following completes the statements below?

The ACCEPTANCE CRITERIA of STP-18.4 for Refueling Integrity states that the Containment Equipment Hatch is capable of being closed within __(1)__ of notification.

Per AOP-30, actions are required to place __(2)__ in service without delay.

	(1)	(2)
A.	four hours	PRF (Penetration Room Filtration)
B.	four hours	CREFS (Control Room Emergency Filtration System)
C.	two hours	PRF (Penetration Room Filtration)
D.✓	two hours	CREFS (Control Room Emergency Filtration System)

A. Incorrect - 1) Incorrect, plausible since some actions of Tech Specs and the ODCM allow a four hour time frame for completion.

2) Incorrect, plausible since AOP-30.0 directs to start PRF if it is a high radiation condition in the Spent Fuel Pool area. Since PRF also performs a function for atmospheric cleanup for a high radiation condition and leakage into the Penetration rooms, it is plausible that a candidate would determine that it should be started here.

B. Incorrect - 1) Incorrect, see A.1.

2) Correct, CREFS is required to be started without delay. This is directed at step 2 of AOP-30.0. In addition, there is a Caution statement at the beginning of Attachment 1 of AOP-30 (Control Room Isolation with CREFS in Service) to place CREFS in service without delay to ensure continued Control Room habitability.

C. Incorrect - 1) Correct, per step 2.3.1 of STP-18.4. The Acceptance Criteria states :A Maintenance Closure Response Team (MCRT) is available and briefed to effect closure within two hours of notification.

2) Incorrect, see A.2.

D. Correct - 1) Correct, see C.1.

2) Correct, see B.2.

K/A: G2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.(CFR: 41.12 / 43.4 / 45.10) IMPORTANCE RO 3.4 SRO 3.8
Importance Rating:	3.4 3.8
Technical Reference:	FNP-1-AOP-30, v19.0 FNP-1-STP-18.4, v39.0
References provided:	None
Learning Objective:	RECALL AND APPLY the information from the required actions (section 3) and surveillance requirements (section 4) in accordance with rules of application requirements (Section 1) for any Technical Specifications or TRM requirements (OPS-62302A01): 10CFR55.43 (b) 2
Question History:	New question

K/A match: Candidate is given conditions where a fuel handling accident has occurred. Knowledge of the radiation hazards is displayed by choosing the actions that should be taken to mitigate the radiation hazard.

SRO justification: 10 CFR 55.43(b)(2):
Application of Required Actions (Section 3) and Surveillance Requirements (SR) (Section 4) in accordance with rules of application requirements (Section 1).

This question requires knowledge of the Surveillance Requirement of STP-18.4 Acceptance Criteria that states : A Maintenance Closure Response Team (MCRT) is available and briefed to effect closure within two hours of notification.

2013 NRC exam

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(2)

1) can **NOT** be answered by knowing less than 1 hour Tech Specs.
2) can **NOT** be answered by knowing information listed "above-the-line".
3) can **NOT** be answered by knowing the TS Safety Limits or their bases.
4) Does involve **one or** more of the following for TS, TRM or ODCM:

- Application of Required Actions (Section 3) and Surveillance Requirements (SR) (Section 4) in accordance with rules of application requirements (Section 1)..

2.0 ACCEPTANCE CRITERIA

2.1 Asterisk (*) steps are those associated with Acceptance Criteria.

2.2 Acceptance Criteria for Mid-Loop Integrity

2.2.1 Containment closure can be established within two hours of the initiating event. (CMT 0007668)

2.3 Acceptance Criteria for Refueling Integrity

2.3.1 The equipment door/hatch is closed or is capable of being closed with the following requirements.

- FNP-0-STP-610 is completed.
- A Maintenance Closure Response Team (MCRT) is available and briefed to effect closure within two hours of notification. This assumes only 1 hour of dose exposure will be incurred by the MCRT.
- Closure includes being closed and held in place by a minimum of 4 bolts IAW FNP-0-MP-38.0.

2.3.2 A minimum of one door in the personnel air lock and one door in the auxiliary access air lock are capable of being closed.(AI2008206863)

2.3.3 Containment purge and exhaust valves and mini purge valves are capable of being closed by containment purge isolation signal and valve stroke times are less than or equal to the maximum allowable stroke times <u>OR</u> penetrations serviced by these valves are isolated by at least one closed valve.

2.3.4 Containment integrity is satisfactory for all mechanical and electrical penetrations, except for the equipment door/hatch, the personnel air lock and the auxiliary access air lock which can be open under admin control specified in 2.3.1 and 2.3.2.

2.3.5 Penetration 71 and 72 conditions:

A. Blind flanges are installed in the main steam valve room or in containment.

<u>OR</u>

B. Special adapter nozzles for SG sludge lancing or ISI activities are installed which meet the following conditions.
- Water or air lines through the penetration must be either pressurized, <u>OR</u> isolated with individual isolation valves.
- Any cable through the penetrations must be sealed.

FARLEY NUCLEAR PLANT

ABNORMAL OPERATING PROCEDURE

FNP-1-AOP-30.0

S
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REFUELING ACCIDENT

PROCEDURE LEVEL OF USE CLASSIFICATION PER NMP-AP-003	
CATEGORY	**SECTIONS**
Continuous:	**ALL**
Reference:	**NONE**
Information:	**NONE**

Approved:

David L Reed (for)
Operations Manager

Effective Date: June 4, 2012

Table of Contents

PROCEDURE CONTAINS — NUMBER OF PAGES

A. Purpose

This procedure provides actions for response to fuel handling accident or a loss of refueling cavity water level.

This procedure is applicable at all times.

B. Symptoms or Entry Conditions

1. This procedure is entered when a fuel handling accident causes damage to a fuel assembly in conjunction with a high radiation indication on any of the following:

[ ] R-2 CTMT 155 ft
[ ] R-5 SFP ROOM
[ ] R-24A(B) CTMT PURGE
[ ] R-25A(B) SPENT FUEL BLDG EXH

2. This procedure is entered when a dry storage activity causes damage to a fuel assembly in conjunction with a high radiation indication on radiation monitor R-5(SFP ROOM).
3. This procedure is entered when rapidly falling refueling cavity level is observed.
4. This procedure may be entered at the discretion of the Shift Supervisor when any abnormal fuel handling incident occurs.

Step	Action/Expected Response	Response Not Obtained

NOTE:
- A high alarm from R-25A or B will automatically isolate fuel building HVAC and start penetration room filtration.
- The Refueling Supervisor, or Cask Supervisor for dry storage activities, shall have sole responsibility for evaluating placement of fuel in step 1.
- The Refueling Supervisor, or Cask Supervisor for dry storage activities, shall have sole responsibility for evacuation of the refueling or dry storage crew.

__ **1 Secure all Fuel Handling operations:**

1.1 IF fuel movement in progress and conditions permit,
THEN place fuel assembly in a safe location by one of the following:

[ ] Return fuel assembly to assigned location in the core.
[ ] Place fuel assembly in upender with manipulator crane gripper disengaged and raised to the GRIPPER UP DISENGAGED position.
[ ] Place fuel assembly in the spent fuel rack.
[ ] Place fuel assembly in the multi-purpose canister (MPC) fuel basket.
[ ] Lower the MPC into the cask storage area or cask wash area, as appropriate.

1.2 Verify CTMT and spent fuel room upenders - LOWERED.

1.3 Verify CONVEYER CONTROL switch in ON at CONTAINMENT BUILDING panel.

1.4 Verify CARRIAGE AT PIT lamp is ON. (155 ft, AUX BLDG spent fuel room control panel)

1.5 Close fuel transfer tube gate valve. (155 ft, AUX BLDG spent fuel room)

° Step 1 continued on next page

__Page Completed

Step	Action/Expected Response	Response Not Obtained

1.6 Dispatch personnel to close all spent fuel area fuel handling hatches.

1.7 IF required,
THEN have Maintenance personnel close the containment equipment hatch.

__ **2** **[CA] While continuing with the remainder of this procedure, perform** ATTACHMENT 1, CONTROL ROOM ISOLATION WITH CREFS IN SERVICE **to ensure control room isolation with CREFS placed in service.**

****

CAUTION: Dangerously high dose rates will result from uncovering reactor internals.

****

__ **3** **IF reactor internals are being moved,**
THEN place them in a safe location.

__Page Completed

Step	Action/Expected Response	Response Not Obtained

****

CAUTION: Rapidly falling refueling cavity level will affect the containment and the spent fuel room.

****

__ **4** **Evacuate all non-essential personnel from accident area.**

__ **5** **Verify all access doors to accident area - CLOSED.**

__ **6** **Evaluate actuating the plant emergency alarm.**

__ **7** **[CA] IF fuel damage has resulted in elevated containment radiation levels, THEN perform the following.**

7.1 Verify containment ventilation isolation.

7.1.1 Verify containment purge dampers - CLOSED

[ ] 3197
[ ] 3198D
[ ] 3198C
[ ] 3196
[ ] 3198A
[ ] 3198B

° Step 7 continued on next page

__Page Completed

Step	Action/Expected Response	Response Not Obtained
	7.1.2 Verify containment mini purge dampers - CLOSED. CTMT PURGE DMPRS MINI-2866C & 2867C FULL-3198A & 3198D [ ] 2866C [ ] 2867C CTMT PURGE DMPRS MINI-2866D & 2867D ULL-3196 & 3197 BOTH-3198B & 3198C [ ] 2866D [ ] 2867D	
	7.1.3 Stop MINI PURGE SUPP/EXH FAN.	
	7.1.4 Stop or verify stopped CTMT PURGE SUPP/EXH FANs	
__ 8	**[CA] <u>IF</u> SFP Ventilation tripped** **<u>OR</u>** **SFP EXH FAN SUCT DMPR HV3990A(B) closed,** **<u>THEN</u> perform the following.**	This step is for starting PRF if the accident had been in the Spent Fuel Pool Room. The accident is in Containment, so PRF start is not required. Adds plausibility to the distracter.
	8.1 Verify PRF exhaust fan A(B) running.	
	8.2 Verify PRF recirculation fan A(B) running.	
	8.3 Verify SFP to PRF FLTR UNIT 3538A(B) open.	
__ 9	**Check Refueling Cavity Level - STABLE.**	9 Proceed to step 19.

__Page Completed

Step	Action/Expected Response	Response Not Obtained

__ **10** **Monitor affected area radiation.**

- Monitor containment radiation.
  - [ ] R-2 CTMT 155 FT
  - [ ] R-24A CTMT PURGE
  - [ ] R-24B CTMT PURGE
- Monitor spent fuel room radiation.
  - [ ] R-5 SPENT FUEL ROOM
  - [ ] R-25A SPENT FUEL BLDG EXH
  - [ ] R-25B SPENT FUEL BLDG EXH

__ **11** **<u>IF</u> dry storage activities are in progress in the SFP area and R-5, SFP ROOM, is in alarm,**
<u>THEN</u> notify Maintenance to initiate appropriate section of FNP-0-MP-112.1, DFS EQUIPMENT MALFUNCTION GUIDANCE.

__ **12** **Evaluate event classification and notification requirements using NMP-EP-110-GL01, FNP EALS - ICS, THRESHOLD VALUES AND BASIS, NMP-EP-110, EMERGENCY NOTIFICATIONS and FNP-0-EIP-8, NON-EMERGENCY NOTIFICATIONS.**

NOTE: Entry into a previously evacuated area should be made using FNP-0-EIP-14, PERSONNEL MOVEMENT, RELOCATION, RE-ENTRY <u>AND</u> SITE EVACUATION.

__ **13** **Evaluate the need for Chemistry to sample refueling cavity and spent fuel pool for activity.**

__ **14** **Evaluate the need for Chemistry to sample the spent fuel pool and reactor cavity for boron concentration.**

__Page Completed

Step	Action/Expected Response	Response Not Obtained
__ 15	**Evaluate placing spent fuel pool purification system in service using** FNP-1-SOP-54.0, SPENT FUEL PIT COOLING AND PURIFICATION SYSTEM**.**	
__ 16	**Evaluate placing containment pre-access filtration system in service per** FNP-1-SOP-12.2, CONTAINMENT PURGE AND PRE-ACESS FILTRATION SYSTEM**.**	
__ 17	**Consult Operations Manager to evaluate further plant response.**	
__ 18	**Go to procedure and step in effect.**	

NOTE: Efforts to determine source of inventory loss should be performed in parallel with makeup efforts below. Possible sources of inventory loss include damaged nozzle dams, reactor cavity seal or spent fuel pool liner, or RHR system malfunctions. Refer to FNP-1-AOP-12.0, RESIDUAL HEAT REMOVAL SYSTEM MALFUNCTION for RHR malfunctions.

Step	Action/Expected Response	Response Not Obtained
__ 19	**Place CTMT SUMP PUMPs Q1G21P019A and Q1G21P019B in PULL-TO-LOCK. (BOP)**	
__ 20	**Align RHR system.**	
20.1	Verify only one RHR PUMP - STARTED IN COOLDOWN ALIGNMENT.	
20.2	[CA] Monitor running RHR pump for evidence of cavitation.	
20.3	Align remaining RHR pump to fill refueling cavity from RWST using FNP-1-SOP-7.0, RESIDUAL HEAT REMOVAL SYSTEM.	20.3 Align one charging pump or the refueling water purification pump to fill the refueling cavity.

__Page Completed

Step	Action/Expected Response	Response Not Obtained
__ 21	**Check RWST level - GREATER THAN 3 ft.**	21 Consult Operations Manager to evaluate method for RWST makeup.
__ 22	**Evaluate the need for Chemistry to sample the spent fuel pool and reactor cavity for boron concentration.**	
__ 23	**Evaluate event classification and notification requirements using NMP-EP-110-GL01, FNP EALS - ICS, THRESHOLD VALUES AND BASIS, NMP-EP-110, EMERGENCY NOTIFICATIONS and FNP-0-EIP-8, NON-EMERGENCY NOTIFICATIONS.**	
__ 24	**Consult Operations Manager to evaluate further plant response.**	
__ 25	**Go to procedure and step in effect.**	

-END-

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ATTACHMENT 1
CONTROL ROOM ISOLATION WITH CREFS IN SERVICE

****

CAUTION: This Attachment should be completed without delay to ensure continued control room habitability.

****

NOTE: A control room isolation should occur and the TSC HVAC System should shift to its emergency (recirculation) mode upon receipt of a high radiation alarm from R-35A or R-35B.

__ **1 Ensure a control room is isolated by closing or verifying closed the following dampers:**

This Attachment places CREFS in service

1.1 CONTROL RM UTILITY EXH

[ ] HV-3628
[ ] HV-3629

1.2 COMPUTER RM HVAC SUPP

[ ] HV-3626
[ ] HV-3627

1.3 COMPUTER RM HVAC RTN

[ ] HV-3622
[ ] HV-3623

1.4 CONTROL RM HVAC SUPP

[ ] HV-3624
[ ] HV-3625

1.5 CONT RM EXH FAN INLET DMPRS

[ ] HV-3649A/B/C

__ **2 Place one of the redundant Control Room Emergency Filtration/Pressurization system (CREFS) in service per FNP-0-SOP-56.0, CONTROL ROOM HVAC SYSTEM.**

__ **3 Stop or verify stopped the Control Room Utility Exhaust Fan.**

__ **4 Verify the TSC HVAC System in the emergency (recirculation) mode of operation per** FNP-0-SOP-56.1, TECHNICAL SUPPORT SYSTEM HVAC SYSTEM**.**

-END-

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97. G2.3.6 097

Unit 1 is operating at 100% power with the following conditions:

- A release of the #2 Waste Monitor Tank (WMT) is planned.
- R-18, LIQ WASTE DISCH, is INOPERABLE.
- Chemistry has taken two (2) independent samples of the #2 WMT and reports the activity is <1.4 x10^{-5} µCi/mL and is within the normal limits for a release.
- Two Shift Radio-Chemists have verified the manual input for the computer generated release rate calculation.

Which one of the following completes the statement below?

A WMT release __(1)__ permitted __(2)__ per the ODCM.

	(1)	(2)
A.	is NOT	until R-18 is returned to service
B.	is NOT	until the activity is lowered less than <1x10^{-7} µCi/mL
C.✓	IS	but as a minimum two qualified plant personnel are required to verify the discharge lineup **only**
D.	IS	but as a minimum two qualified plant personnel are required to verify the discharge lineup **and** an SRO is required to verify the entire release rate calculation

A. Incorrect A release could be held until RE-18 is operable, and this may be chosen as the conservative action, but it is not required per the ODCM. The ODCM directs the ACTION shown in Table 2-1, which permit a release if all conditions can be completed.

Plausible: if a release was on-going when R-18 became inoperable then the release must be immediately stopped. (SOP-50.0, v66.0, P&L 3.3)

B. Incorrect The release limit of 1x10^{-7} µCi/mL is that for **SGBD per action 29 when R-23B is INOPERABLE**, not applicable to the R-18 release path, therefore a release is permitted at this activity. The activity is NOT too high for release assuming all the requirements of the ODCM are met.

Plausible: Two consecutive samples must be taken, and must be within release limits (the release limit provided exceeds the limit which is applicable only to SGBD Release path).

C. Correct This answer choice describes the actions required by ACTION 28 of Table 2-1 of the ODCM which states the effluent releases may continue

provided that prior to initiating the release:

a. "Two separate samples must be analyzed,
b. two independent qualified members of facility staff verify the discharge line valving and verify:
   1) the manual portion of the computer input for the release rate calculations
   OR
   2) the entire release rate calculations if performed manually.

A liquid release permit is required to be reviewed by the SSS per SOP-50.1 appendices 1&2 to verify the above requirements are satisfied.

D. Incorrect The second part is incorrect, the SRO is not required to verify the calculation. The ODCM requires that the release rate calculations are verified by TWO qualified facility personnel, and the discharge flowpath also verified by TWO qualified facility personnel; NEITHER requires an SRO or licensed operator and both are normally not performed by an SRO or licensed operator. The System operators normally complete the valve lineup and verification while the Chemists normally complete the calculations and verifications. Further, the "entire release rate calculation" is not "REQUIRED" unless the calculation is done manually, but again is not REQUIRED to be performed by an SRO.

All actions of ACTION 28 of the ODCM have been completed except the release lineup has to be verified.

Plausible: It could be assumed that the SRO has to perform the verification of the release rate calculations. This is not the case, the ODCM requires two technically qualified personnel. There is no requirement for one of those to be an SRO.

K/A: G2.3.6 — Ability to approve release permits.
(CFR: 41.13 / 43.4 / 45.10)
IMPORTANCE RO 2.0 SRO 3.8

Importance Rating: 2.0 3.8

Technical Reference: FNP-ODCM, v24

References provided: None

Learning Objective: OPS-62106A01—RECALL AND APPLY the information from the LCO BASES sections: BACKGROUND, APPLICABLE SAFETY ANALYSIS, ACTIONS, SURVEILLENCE REQUIREMENTS, for any Technical Specifications or TRM requirements associated with Liquid

and Solid Waste System components and attendant equipment alignment, to include the following
- 5.5.1, Offsite Dose Calculation Manual (ODCM)

Question History: 2011 HLT-34 NRC Exam question # 97
This is one of the previous 2 Farley NRC Exams.

K/A match: The SRO must approve a release if ODCM actions are required prior to the release. For a normal release the Chemistry Department provides the final approval of the permit, but the affected unit's SS (SRO) must also provide approval for the release. This question provides a scenario in which the release cannot be allowed until ODCM actions are accomplished as determined by the SRO, and the applicant must recall what completed actions allow approving the release.

SRO justification: 10CFR55.43 (b) (2)
Some examples of SRO exam items for this topic include:
• Application of Required Actions (Section 3) and Surveillance Requirements (SR) (Section 4) in accordance with rules of application requirements (Section 1).
• Same items listed above for the Technical Requirements Manual (TRM) and Offsite Dose Calculation Manual (ODCM).

2013 NRC exam

10 CFR 55.43(b)(2)

Facility operating limitations in the TS and their bases. [10 CFR 55.43(b)(2)]

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart:

1) can **NOT** be answered by knowing less than 1 hour Tech Specs.
2) can **NOT** be answered by knowing information listed "above-the-line".
3) can **NOT** be answered by knowing the TS Safety Limits or their bases.
4) Does involve one **or more** of the following for TS, TRM or ODCM:
   - **Application of Required Actions (Section 3) and Surveillance Requirements** (Section 4) in accordance with rules of application requirements (Section 1). (Required actions for INOPERABLE R-18 rad monitor have to be implemented per the ODCM.)

CHAPTER 2

LIQUID EFFLUENTS

2.1 LIMITS OF OPERATION

The following Liquid Effluent Controls implement requirements established by Technical Specifications Section 5.0. Terms printed in all capital letters are defined in Chapter 10.

2.1.1 Liquid Effluent Monitoring Instrumentation Control

In accordance with Technical Specification 5.5.4.a, the radioactive liquid effluent monitoring instrumentation channels shown in Table 2-1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits specified in Section 2.1.2 are not exceeded. The alarm/trip setpoints of these channels shall be determined in accordance with Section 2.3.

2.1.1.1 Applicability

This limit applies at all times.

2.1.1.2 Actions

With a radioactive liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above control, immediately suspend the release of radioactive liquid effluents monitored by the affected channel, declare the channel inoperable, or change the setpoint to a conservative value.

With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 2-1. Restore the inoperable instrumentation to OPERABLE status within 30 days and, if unsuccessful, explain in the next Radioactive Effluent Release Report pursuant to Section 7.2 why this inoperability was not corrected in a timely manner.

This control does not affect shutdown requirements or MODE changes.

2.1.1.3 Surveillance Requirements

Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL OPERATIONAL TEST (COT) operations at the frequencies shown in Table 2-2.

2.1.1.4 Basis

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluents. The Alarm/Trip Setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in Section 2.3 to ensure that the alarm/trip will occur prior to exceeding the limits of Section 2.1.2. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

Table 2-1 Radioactive Liquid Effluent Monitoring Instrumentation

Instrument	OPERABILITY Requirements[a]	
	Minimum Channels OPERABLE	ACTION
1. Gross Radioactivity Monitors Providing Automatic Termination of Release		
a. Liquid Radwaste Effluent Line (RE-18)	1	28
b. Steam Generator Blowdown Effluent Line (RE-23B)	1	29
2. Flowrate Measurement Devices		
a. Liquid Radwaste Effluent Line 1) Waste Monitor Tank No. 1	1	30
2) Waste Monitor Tank No. 2	1	30
b. Discharge Canal Dilution Line (Service Water)	1	30
c. Steam Generator Blowdown Effluent Line	1	30

a. All requirements in this table apply to each unit.

Table 2-1 (contd) Notation for Table 2-1 - ACTION Statements

ACTION 28 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may continue provided that prior to initiating a release:

a. At least two independent samples are analyzed in accordance with Section 2.1.2.3, and

b. At least two technically qualified members of the Facility Staff independently verify the discharge line valving and

   (1) Verify the manual portion of the computer input for the release rate calculations performed on the computer, or

   (2) Verify the entire release rate calculations if such calculations are performed manually.

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 29 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue, provided grab samples are analyzed for gross radioactivity (beta or gamma) at a MINIMUM DETECTABLE CONCENTRATION no higher than 1×10^{-7} μCi/mL.

a. At least once per 8 hours when the specific activity of the secondary coolant is greater than 0.01 μCi/gram DOSE EQUIVALENT I-131.

b. At least once per 24 hours when the specific activity of the secondary coolant is less than or equal to 0.01 μCi/gram DOSE EQUIVALENT I-131.

ACTION 30 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue, provided that the flowrate is estimated at least once per 4 hours during actual releases. Pump curves may be used to estimate flow.

98. G2.4.6 098

Unit 1 tripped from 100% power with the following conditions:

- A Safety Injection was actuated due to a SG Tube Rupture on the 1B SG.
- The crew is performing EEP-3.0, Steam Generator Tube Rupture.
- The following results are reported:
  — HV3369B, 1B SG MSIV, will not close.
  — HV3370B, 1B SG MSIV, will not close.
- 1B SG pressure is 950 psig.

Which one of the following completes the statements below?

The Control Room crew is required to __(1)__ .

The recovery strategy for the selected procedure is to __(2)__ .

Procedure titles are as follows:
EEP-3.0, Steam Generator Tube Rupture
ECP-3.1, SGTR with Loss of Reactor Coolant Subcooled Recovery Desired

	(1)	(2)
A.	continue in EEP-3.0	**complete** an RCS cooldown first; then perform an RCS depressurization
B.	transition to ECP-3.1	**complete** an RCS cooldown first; then perform an RCS depressurization
C.	continue in EEP-3.0	**start** an RCS cooldown and then perform an RCS depressurization during the cooldown
D.✓	transition to ECP-3.1	**start** an RCS cooldown and then perform an RCS depressurization during the cooldown

A. Incorrect - 1) Incorrect, plausible since SG pressure is at normal pressure. There is a transition point in EEP-3.0 that sends you to ECP-3.1 if SG pressure is <250 psig. A candidate may think that since SG pressure is higher than 250 psig, actions will continue in EEP-3.0 (step 5 of EEP-3.0).

2) Incorrect, plausible since this is the normal strategy for actions in EEP-3.0, but EEP-3.0 is not the correct procedure for performing the actions.

B. Incorrect - 1) Correct, per EEP-3.0, if at least one MSIV is not closed in the ruptured SG, go to ECP-3.1 (step 3.7 of EEP-3.0).

2) Incorrect, see A.2.

C. Incorrect - 1) Incorrect, see A.1.

2) Correct, this is the strategy for ECP-3.1..

D. Correct - 1) Correct, see B.1.

2) Correct, see C.2.

K/A: G2.4.6	Knowledge of EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13) IMPORTANCE RO 3.7 SRO 4.7
Importance Rating:	3.7 4.7
Technical Reference:	FNP-1-EEP-3.0 v27
References provided:	None
Learning Objective:	ASSESS the facility conditions associated with the EEP-3, Steam Generator Tube Rupture and based on that assessment: (OPS-62530D01) • SELECT the appropriate procedures during normal, abnormal and emergency situations. 10CFR55.43 (b) 5 • DETERMINE if transition to another section of the procedure or to another procedure is required • DETERMINE if the critical safety functions are satisfied
Question History:	New question
K/A match:	The second part of the question deals with knowledge of EOP mitigation strategies - specifically how the cooldown is performed and how the depressurization is performed. It is different between EEP-3.0 and ECP-3.1.

SRO justification:

10 CFR 55.43(b)(5)
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations. [10 CFR 55.43(b)(5)] This 10 CFR 55.43 topic involves both 1) assessing plant conditions (normal, abnormal, or emergency) and then 2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed. One area of SRO level knowledge (with respect to selecting a procedure) is knowledge of the content of the procedure versus knowledge of the procedure's overall mitigative strategy or purpose.

Assessing plant conditions (normal, abnormal, or emergency) and then selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

Knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event specific sub-procedures or emergency contingency procedures.

2013 NRC exam

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(5) :
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations [10 CFR 55.43(b)(5)], involving BOTH:

1) assessing plant conditions and then
2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

Using the flowchart, this question can:

- NOT be answered solely by knowing "systems knowledge", i.e., how the system works, flowpath, logic, component location.
- NOT be answered solely by knowing immediate operator actions.
- NOT be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry to major EOPs.
- NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure. (the second part of the question is major mitigative strategy and meets the K/A. The first part of the question meets the SRO requirement for procedure selection)
- Be answered with knowledge of ONE or MORE of the following:
  - **Assessing plant conditions (normal, abnormal, or emergency) and then selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.**
  - **Knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event specific sub-procedures or emergency contingency procedures.**

Step	Action/Expected Response	Response NOT Obtained

3.7 Verify at least one SG main steam isolation and bypass valve for ruptured SG(s) - CLOSED.

Ruptured SG	1A	1B	1C
1A(1B,1C) SG MSIV - TRIP Q1N11HV	[]3369A []3370A	[]3369B []3370B	[]3369C []3370C
1A(1B,1C)SG MSIV - BYPASS Q1N11HV	[]3368A []3976A	[]3368B []3976B	[]3368C []3976C

3.7 Perform the following.

3.7.1 Place associated test switch to TEST position.

Ruptured SG	1A	1B	1C
1A(1B,1C) SG MSIV - TEST Q1N11HV	[]3369A/ 70A	[]3369B/ 70B	[]3369C/ 70C

3.7.2 IF at least one main steam isolation and one bypass valve for ruptured SG closed,
THEN proceed to step 4
IF NOT go to FNP-1-ECP-3.1, SGTR WITH LOSS OF REACTOR COOLANT SUBCOOLED RECOVERY DESIRED.

****

CAUTION: [CA] To prevent excessive RCS cooldown, AFW flow to any ruptured SG that is also faulted, should remain isolated during subsequent recovery actions unless the SG is needed for RCS cooldown.

****

NOTE: [CA] Maintaining ruptured SG(s) narrow range level greater than 31%{48%} prevents SG depressurization during RCS cooldown.

___ 4 **[CA] WHEN ruptured SG(s) narrow range level greater than 31%{48%},
THEN perform the following.**

The first two pages are related to part one of the question.

Step 4 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

4.1 [CA] Isolate AFW flow to ruptured SG(s) using FCVs.

Ruptured SG	1A	1B	1C
MDAFWP TO 1A(1B,1C) SG Q1N23HV	[] 3227A in MOD	[] 3227B in MOD	[] 3227C in MOD
MDAFWP TO 1A(1B,1C) SG FLOW CONT HIC	[] 3227AA closed	[] 3227BA closed	[] 3227CA closed
TDAFWP TO 1A(1B,1C) SG Q1N23HV	[] 3228A in MOD	[] 3228B in MOD	[] 3228C in MOD
TDAFWP TO 1A(1B,1C) SG FLOW CONT HIC	[] 3228AA closed	[] 3228BA closed	[] 3228CA closed

4.1 Perform the following.

4.1.1 If AFW flow from MDAFWP(s) NOT isolated, THEN isolate flow to ruptured SG(s) using MDAFWP isolation valve(s).

Ruptured SG	1A	1B	1C
MDAFWP TO 1A(1B,1C) SG ISO Q1N23MOV	[]3764A OR []3764E	[]3764D OR []3764B	[]3764F OR []3764C

4.1.2 If AFW flow from TDAFWP(s) NOT isolated, THEN isolate flow to ruptured SG(s) using AFW stop valve(s).

Ruptured SG	1A	1B	1C
AFW TO 1A(1B,1C) SG STOP VLV supply bkr Q1R17BKR	[] BKR FU-U4 (key Z-81)	[] BKR FU-U5 (key Z-82)	[] BKR FU-I2 (key Z-83)
AFW TO 1A(1B,1C) SG STOP VLV Q1N23MOV	[] 3350A Closed	[] 3350B Closed	[] 3350C Closed

****

CAUTION: Major steam flow paths from the ruptured SG(s) (i.e. MSIVs and bypasses, TDAFW steam supply and SG atmospheric relief valve) should be isolated before initiating cooldown

****

___ 5 **Check ruptured SG(s) pressure - GREATER THAN 250 psig.**

5 Go to FNP-1-ECP-3.1, SGTR WITH LOSS OF REACTOR COOLANT SUBCOOLED RECOVERY DESIRED.

Plausibility for remaining in EEP-3, SG pressure in the stem is 950 psig.

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: [CA] To ensure proper SI flow to the reactor, the RHR pumps must be manually restarted if they are secured and RCS pressure falls below

The rest of the pages are related to part two of the question.

CAUTION: Pump damage may occur if RHR pumps are operated on miniflow for longer than three hours with no CCW supplied to the RHR heat exchangers.

****

___13 **[CA] Check if LHSI Pumps should be stopped.**

Step	Action/Expected Response	Response NOT Obtained
13.1	RHR pumps - ANY RUNNING WITH SUCTION ALIGNED TO RWST.	13.1 Proceed to step 14.
13.2	Check RCS pressure - GREATER THAN 275 psig{435 psig} 1C(1A) LOOP RCS NR PRESS [] PI 402B [] PI 403B	13.2 Perform the following. 13.2.1 Establish CCW flow to RHR heat exchangers. CCW TO 2A(2B) RHR HX [] Q1P17MOV3185A open [] Q1P17MOV3185B open 13.2.2 Proceed to Step 14.
13.3	Stop any RHR Pumps running with suction from the RWST.	

___14 **Check if Cooldown should be stopped.**

Step	Action/Expected Response	Response NOT Obtained
14.1	Check hottest core exit T/Cs - LESS THAN REQUIRED TEMPERATURE.	14.1 Do NOT proceed until hottest core exit T/Cs - LESS THAN REQUIRED TEMPERATURE.
14.2	Stop RCS cooldown	
14.3	Maintain core exit T/Cs - LESS THAN REQUIRED TEMPERATURE.	

Once the pre-determined Core Exit temperature is reached during the cooldown, the cooldown is stopped.

Step	Action/Expected Response	Response NOT Obtained
___15	**Check ruptured SG(s) pressure - STABLE OR RISING.**	15 Perform the following.
		15.1 Maintain RCS cold legs cooldown rate less than 100°F in any 60 minute period.
		15.2 Dump steam from intact SGs to maintain ruptured SG pressure at least 250 psig above pressure of intact SGs used for cooldown.
		15.3 IF ruptured SG(s) pressure NOT maintained greater than 250 psig above pressure of intact SGs used for cooldown, THEN go to FNP-1-ECP-3.1, SGTR WITH LOSS OF REACTOR COOLANT SUBCOOLED RECOVERY DESIRED.
___16	**Check SUB COOLED MARGIN MONITOR indication - GREATER THAN 36°F{65°F} SUBCOOLED IN CETC MODE.**	16 Go to FNP-1-ECP-3.1, SGTR WITH LOSS OF REACTOR COOLANT SUBCOOLED RECOVERY DESIRED.
___17	**Reduce RCS pressure to minimize break flow and refill pressurizer.**	
	17.1 IF normal pressurizer spray available, THEN open all available normal pressurizer spray valves. 1A(1B) LOOP SPRAY VLV [] PK 444C [] PK 444D	17.1 Proceed to Step 18. OBSERVE CAUTIONS AND NOTES PRIOR TO STEP 18.

Now the RCS depressurization is performed.

Step 17 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
17.2	Reduce RCS pressure with maximum available spray until ANY of the following conditions occur, then stop RCS pressure reduction. • RCS pressure less than ruptured SG(s) pressure <u>AND</u> pressurizer level greater than 13%{43%} <u>OR</u> • RCS pressure within 300 PSI of ruptured SG(s) pressure <u>AND</u> pressurizer level greater than 43%{50%} <u>OR</u> • Pressurizer level greater than 73%{66%} <u>OR</u> • SUBCOOLED MARGIN MONITOR indication less than 16°F{45°F} subcooled in CETC mode.	
17.2.1	Verify both normal pressurizer spray valves - CLOSED. 1A(1B) LOOP SPRAY VLV [] PK 444C [] PK 444D	17.2.1 Stop 1A <u>AND</u> 1B RCPs to stop spray flow. RCP [] 1A [] 1B
17.2.2	Verify auxiliary spray valve - CLOSED. RCS PRZR AUX SPRAY [] Q1E21HV8145	17.2.2 Isolate auxiliary spray line. CHG PMPS TO REGENERATIVE HX [] Q1E21MOV8107 closed [] Q1E21MOV8108 closed
17.2.3	Proceed to Step 20. OBSERVE CAUTION PRIOR TO STEP 20.	

End of EEP-3.0 info, the next several pages are from ECP-3.1

Step | **Action/Expected Response** | **Response NOT Obtained**

12.2.2 Control TDAFWP flow.

TDAFWP FCV 3228
[] RESET reset

TDAFWP
SPEED CONT
[] SIC 3405 adjusted

Intact SG	1A	1B	1C
TDAFWP TO 1A(1B,1C) SG Q1N23HV	[]3228A in MOD	[]3228B in MOD	[]3228C in MOD
TDAFWP TO 1A(1B,1C) SG FLOW CONT HIC	[]3228AA adjusted	[]3228BA adjusted	[]3228CA adjusted

NOTE: [CA] Comparison of Curve 61 and/or 61A with existing RCS boron concentration should be performed to verify adequate shutdown margin during cooldown to cold shutdown.

___13 **Begin RCS cooldown to cold shutdown**.

13.1 <u>WHEN</u> P-12 light lit (543°F), <u>THEN</u> perform the following.

13.1.1 Block low steam line pressure SI.

STM LINE PRESS SI
BLOCK - RESET
[] A TRN to BLOCK
[] B TRN to BLOCK

An RCS cooldown to cold shutdown is initiated and maintained.

Step 13 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

13.1.2 Verify blocked indication.

BYP & PERMISSIVE
STM LINE ISOL.
SAFETY INJ.
[] TRAIN A BLOCKED light lit
[] TRAIN B BLOCKED light lit

13.1.3 Bypass the steam dump interlock.

STM DUMP
INTERLOCK
[] A TRN to BYP INTLK
[] B TRN to BYP INTLK

13.1.4 Adjust steam header pressure controller to control cooldown rate.

STM HDR
PRESS
[] PK 464 adjusted

13.2 [CA] Maintain RCS cold legs cooldown rate - LESS THAN 100°F IN ANY 60 MINUTE PERIOD.

RCS COLD LEG TEMP
[] TR 410

13.3 <u>IF</u> RHR system is in service in shutdown cooling alignment per FNP-1-SOP-7.0, RESIDUAL HEAT REMOVAL SYSTEM,
<u>THEN</u> use RHR to cool the RCS.

Step 13 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

NOTE:
- The steam dumps will be interlocked closed when RCS TAVG reaches P-12 (543°F). This interlock may be bypassed for A and E steam dumps with the STM DUMP INTERLOCK switches.
- Excessive opening of steam dumps can cause a high steam flow LO-LO TAVG main steam line isolation signal.

Step	Action/Expected Response	Response NOT Obtained
13.4	IF condenser available, THEN dump steam to condenser from intact SGs. BYP & PERMISSIVE COND AVAIL [] C-9 status light lit STM DUMP [] MODE SEL A-B TRN in STM PRESS STM DUMP INTERLOCK [] A TRN in ON [] B TRN in ON STM HDR PRESS [] PK 464 adjusted	13.4 Dump steam to atmosphere. 13.4.1 Direct counting room to perform FNP-0-CCP-645, MAIN STEAM ABNORMAL ENVIRONMENTAL RELEASE. 13.4.2 IF normal air available, THEN control atmospheric relief valves to dump steam from intact SGs, IF NOT, dump steam using FNP-1-SOP-62.0, EMERGENCY AIR SYSTEM. 1A(1B,1C) MS ATMOS REL VLV [] PC 3371A adjusted [] PC 3371B adjusted [] PC 3371C adjusted 13.4.3 IF no intact SG available, AND RHR system NOT in service, THEN dump steam from a faulted SG. 13.4.4 IF no intact or faulted SG available, AND RHR system NOT in service, THEN dump steam from a ruptured SG.
13.5	IF RHR system is NOT in service, THEN begin preparation of RHR system for cooldown using FNP-1-SOP-7.0, RESIDUAL HEAT REMOVAL SYSTEM.	

Step	Action/Expected Response	Response NOT Obtained

NOTE: Step 14 is a continuing action. FNP-1-ECP-3.2, SGTR WITH LOSS OF REACTOR COOLANT SATURATED RECOVERY DESIRED, transition criteria specified in the RNO apply anytime during the cooldown to cold shutdown.

Step	Action/Expected Response	Response NOT Obtained
___14	**[CA] Check subcooled recovery allowed.**	
14.1	[CA] Check RWST level - GREATER THAN 25 ft. RWST LVL [] LI 4075A [] LI 4075B	14.1 IF CTMT SUMP LVL LI 3594A less than TABLE 1 requirements, THEN go to FNP-1-ECP-3.2, SGTR WITH LOSS OF REACTOR COOLANT SATURATED RECOVERY DESIRED.
14.2	[CA] Check ruptured SG narrow range level - LESS THAN 91%{76%}.	14.2 Consult TSC staff to evaluate need for transition to FNP-1-ECP-3.2, SGTR WITH LOSS OF REACTOR COOLANT SATURATED RECOVERY DESIRED.
___15	**Check SUB COOLED MARGIN MONITOR indication - GREATER THAN 16°F{45°F} SUBCOOLED IN CETC MODE.**	15 Proceed to step 29.

Step	Action/Expected Response	Response NOT Obtained

___16 **Check SI in service.**

16 Proceed to Step 24.

- Check HHSI flow - GREATER THAN 0 gpm.

  A TRN
  HHSI FLOW
  [] FI 943

  OR

- Check any RHR PUMP - STARTED IN SI MODE.

Started RHR PUMP	1A	1B
RWST TO 1A(1B) RHR PUMP Q1E11MOV	[] 8809A open	[] 8809B open
1C(1A) RCS LOOP TO 1A(1B) RHR PUMP Q1E11MOV	[] 8701A closed [] 8701B closed	[] 8702A closed [] 8702B closed

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: To prevent pressurizer PORV failure, cycling of pressurizer PORVs should be minimized.

****

****

CAUTION: The PRT may rupture causing abnormal containment conditions while using pressurizer PORVs.

****

NOTE: Reactor vessel steam voiding may occur during pressure reduction while on natural circulation. This will cause a rapid rise in pressurizer level.

As the RCS cooldown continues, an RCS depressurization is initiated.

___17 **Reduce RCS pressure to refill pressurizer**.

Action/Expected Response	Response NOT Obtained
17.1 IF normal pressurizer spray available, THEN open all available normal pressurizer spray valves. 1A(1B) LOOP SPRAY VLV [] PK 444C [] PK 444D	17.1 IF any PRZR PORV available, THEN open only one PRZR PORV, IF NOT, THEN proceed to Step 18.
17.2 Check pressurizer level - GREATER THAN 25%{50%}.	17.2 Perform the following. 17.2.1 WHEN pressurizer level greater than 25%{50%}, THEN perform Step 17.3. 17.2.2 Proceed to Step 18. OBSERVE NOTE PRIOR TO STEP 18.

Step 17 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

NOTE: Pressurizer level may fall when SI flow is reduced in subsequent steps. Establishing a pressurizer level greater than 25%{50%} will minimize returning to this step to refill the pressurizer.

17.3 Stop RCS pressure reduction.

17.3.1 Verify both normal pressurizer spray valves - CLOSED.

1A(1B) LOOP
SPRAY VLV
[] PK 444C
[] PK 444D

17.3.1 Stop RCP in loop with normal pressurizer spray valve open.

Spray Valve	1A LOOP SPRAY VLV PK 444C	1B LOOP SPRAY VLV PK 444D
RCP	[] 1A	[] 1B

17.3.2 Verify both PRZR PORVs - CLOSED.

17.3.2 Close PRZR PORV ISO for any open PRZR PORV.

99. WE02EA2.1 099

Unit 1 has tripped from 100% power with the following conditions:

- A Safety Injection occurred after the Reactor Trip due to a Steam Dump malfunction.
- All MSIV's are closed.
- The crew is evaluating SI termination criteria in EEP-0.0, Reactor Trip or Safety Injection.
- The SCMMs indicate 105°F in CETC mode.
- All SG Narrow Range levels are 43% and rising.
- RCS pressure is 1820 psig and slowly rising.
- Pressurizer level is 5% and rising.

Which one of the following describes the required actions regarding SI Termination?

A. Immediately transition to ESP-1.1, SI Termination, to terminate SI flow.

B. Maintain SI flow until PZR level recovers, then transition to ESP-1.2, Post LOCA Cooldown and Depressurization.

C.✓ Maintain SI flow until PZR level recovers, then terminate SI flow in EEP-0.0, Reactor Trip or Safety Injection.

D. Immediately terminate SI flow in EEP-0, Reactor Trip or Safety Injection, then transition to ESP-1.1, SI Termination.

EEP-0 Termination step

16 Check SI termination criteria.

16.1 Check SUB COOLED MARGIN MONITOR indication - GREATER THAN 16 F SUBCOOLED IN CETC MODE.	16.1 Proceed to step 23.
16.2 Check secondary heat sink available. Total feed flow to SGs - GREATER THAN 395 gpm. AFW FLOW TO 1A(1B,1C) SG [] FI 3229A [] FI 3229B [] FI 3229C AFW TOTAL FLOW [] FI 3229 OR Narrow range level in at least one SG - GREATER THAN	16.2 IF neither condition is satisfied, THEN proceed to step 23.

31%.

16.3 Check RCS pressure - STABLE OR RISING. 1C(1A) LOOP RCS WR PRESS [] PI 402A [] PI 403A	16.3 Proceed to step 23.
16.4 Check Pressurizer level - GREATER THAN 13%.	16.4 Perform the following. 16.4.1 Stabilize RCS pressure to allow Pressurizer level to rise. 1A(1B) LOOP SPRAY VLV [] PK 444C adjusted [] PK 444D adjusted 16.4.2 Return to step 16.1.

A. Incorrect - In ESP-0.1, as long as you are greater than 4% Pressurizer level, a SI is not required. Plausible since normally there is a transition to ESP-1.1 when SI termination criteria is met in other procedures, and normally SI flow is terminated in ESP-1.1. For the given conditions, ESP-1.1 will be implemented, but after SI flow is actually terminated in EEP-0.

B. Incorrect - Plausible since normally when SI termination criteria is not met, there is a transition to ESP-1.2. In EEP-0, step 21 normal charging flow is being established. At step 21.2.3 RNO a transition to ESP-1.2 exists for the case where Pzr level cannot be maintained 25-50%, then HHSI flow is realigned and ESP-1.2 entered.
For the given conditions, SI termination is **not met** due to Pressurizer level being < 13%. EEP-0 provides an exception to allow Pressurizer level to rise until all SI termination criteria is met, and then terminate SI.

C. Correct - PZR level is less than the required 13%. The RNO action for step 16.4 is to stabilize pressure and allow level to recover (maintain SI flow until level recovers to >13%). SI Termination Criteria will be met in EEP-0 so SI flow will be terminated in this procedure.

D. Incorrect - PZR level is < the required 13%; SI termination criteria is not yet satisfied, so it is incorrect to immediately terminate SI. EEP-0 provides a loop back to allow time for SI flow to refill the Pressurizer, and then if all SI termination criteria is met, terminate SI flow in EEP-0, and transition to ESP-1.1.

Ability to determine and interpret the following as they apply to the (SI Termination)
(CFR: 43.5 / 45.13)
EA2.1 Facility conditions and selection of appropriate procedures during abnormal and emergency operations.
IMPORTANCE RO 3.3 SRO 4.2

Importance Rating: 3.3 4.2

Technical Reference: FNP-1-EEP-0.0, v44.0
FNP-1-ESP-1.1, v25

References provided: None

Learning Objective: ASSESS the facility conditions associated with the (1) EEP-0, Reactor Trip or Safety Injection and (2) ESP-0.0, Rediagnosis and based on that assessment:

SELECT the appropriate procedures during normal, abnormal and emergency situations. 10CFR55.43 (b) 5
DETERMINE if transition to another section of the procedure or to another procedure is required
DETERMINE if the critical safety functions are satisfied
(OPS-62530A01)

Question History: FNP Bank - 006A2.13 01
Same as Harris 2009 NRC Exam

K/A match: The question provides information from plant instrumentation on SI termination criteria while in EEP-0. The candidate has to interpret the information and determine the actions required and the procedure required to perform SI termination actions.

SRO justification: 10 CFR 55.43(b)(5)
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations. [10 CFR 55.43(b)(5)] This 10 CFR 55.43 topic involves both 1) assessing plant conditions (normal, abnormal, or emergency) and then 2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed. One area of SRO level knowledge (with respect to selecting a procedure) is knowledge of the content of the procedure versus knowledge of the procedure's overall mitigative strategy or purpose.

Assessing plant conditions (normal, abnormal, or emergency) and then selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

Knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event specific sub-procedures or emergency contingency procedures.

2013 NRC exam

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(5) :
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1) assessing plant conditions and then
2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

Using the flowchart, this question can:

- NOT be answered solely by knowing "systems knowledge", i.e., how the system works, flowpath, logic, component location.
- NOT be answered solely by knowing immediate operator actions.
- NOT be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry to major EOPs.
- NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure.
- Be answered with knowledge of ONE or MORE of the following:
  - **— Assessing plant conditions (normal, abnormal, or emergency) and then selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.**
  - — Knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps.
  - **— Knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event specific sub-procedures or emergency contingency procedures.**

Step	Action/Expected Response	Response NOT Obtained
___16	**Check SI termination criteria.**	
16.1	Check SUB COOLED MARGIN MONITOR indication - GREATER THAN 16°F SUBCOOLED IN CETC MODE.	16.1 Proceed to step 23.
16.2	Check secondary heat sink available. • Total feed flow to SGs - GREATER THAN 395 gpm. AFW FLOW TO 1A(1B,1C) SG [] FI 3229A [] FI 3229B [] FI 3229C AFW TOTAL FLOW [] FI 3229 <u>OR</u> • Narrow range level in at least one SG - GREATER THAN 31%.	16.2 <u>IF</u> neither condition is satisfied, <u>THEN</u> proceed to step 23.
16.3	Check RCS pressure - STABLE OR RISING. 1C(1A) LOOP RCS WR PRESS [] PI 402A [] PI 403A	16.3 Proceed to step 23.
16.4	Check pressurizer level - GREATER THAN 13%.	16.4 Perform the following. 16.4.1 Stabilize RCS pressure to allow pressurizer level to rise. 1A(1B) LOOP SPRAY VLV [] PK 444C adjusted [] PK 444D adjusted 16.4.2 Return to step 16.1.

A continuous loop will be performed here until Pressurizer level is > 13%.

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: Automatic reinitiation of SI will not occur since reactor trip breakers are not reset.

****

___17	**Verify SI reset.** [] MLB-1 1-1 not lit (A TRN) [] MLB-1 11-1 not lit (B TRN)	17 Perform the following: 17.1 IF any train will NOT reset using the MCB SI RESET pushbuttons, THEN place the affected train S821 RESET switch to RESET. (SSPS TEST CAB.) 17.2 IF a failure exists in SSPS such that SI cannot be reset, THEN reset SI using FNP-1-SOP-40.0, RESPONSE TO INADVERTENT SI AND INABILITY TO RESET OR BLOCK SI, Appendix 2.
___18	**Stop all but one CHG PUMP.**	
___19	**Verify RCS pressure - STABLE OR RISING.** 1C(1A) LOOP RCS WR PRESS [] PI 402A [] PI 403A	19 Go to FNP-1-ESP-1.2, POST LOCA COOLDOWN AND DEPRESSURIZATION.

Plausibility for transition to ESP-1.2.

Step	Action/Expected Response	Response NOT Obtained
___20	**Isolate HHSI flow.**	
20.1	Verify charging pump miniflow valves - OPEN. 1A(1B,1C) CHG PUMP MINIFLOW ISO [] Q1E21MOV8109A [] Q1E21MOV8109B [] Q1E21MOV8109C CHG PUMP MINIFLOW ISO [] Q1E21MOV8106	
20.2	Close HHSI isolation valves. HHSI TO RCS CL ISO [] Q1E21MOV8803A [] Q1E21MOV8803B	SI termination is actually performed here, prior to going to ESP-1.1.
___21	**Establish normal charging.**	
21.1	Manually close charging flow control valve. CHG FLOW [] FK 122	

Step 21 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

21.2 Verify charging flow path aligned.

21.2.1 Verify charging pump discharge flow path - ALIGNED.

CHG PUMP
DISCH HDR ISO
[] Q1E21MOV8132A open
[] Q1E21MOV8132B open
[] Q1E21MOV8133A open
[] Q1E21MOV8133B open

CHG PUMPS TO
REGENERATIVE HX
[] Q1E21MOV8107 open
[] Q1E21MOV8108 open

21.2.2 Verify only one charging line valve - OPEN.

RCS NORMAL
CHG LINE
[] Q1E21HV8146

RCS ALT
CHG LINE
[] Q1E21HV8147

Step 21 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

NOTE: The RCS may be approaching solid plant conditions. In the event the RCS must be operated water solid, charging flow should be adjusted to maintain subcooling instead of pressurizer level.

Step	Action/Expected Response	Response NOT Obtained
	21.2.3 [CA] Control charging flow to maintain pressurizer level 25%-50%{50%-60%}.	21.2.3 Perform the following.
	21.2.3.1 Control charging flow. CHG FLOW [] FK 122 adjusted	• IF pressurizer level cannot be maintained greater than 25%{50%}, THEN perform the following. 1) Establish HHSI flow using ATTACHMENT 7, RE-ESTABLISHING HHSI FLOW. 2) Go to FNP-1-ESP-1.2, POST LOCA COOLDOWN AND DEPRESSURIZATION. • IF solid plant operation required, THEN control charging flow to maintain subcooling greater than 16°F{45°F}. CHG FLOW [] FK 122 adjusted
___22	**Go to FNP-1-ESP-1.1, SI TERMINATION, step 6.**	Plausibility for SI termination to be performed in ESP-1.1, you are directed there by this procedure.
___23	**Begin monitoring critical safety function status trees.**	

100. WE06EG2.1.27 100

A LOCA has occurred on Unit 1 with the following conditions:

- There has been **no** HHSI or LHSI flow for an extended period of time.
- ESP-1.2, Post LOCA Cooldown and Depressurization, was in progress when conditions required a transition to FRP-C.2, Response to Degraded Core Cooling.
- A SG depressurization is in progress per FRP-C.2.

Subsequently, core cooling is re-established:

- 1A RHR pump is started.
- LHSI flow is 1800 gpm.

Which one of the following completes the statements below?

The SG depressurization is performed at _(1)_ per FRP-C.2.

Once the SG depressurization is complete and core cooling is re-established, a transition will be made to _(2)_.

A. 1) a maximum attainable rate

2) EEP-1.0, Loss of Reactor or Secondary Coolant

B.✓ 1) <100°F/hour cooldown rate

2) EEP-1.0, Loss of Reactor or Secondary Coolant

C. 1) a maximum attainable rate

2) ESP-1.2, Post LOCA Cooldown and Depressurization

D. 1) <100°F/hour cooldown rate

2) ESP-1.2, Post LOCA Cooldown and Depressurization

A. Incorrect 1) Incorrect, plausible because this is the action that would be performed in FRP-C.1.

2) Correct, for the conditions given, a transition is made to EEP-1 after core cooling is re-established and the SG depressurization is complete.

B. Correct 1) Correct, this is the required cooldown rate for FRP-C.2.

2) Correct, see A.2.

C. Incorrect 1) Incorrect, see A.1.

2) Incorrect, plausible since before a cooldown is performed in FRP-C.2, if conditions are met at step 8.3, an exit to "the procedure and step in effect" would be performed, and the procedure previously in effect was ESP-1.2.

D. Incorrect 1) Correct, see B.1.

2) Incorrect, see C.2.

K/A: WE06EG2.1.27 Degraded Core Cooling
Knowledge of system purpose and/or function.
(CFR: 41.7)
IMPORTANCE RO 3.9 SRO 4.0

Importance Rating: 3.9 4.0

Technical Reference: FNP-1-FRP-C.2, v18

References provided: None

Learning Objective: ASSESS the facility conditions associated with the (1) FRP-C.1, Response to Inadequate Core Cooling; (2) FRP-C.2, Response to Degraded Core Cooling; (3) FRP-C.3, Response to Saturated Core Cooling, and based on that assessment: (OPS-62533C01)

• SELECT the appropriate procedures during normal, abnormal and emergency situations. 10CFR55.43 (b) 5
• DETERMINE if transition to another section of the procedure or to another procedure is required
• DETERMINE if the critical safety functions are satisfied

Question History: New question

K/A match: The K/A requires a knowledge of the function of actions taken during a Degraded Core cooling scenario (WE06).

The candidate is questioned on the procedural actions taken to perform a SG depressurization as it relates to how the depressurization is performed (to cooldown and depressurize the RCS at <100°F/hr). In addition, knowledge of the procedurally directed transition is required.

SRO justification: 10 CFR 55.43(b)(5)

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations. [10 CFR 55.43(b)(5)] This 10 CFR 55.43 topic involves both 1) assessing plant conditions (normal, abnormal, or emergency) and then 2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed. One area of SRO level knowledge (with respect to selecting a procedure) is knowledge of the content of the procedure versus knowledge of the procedure's overall mitigative strategy or purpose.

Assessing plant conditions (normal, abnormal, or emergency) and then selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

Knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event specific sub-procedures or emergency contingency procedures.

2013 NRC exam

From the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 flowchart for 10 CFR 55.43(b)(5) :
Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations [10 CFR 55.43(b)(5)], involving BOTH:

1) assessing plant conditions and then
2) selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.

Using the flowchart, this question can:

- NOT be answered solely by knowing "systems knowledge", i.e., how the system works, flowpath, logic, component location.
- NOT be answered solely by knowing immediate operator actions.
- NOT be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry to major EOPs.
- NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure.
- Be answered with knowledge of ONE or MORE of the following:
  - — **Assessing plant conditions (normal, abnormal, or emergency) and then selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed.**
  - — Knowledge of when to implement attachments and appendices, including

— **Knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event specific sub-procedures or emergency contingency procedures.**

FARLEY NUCLEAR PLANT

FUNCTION RESTORATION PROCEDURE

FNP-1-FRP-C.2

RESPONSE TO DEGRADED CORE COOLING

S A F E T Y R E L A T E D

PROCEDURE USAGE REQUIREMENTS-per FNP-0-AP-6	SECTIONS
Continuous Use	ALL
Reference Use	
Information Use	

See pages 11,15,16,21

Approved:

David L Reed (for)
Operations Manager

Date Issued: 03/24/12

Table of Contents

Procedure Contains	Number of pages

A. **Purpose**

This procedure provides actions to restore core cooling.

B. **Symptoms or Entry Conditions**

I. This procedure is entered from the Core Cooling Critical Safety Function Status Tree, on an Orange condition.

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: Further degradation of core cooling can occur if any running RCP is stopped before being directed by this procedure even if normal support conditions are lost.

****

___ 1 **Monitor RWST level.**

RWST
LVL
[] LI 4075A
[] LI 4075B

1.1 [CA] WHEN RWST level less than 12.5 ft, THEN go to FNP-1-ESP-1.3, TRANSFER TO COLD LEG RECIRCULATION.

___ 2 **Verify proper SI valve alignment using ATTACHMENT 2, SI VALVE ALIGNMENT FOR COLD LEG INJECTION.**

Step	Action/Expected Response	Response NOT Obtained
___ 3	**Check any HHSI flow - GREATER THAN 0 gpm.** A TRN HHSI FLOW [] FI 943 HHSI B TRN RECIRC FLOW [] FI 940	3 Perform the following. 3.1 Verify all available charging pumps started. CHG PUMP [] 1A amps > 0 [] 1B amps > 0 [] 1C amps > 0 3.2 Verify charging pump MOV disconnects closed using ATTACHMENT 3, CHARGING PUMP MOV DISCONNECTS. 3.3 Verify proper SI alignment. CHG PUMPS TO REGENERATIVE HX [] Q1E21MOV8107 closed [] Q1E21MOV8108 closed RWST TO CHG PUMP [] Q1E21LCV115B open [] Q1E21LCV115D open VCT OUTLET ISO [] Q1E21LCV115C closed [] Q1E21LCV115E closed HHSI TO RCS CL ISO [] Q1E21MOV8803A open [] Q1E21MOV8803B open CHG PUMP SUCTION HDR ISO [] Q1E21MOV8130A open [] Q1E21MOV8130B open [] Q1E21MOV8131A open [] Q1E21MOV8131B open CHG PUMP DISCH HDR ISO [] Q1E21MOV8132A open [] Q1E21MOV8132B open [] Q1E21MOV8133A open [] Q1E21MOV8133B open

Step 3 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

3.4 IF HHSI flow now established, THEN proceed to step 4, IF NOT, establish HHSI bypass SI flow.

CHG PMP RECIRC
TO RCS COLD LEGS
[] Q1E21MOV8885 open

HHSI TO
RCS CL ISO
[] Q1E21MOV8803A closed
[] Q1E21MOV8803B closed

3.5 IF HHSI flow now established, THEN proceed to step 4, IF NOT, perform the following.

3.5.1 Open HHSI isolation valves.

HHSI TO
RCS CL ISO
[] Q1E21MOV8803A
[] Q1E21MOV8803B

3.5.2 Align charging pump suction header isolation valves based on 1B charging pump status.

1B Charging Pump Status	Aligned As A Train pump	Aligned As B Train pump
CHG PUMP SUCTION HDR ISO Q1E21MOV	[] 8130A open [] 8130B open [] 8131A closed [] 8131B closed	[] 8130A closed [] 8130B closed [] 8131A open [] 8131B open

Step 3 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

3.5.3 Align charging pump discharge header isolation valves based on 1B charging pump status.

1B Charging Pump Status	Aligned As A Train pump	Aligned As B Train pump
CHG PUMP DISCH HDR ISO Q1E21MOV	[] 8132A open [] 8132B open [] 8133A closed [] 8133B closed	[] 8132A closed [] 8132B closed [] 8133A open [] 8133B open

---

NOTE: Continuing efforts to establish SI flow should not interfere with performance of the remainder of this procedure.

3.6 If HHSI flow NOT established, THEN Continue efforts to establish SI flow.

- HHSI flow
- LHSI flow
- Any form of RCS injection.

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: Pump damage may occur if RHR pumps are operated on miniflow for longer than three hours with no CCW supplied to the RHR heat exchangers.

****

___ 4 **Check LHSI status.**

4.1	Verify CCW flow to RHR heat exchangers - ESTABLISHED. CCW TO 1A(1B) RHR HX [] Q1P17MOV3185A open [] Q1P17MOV3185B open	
4.2	Check RCS pressure - LESS THAN 275 psig{435 psig}. 1C(1A) LP RCS NR PRESS [] PI 402B [] PI 403B	4.2 Proceed to step 5.

Step 4 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
4.3	Check both RHR flows - GREATER THAN $1.5x10^3$ gpm. 1A(1B) RHR HDR FLOW [] FI 605A [] FI 605B	4.3 Verify LHSI properly aligned. RHR PMP [] 1A amps > 0 [] 1B amps > 0 1A(1B) RHR HX TO RCS COLD LEGS ISO [] Q1E11MOV8888A open [] Q1E11MOV8888B open RWST TO 1A(1B) RHR PUMP [] Q1E11MOV8809A open [] Q1E11MOV8809B open 1A(1B) RHR HX DISCH VLV [] HIK 603A open [] HIK 603B open 1A(1B) RHR HX BYP FLOW VLV [] FK 605A closed [] FK 605B closed 1A(1B) RHR TO RCS HOT LEGS XCON [] Q1E11MOV8887A open [] Q1E11MOV8887B open

Step	Action/Expected Response	Response NOT Obtained
___ 5	**Check RCS vent paths.**	
5.1	Check any PRZR PORV ISO - POWER AVAILABLE.	5.1 Restore power to PRZR PORV ISO valves unless de-energized for inoperable PORVs not capable of being manually cycled.
5.2	Verify both PRZR PORVs - CLOSED.	5.2 Perform the following. 5.2.1 Close PRZR PORVs. 5.2.2 <u>IF</u> any valve can <u>NOT</u> be closed, <u>THEN</u> close its PORV ISO valve.

NOTE: The purpose of the following step is to establish an available PORV flowpath for mitigation of overpressure conditions, without relying on the PRZR code safety valves. A failed open PORV must not be unisolated. A leaking PORV which is isolated with power available to the isolation valve should remain isolated until needed to reduce RCS pressure or mitigate an RCS overpressure condition. Any leaking PORV should be re-isolated when not in use.

Step	Action/Expected Response	Response NOT Obtained
5.3	Check at least one PRZR PORV ISO - OPEN.	5.3 Open any PRZR PORV ISO not required to isolate an open or leaking PORV.
5.4	Verify reactor vessel head vent valves - CLOSED. RX VESSEL HEAD VENT OUTER ISO [] Q1B13SV2213A [] Q1B13SV2213B RX VESSEL HEAD VENT INNER ISO [] Q1B13SV2214A [] Q1B13SV2214B	

Step	Action/Expected Response	Response NOT Obtained
___ 6	**Check RCP status.**	
	6.1 Check at least one RCP - STARTED.	6.1 Proceed to Step 8.

NOTE: Normal support conditions for running RCPs are desired, however, RCP operation must continue even if support conditions cannot be maintained.

Step	Action/Expected Response	Response NOT Obtained
	6.2 Verify No. 1 seal support conditions established.	
	6.2.1 [CA] Maintain seal injection flow - GREATER THAN 6 gpm.	
	6.2.2 Verify No. 1 seal leakoff flow - WITHIN FIGURE 1 LIMITS.	
	6.2.3 Verify No. 1 seal differential pressure - GREATER THAN 200 psid.	
	6.3 Verify CCW - ALIGNED. CCW FROM RCP THRM BARR [] Q1P17HV3045 open [] Q1P17HV3184 open	
	6.4 Check RCP thermal barrier - INTACT. RCP THRM BARR CCW FLOW HI [] Annunciator DD2 clear	6.4 Verify CCW flow isolated. CCW FROM RCP THRM BARR [] Q1P17HV3045 closed [] Q1P17HV3184 closed

Step 6 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
6.5	Check CCW to RCP oil coolers - SUFFICIENT. CCW FLOW FROM RCP OIL CLRS LO [] Annunciator DD3 clear	6.5 Verify CCW - ALIGNED. CCW TO RCP CLRS [] Q1P17MOV3052 open CCW FROM RCP OIL CLRS [] Q1P17MOV3046 open [] Q1P17MOV3182 open
6.6	Check RCP oil level - SUFFICIENT. RCP 1A(1B,1C) BRG UPPER/LOWER OIL RES LO LVL [] Annunciator HH1 clear [] Annunciator HH2 clear [] Annunciator HH3 clear	

NOTE: Since RCP damage may occur when operating RCPs without normal support conditions established or under highly voided RCS conditions, the intent of the following step is to save one RCP (which provides the best pressurizer spray capability) for future use, if all three RCPs are running.

Step	Action/Expected Response	Response NOT Obtained
___ 7	**Check if one RCP should be stopped.**	
7.1	Check ALL RCPs - STARTED	7.1 Proceed to Step 9.
7.2	Stop RCP 1B.	
7.3	Proceed to Step 9.	

Step	Action/Expected Response	Response NOT Obtained
___ 8	**Check core cooling.**	
8.1	Check REACTOR VESSEL LEVEL indication - GREATER THAN 0% UPPER PLENUM.	8.1 IF SI established, THEN return to step 2, IF NOT, proceed to step 9.
8.2	Check core exit T/Cs - LESS THAN 700°F.	8.2 IF core exit T/Cs falling, THEN return to step 2, IF NOT, proceed to step 9.
8.3	Go to procedure and step in effect.	This provides plausibility for the distracter to go to ESP-1.2. Once the cooldown is initiated at step 12, you will always exit to EEP-1.
___ 9	**Check SI accumulator discharge valve status.**	
9.1	Check power to discharge valves - AVAILABLE. 1A(1B,1C) ACCUM DISCH ISO [] Q1E21MOV8808A [] Q1E21MOV8808B [] Q1E21MOV8808C	9.1 Close accumulator discharge valve disconnects using ATTACHMENT 1.
9.2	Check discharge valves - OPEN. 1A(1B,1C) ACCUM DISCH ISO [] Q1E21MOV8808A [] Q1E21MOV8808B [] Q1E21MOV8808C	9.2 IF accumulators have NOT discharged, THEN open discharge valves. 1A(1B,1C) ACCUM DISCH ISO [] Q1E21MOV8808A [] Q1E21MOV8808B [] Q1E21MOV8808C
___ 10	**Monitor CST level.**	
10.1	[CA] Check CST level greater than 5.3 ft. CST LVL [] LI 4132A [] LI 4132B	10.1 Align AFW pumps suction to SW using FNP-1-SOP-22.0, AUXILIARY FEEDWATER SYSTEM.
10.2	Align makeup to the CST from water treatment plant OR demin water system using FNP-1-SOP-5.0, DEMINERALIZED MAKEUP WATER SYSTEM, as necessary.	

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: To prevent potential release of radioactive material to the atmosphere, a faulted or ruptured SG should only be used if no intact SG is available.

****

___11 **Check intact SG levels.**

11.1	Check narrow range levels - GREATER THAN 31%{48%}.	11.1 Verify total AFW flow to intact SGs greater than 395 gpm. AFW FLOW TO 1A(1B,1C) SG [] FI 3229A [] FI 3229B [] FI 3229C AFW TOTAL FLOW [] FI 3229

Step 11 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

11.2 [CA] WHEN intact SG narrow range level 31%-65%{48%-65%}, THEN maintain intact SG narrow range level 31%-65%{48%-65%}.

11.2.1 Control MDAFWP flow.

MDAFWP FCV 3227
RESET
[] A TRN reset
[] B TRN reset

MDAFWP TO
1A/1B/1C SG
B TRN
[] FCV 3227 in MOD

Intact SG	1A	1B	1C
MDAFWP TO 1A(1B,1C) SG Q1N23HV	[] 3227A in MOD	[] 3227B in MOD	[] 3227C in MOD
MDAFWP TO 1A(1B,1C) SG FLOW CONT HIC	[]3227AA adjusted	[]3227BA adjusted	[]3227CA adjusted

Step 11 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

11.2.2 Control TDAFWP flow.

TDAFWP FCV 3228
[] RESET reset

TDAFWP
SPEED CONT
[] SIC 3405 adjusted

Intact SG	1A	1B	1C
TDAFWP TO 1A(1B,1C) SG Q1N23HV	[] 3228A in MOD	[] 3228B in MOD	[] 3228C in MOD
TDAFWP TO 1A(1B,1C) SG FLOW CONT HIC	[]3228AA adjusted	[]3228BA adjusted	[]3228CA adjusted

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: Performance of step 12 will cause accumulator injection which may result in a red path on the INTEGRITY status tree. This procedure should be completed before transition to FNP-1-FRP-P.1, RESPONSE TO IMMINENT PRESSURIZED THERMAL SHOCK CONDITIONS.

****

NOTE: After the low steam line pressure SI is blocked, excessive opening of steam dumps can cause a high steam flow LO-LO TAVG main steam isolation signal.

___12 **Reduce pressure in all intact SGs to 160 psig.**

12.1 WHEN P-12 light lit (543°F), THEN perform the following.

12.1.1 Block low steam line pressure SI.

STM LINE PRESS SI
BLOCK - RESET
[] A TRN to BLOCK
[] B TRN to BLOCK

12.1.2 Verify blocked indication.

BYP & PERMISSIVE
STM LINE ISOL.
SAFETY INJ.
[] TRAIN A BLOCKED light lit
[] TRAIN B BLOCKED light lit

12.1.3 Bypass the steam dump interlock.

STM DUMP
INTERLOCK
[] A TRN to BYP INTLK
[] B TRN to BYP INTLK

The SG depressurization starts here. Once you get to this step, you never go back in this procedure, you just go forward. Step 19 to EEP-1 is the final transition out.

Step 12 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
12.1.4	Adjust steam header pressure controller to control cooldown rate. STM HDR PRESS [] PK 464 adjusted	
12.2	[CA] Maintain RCS cold leg cooldown rate - LESS THAN 100°F IN ANY 60 MINUTE PERIOD.	
12.3	IF condenser available, THEN dump steam to condenser from intact SGs. BYP & PERMISSIVE COND AVAIL [] C-9 status light lit STM DUMP [] MODE SEL A-B TRN in STM PRESS STM DUMP INTERLOCK [] A TRN in ON [] B TRN in ON STM HDR PRESS [] PK 464 adjusted	12.3 Dump steam to atmosphere. 12.3.1 Direct counting room to perform FNP-0-CCP-645, MAIN STEAM ABNORMAL ENVIRONMENTAL RELEASE. 12.3.2 IF normal air available, THEN control atmospheric relief valves to dump steam from intact SGs, IF NOT, dump steam using FNP-1-SOP-62.0, EMERGENCY AIR SYSTEM. 1A(1B,1C) MS ATMOS REL VLV [] PC 3371A adjusted [] PC 3371B adjusted [] PC 3371C adjusted 12.3.3 IF no source of air available, THEN locally control SG atmospheric relief valves with handwheel to dump steam from intact SGs. (127 ft, AUX BLDG main steam valve room)

Intact SG	1A	1B	1C
Q1N11PCV	[] 3371A	[] 3371B	[] 3371C

Step	Action/Expected Response	Response NOT Obtained
12.4	Check all intact SG pressures - LESS THAN 160 psig.	12.4 Return to Step 11. OBSERVE CAUTION PRIOR TO STEP 11.

Step 12 continued on next page.

The cooldown rate is maintained <100°F/hr throughout this procedure to prevent going to FRP-P.1.

Step	Action/Expected Response	Response NOT Obtained
12.5	Check at least two RCS hot leg temperatures - LESS THAN 385°F. RCS HOT LEG TEMP [] TR 413	12.5 Return to Step 11. OBSERVE CAUTION PRIOR TO STEP 11.
12.6	Stop SG pressure reduction. STM HDR PRESS [] PK 464 adjusted 1A(1B,1C) MS ATMOS REL VLV [] PC 3371A adjusted [] PC 3371B adjusted [] PC 3371C adjusted <u>OR</u> 1A(1B,1C) MS ATMOS REL VLV [] Q1N11PCV3371A closed [] Q1N11PCV3371B closed [] Q1N11PCV3371C closed	

****

<u>CAUTION</u>: Pump damage may occur if RHR pumps are operated on miniflow for longer than 3 hours with no CCW supplied to the RHR heat exchangers.

****

___**13** **Verify RHR pumps - STARTED.**

RHR PUMP
[] 1A amps > 0
[] 1B amps > 0

Step	Action/Expected Response	Response NOT Obtained
___14	**[CA] Check if SI accumulators should be isolated.**	

NOTE: Step 14.1 is a continuing action.

Step	Action/Expected Response	Response NOT Obtained
14.1	[CA] Check at least two RCS hot leg temperatures - LESS THAN 385°F. RCS HOT LEG TEMP [] TR 413	14.1 Perform the following. 14.1.1 WHEN at least two RCS hot leg temperatures are less than 385°F, THEN perform steps 14.2 and 14.3 to isolate accumulators. 14.1.2 Proceed to step 15. OBSERVE CAUTION PRIOR TO STEP 15.
14.2	Verify SI reset. [] MLB-1 1-1 not lit (A TRN) [] MLB-1 11-1 not lit (B TRN)	14.2 Perform the following: 14.2.1 IF any train will NOT reset using the MCB SI RESET pushbuttons, THEN place the affected train S821 RESET switch to RESET. (SSPS TEST CAB.) 14.2.2 IF a failure exists in SSPS such that SI cannot be reset, THEN reset SI using FNP-1-SOP-40.0, RESPONSE TO INADVERTENT SI AND INABILITY TO RESET OR BLOCK SI, Appendix 2.

Step 14 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

14.3 Close all SI accumulator discharge valves.

1A(1B,1C) ACCUM
DISCH ISO
[] Q1E21MOV8808A
[] Q1E21MOV8808B
[] Q1E21MOV8808C

14.3 Perform the following.

14.3.1 Vent any SI accumulator that cannot be isolated.

ACCUM
N2 VENT
[] HIK 936 open

SI ACCUM	1A	1B	1C
1A(1B,1C) ACCUM N2 SUPP/VT ISO Q1E21HV	[] 8875A open	[] 8875B open	[] 8875C open

14.3.2 IF an accumulator can NOT be isolated or vented, THEN consult the TSC staff to determine contingency actions.

****

CAUTION: Core cooling may degrade during subsequent steps. FNP-1-CSF-0.2, CORE COOLING status tree should be closely monitored.

****

___15 Stop all RCPs.

RCP
[] 1A
[] 1B
[] 1C

Step	Action/Expected Response	Response NOT Obtained
___16	**Reduce pressure in all intact SGs to atmospheric pressure.**	
16.1	Maintain RCS cold leg cooldown rate - LESS THAN 100°F IN ANY 60 MINUTE PERIOD.	
16.2	IF condenser available, THEN dump steam to condenser from intact SGs. BYP & PERMISSIVE COND AVAIL [] C-9 status light lit STM DUMP [] MODE SEL A-B TRN in STM PRESS STM DUMP INTERLOCK [] A TRN in ON [] B TRN in ON STM HDR PRESS [] PK 464	16.2 Dump steam to atmosphere. 16.2.1 Direct counting room to perform FNP-0-CCP-645, MAIN STEAM ABNORMAL ENVIRONMENTAL RELEASE. 16.2.2 IF normal air available, THEN control atmospheric relief valves to dump steam from intact SGs, IF NOT, dump steam using FNP-1-SOP-62.0, EMERGENCY AIR SYSTEM. 1A(1B,1C) MS ATMOS REL VLV [] PC 3371A adjusted [] PC 3371B adjusted [] PC 3371C adjusted 16.2.3 IF no source of air available, THEN locally control SG atmospheric relief valves with handwheel to dump steam from intact SGs. (127 ft, AUX BLDG main steam valve room)

Intact SG	1A	1B	1C
Q1N11PCV	[] 3371A	[] 3371B	[] 3371C

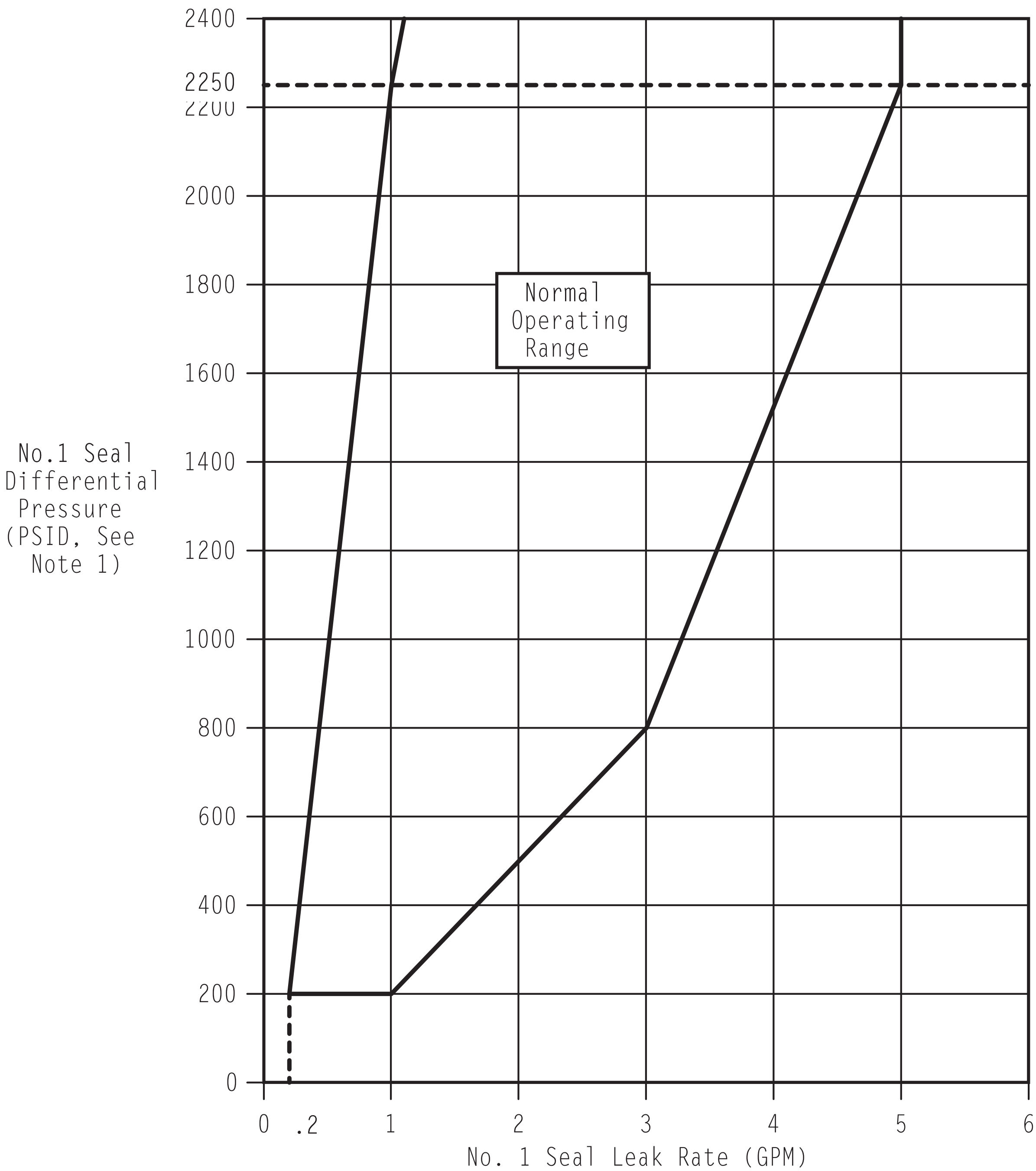
Step	Action/Expected Response	Response NOT Obtained
___17	**Verify any SI flow established.** • Verify any HHSI flow - GREATER THAN 0 gpm. A TRN HHSI FLOW [] FI 943 HHSI B TRN RECIRC FLOW [] FI 940 <u>OR</u> • Verify any LHSI flow - GREATER THAN 1.5x10^3 gpm. 1A(1B) RHR HDR FLOW [] FI 605A [] FI 605B	17 Perform the following. 17.1 Continue efforts to establish SI flow. • HHSI flow • LHSI flow • Any form of RCS injection. 17.2 Return to Step 16.
___18	**Check core cooling.** • REACTOR VESSEL LEVEL indication - GREATER THAN 0% UPPER PLENUM. • At least two RCS hot leg temperatures - LESS THAN 350°F. RCS HOT LEG TEMP [] TR 413	18 Return to step 16.
___19	**Go to FNP-1-EEP-1, LOSS OF REACTOR OR SECONDARY COOLANT, step 13.**	

-END-

START	STEP	CONTINUOUS ACTION
☐	1	1.1 [CA] WHEN RWST level less than 12.5 ft, THEN go to FNP-1-ESP-1.3, TRANSFER TO COLD LEG RECIRCULATION.
☐	6	6.2.1 [CA] Maintain seal injection flow - GREATER THAN 6 gpm.
☐	10	10.1 [CA] Check CST level greater than 5.3 ft.
☐	11	11.2 [CA] WHEN intact SG narrow range level 31%-65%{48%-65%}, THEN maintain intact SG narrow range level 31%-65%{48%-65%}.
☐	12	12.2 [CA] Maintain RCS cold leg cooldown rate - LESS THAN 100F IN ANY 60 MINUTE PERIOD.
☐	14	[CA] Check if SI accumulators should be isolated. 14.1 [CA] Check at least two RCS hot leg temperatures - LESS THAN 385F.

FIGURE 1

NO. 1 SEAL NORMAL OPERATING RANGE



Note 1: For No. 1 Seal Differential Pressures greater than 400 psid, use RCS pressure in psig.

Step	Action/Expected Response	Response NOT Obtained

ATTACHMENT 1

___ 1 **Close the following disconnects.**

'A' Train Disconnects				
Disconnect TPNS No.	Description	Position	Key	Location
Q1R18B031-A	Disconnect FU-Z3 MOV 8808C-A	ON	Z-85	139' hallway-across from MCC 1A
Q1R18B032-A	Disconnect FU-Z2 MOV 8808A-A	ON	Z-84	

'B' Train Disconnects				
Disconnect TPNS No.	Description	Position	Key	Location
Q1R18B035-B	Disconnect FV-S2 MOV 8808B-B	ON	Z-86	139' hallway-across from chemistry sample room

___ 2 **Verify accumulator discharge valves MCB indication - POWER AVAILABLE.**

1A(1B,1C) ACCUM
DISCH ISO
[] Q1E21MOV8808A
[] Q1E21MOV8808B
[] Q1E21MOV8808C

___ 3 **Notify control room of accumulator discharge valve disconnect status.**

-END-

Step | **Action/Expected Response** | **Response NOT Obtained**

ATTACHMENT 2

SI VALVE ALIGNMENT FOR COLD LEG INJECTION

___ 1 **Verify proper HHSI alignment.**

CHG PUMPS TO
REGENERATIVE HX
[] Q1E21MOV8107 closed
[] Q1E21MOV8108 closed

RWST
TO CHG PUMP
[] Q1E21LCV115B open
[] Q1E21LCV115D open

VCT
OUTLET ISO
[] Q1E21LCV115C closed
[] Q1E21LCV115E closed

HHSI TO
RCS CL ISO
[] Q1E21MOV8803A open
[] Q1E21MOV8803B open

CHG PUMP
SUCTION HDR ISO
[] Q1E21MOV8130A open
[] Q1E21MOV8130B open
[] Q1E21MOV8131A open
[] Q1E21MOV8131B open

CHG PUMP
DISCH HDR ISO
[] Q1E21MOV8132A open
[] Q1E21MOV8132B open
[] Q1E21MOV8133A open
[] Q1E21MOV8133B open

Step	Action/Expected Response	Response NOT Obtained

ATTACHMENT 2

___ 2 **Verify proper RHR alignment.**

RWST TO
1A(1B) RHR PUMP
[] Q1E11MOV8809A open
[] Q1E11MOV8809B open

CTMT SUMP TO
1A(1B) RHR PUMP
[] Q1E11MOV8811A closed
[] Q1E11MOV8812A closed
[] Q1E11MOV8811B closed
[] Q1E11MOV8812B closed

1C(1A) RCS LOOP TO
1A(1B) RHR PUMP
[] Q1E11MOV8701A closed
[] Q1E11MOV8702A closed
[] Q1E11MOV8701B closed
[] Q1E11MOV8702B closed

RHR TO RCS HOT LEG
XCON
[] Q1E11MOV8887A open
[] Q1E11MOV8887B open

1A(1B) RHR HX
TO CHG PUMP SUCT
[] Q1E11MOV8706A closed
[] Q1E11MOV8706B closed

1A(1B) RHR HX
DISCH VLV
[] HIK 603A open
[] HIK 603B open

1A(1B) RHR HX
BYP FLOW VLV
[] FK 605A closed
[] FK 605B closed

Step	Action/Expected Response	Response NOT Obtained

ATTACHMENT 2

___ 3 **Align charging pump miniflow valves based on RCS pressure.**

1C(1A) LOOP
RCS WR PRESS
[] PI 402A
[] PI 403A

RCS PRESSURE	<1300 psig	1300 psig-1900 psig	>1900 psig
1A(1B,1C)CHG PUMP MINIFLOW ISO Q1E21MOV	[]8109A closed []8109B closed []8109C closed	[]8109A as is []8109B as is []8109C as is	[]8109A open []8109B open []8109C open
CHG PUMP MINIFLOW ISO Q1E21MOV	[]8106 closed	[]8106 as is	[]8106 open

-END-

Step	Action/Expected Response	Response NOT Obtained

ATTACHMENT 3

CHARGING PUMP MOV DISCONNECTS

___ 1 **Close the following disconnects.**

'B' Train Disconnects				
Disconnect TPNS No.	Description	Position	Key	Location
Q1R18B034-B	Disconnect FV-J2 MOV 8132B-B	ON	Z-89	139' hallway across from Chemistry Sample Room
Q1R18B041-B	Disc for MOV 8130B-B	ON	Z-408	
Q1R18B042-B	Disc for MOV 8131B-B	ON	Z-412	
Q1R18B043-B	Disc for MOV 8133B-B	ON	Z-416	

___ 2 **Close the following disconnects.**

'A' Train Disconnects				
Disconnect TPNS No.	Description	Position	Key	Location
Q1R18B030-A	Disconnect FU-J2 MOV 8132A-A	ON	Z-203	139' hallway across from MCC 1A
Q1R18B038-A	Disc for MOV 8130A-A	ON	Z-405	
Q1R18B039-A	Disc for MOV 8131A-A	ON	Z-410	
Q1R18B040-A	Disc for MOV 8133A-A	ON	Z-415	

___ 3 **Notify control room of charging pump discharge valve disconnect status.**

-END-