76. 005G2.4.18 001/NEW/SRO/C/A 3.3/4.0/005G2.4.18/N/3/HBF/

The following plant conditions exist on Unit 1:

- A LOCA has occurred.
- EEP-1.0, Loss of Reactor Or Secondary Coolant, is in progress.
- RCS pressure is 1600 psig and lowering.
- RWST level is 35 ft.
- The crew is at the step to check if LHSI pumps should be stopped.

Which one of the following describes the required system operation for this decision point of EEP-1.0 and the basis for those actions?

A. • Stop BOTH RHR pumps;

• Prevents overheating.

B. • Stop BOTH RHR pumps;

• Ensures future pump operability.

C✓ • Align CCW cooling to BOTH RHR heat exchangers;

• Ensures adequate cooling for the RHR pump components.

D. • Align CCW cooling to BOTH RHR heat exchangers;

• Ensures sufficient cooling for the RCS when injection is required.

Plausibility and Answer Analysis

A Incorrect. RCS pressure is lowering therefore the RHR pumps are left running until pressure is stabilized. Also, RHR pumps can be run on recirc for up to **3 hours** (while in the injection lineup) without CCW cooling per the Caution stated before step 9.

Plausible: a) RCS pressure is > LHSI pump shutoff pressure, Stopping the RHR pump is correct <u>IF</u> RCS pressure were stable or rising per step 9.2 of EEP-1.0.
b) (MISCONCEPTION of Flowpath) For <u>other</u> centrifugal pumps, such as HHSI pumps, running pump at shutoff head (assuming with inadequate recirc flow) or without cooling will result in damage relatively quickly.

B. Incorrect. RCS pressure is lowering therefore the RHR pumps are left running until pressure is stabilized.

Plausible: a) See A.a

b) This is the basis for securing the LHSI pump <u>IF</u> RCS pressure were stable or rising per step 9.2 of EEP-1.0 .

C Correct. Per EEP-1.0 step 9. Although RCS pressure > shutoff head, RCS pressure is continuing to fall. The RNO for step 9.1 aligns CCW to the RHR HX to ensure pump cooling is maintained while continuing with strategy.

D Incorrect. aligning CCW to the RHR HX provides pump cooling while on recirc. Cooling is not required in the injection phase due to RWST temp and little to no recirc cooling required while in this phase of operation.

Plausible: CCW cooling to the RHR HX is required for RECIRC phase or S/D cooling alignment to provide core cooling and pump seal cooling.

K/A statement - 005G2.4.18 Residual Heat Removal System **Knowledge of the specific bases for EOPs**.

Importance Rating:	3.3 4.0
Technical Reference:	EEP-1.0, ver 29 ESB-1.2, ver 1.0 (for Knowledge information omitted from EEB-1.0 equivalent step) ESB-1.0, ver 2.0
References to be provided:	None
Learning Objective:	OPS-52530B03:**STATE AND EXPLAIN** the basis for all Cautions, Notes, and Actions associated with EEP-1.0. OPS-62530B01: **ASSESS** the facility conditions associated with the EEP-1, and based on that assessment:

• **DETERMINE** if transition to another section of the procedure or to another procedure is required

Question origin:	NEW
Comments:	ES-401, appendix B.2.a Model B & C hybrid required to create plausible but incorrect 4th distractor-- plausible misconception (system flowpath). K/A match: basis for the action of aligning CCW to the RHR heat exchanger or stopping the RHR pump while in EEP-1 is directly challenged. Formatting is such that the second half of each answer is unique, but related to the first portion of the answer choice. This format is required to create plausible distractors. The correct answer can not be identified solely on either portion of the answer choice.
SRO justification:	Detailed knowledge of a decision point within a procedure and knowledge of procedure implementation strategy is required to correctly assess the required action of EEP-1. Procedure Selection? Both part 1 answers are "good practices" exercised within this procedure, but requires knowledge of the strategy written within the procedure for the given set of conditions to determine which is the correct action required. **DECISION point:** <u>Recognition that RCS pressure is continuing to lower</u>

Question #	76
K/A	005G2.4.18

REFERENCE Docs

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 275 psig{435 psig}.

****

****

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.

****

___ **9 [CA] Check if LHSI Pumps should be stopped.**

Action/Expected Response	Response NOT Obtained
9.1 Check RCS pressure - GREATER THAN 275 psig{435 psig} 1600 1C(1A) LOOP RCS NR PRESS Yes [] PI 402B [] PI 403B	9.1 Perform the following. 9.1.1 Establish CCW flow to RHR heat exchangers. CCW TO 1A(1B) RHR HX [] Q1P17MOV3185A open [] Q1P17MOV3185B open 9.1.2 Proceed to Step 12.
SRO decision: Detailed knowledge of decision point within procedure.	
9.2 Check RCS pressure - STABLE OR RISING Lowering 1C(1A) LOOP RCS NR PRESS No [] PI 402B [] PI 403B	9.2 Perform the following. Answer choice C&D part a 9.2.1 Establish CCW flow to RHR heat exchangers. CCW TO 1A(1B) RHR HX [] Q1P17MOV3185A open [] Q1P17MOV3185B open 9.2.2 Proceed to Step 10.
Answer choice A&B part a	
9.3 RHR pumps - ANY RUNNING WITH SUCTION ALIGNED TO RWST.	9.3 Proceed to step 10

Step 9 continued on next page.

___Page Completed

POST LOCA COOLDOWN AND DEPRESSURIZATION

Plant Specific Background Information

Section: **Procedure**

Unit 1 ERP Step: 7 **Unit 2 ERP Step:** 7 ***ERG Step No:*** *6*

ERP StepText: Check if LHSI Pumps should be stopped.

ERG StepText: *Check If Low-Head SI Pumps Should Be Stopped*

Purpose: To stop the low-head SI pumps if RCS pressure is above their shutoff head to prevent damage to the pumps

Basis: Upon safety injection initiation all safeguard pumps are started regardless of the possibility of high RCS pressure with respect to the low-head safety injection pump shutoff head. On low-head systems where the pump recirculates on a small volume circuit there is concern for pump and motor overheating. Shutdown of the pump and placement in the standby mode, when the RCS pressure meets the criteria outlined in this step, allows for future pump operability.

Choice A&B part B distractor

Knowledge: 1. If injection flow from the charging/SI and high-head SI pumps is not available, the operator may elect to not stop one or more low-head SI pumps provided concern for continued operation is not applicable. 2. This step is a continuous action step. 3. This step begins a loop in the guideline (Steps 6-32) which cools and depressurizes the RCS to cold shutdown conditions.

References: DW-98-015; DW-01-014

Justification of Differences:

1 Changed to make plant specific.

2 Added substep to check RHR pumps running aligned to the RWST before securing. If the RHR pumps are not aligned to the RWST they should remain running (reference DW-98-015 and DW-01-014).

Section: Procedure

Unit 1 ERP Step: 9 CAUTION-2 **Unit 2 ERP Step:** 9 CAUTION-2 ***ERG Step No:***

ERP StepText: 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.

ERG StepText: *N/A Step Addition*

Purpose:

Basis:

Knowledge:

References:

Justification of Differences:

1 Caution added to alert user of potential RHR pump damage if operated on miniflow for longer than three hours without CCW flow to the RHR heat exchanger. This is not a directed action. Procedural guidance will have the operator secure the RHR pump if there is no CCW flow through the RHR heat exchanger and RCS pressure is greater than 275 psig.

77. 007EA2.02 001/MODIFIED BANK/SRO/MEM 4.3/4.6/007EA2.02/N/2/HBF/VER 4 EDITORIAL

Unit 1 is in Mode 3, and the following conditions exist:

At 10:00:

- The shutdown banks are withdrawn.
- A Cooldown per Technical Specification 3.4.10 is in progress due to an inoperable PRZR code safety valve.

At 10:10, A complete Loss of Off-Site Power occurs with the following conditions:

- All emergency equipment operates normally.
- ACC reports that off-site power will be restored in 18 hrs.

Which one of the following describes the required action, if any, to open the Rx Trip Breakers and the transition after the plant is stabilized in ESP-0.1, Reactor Trip Response?

Manual action __(1)__ required to open the Rx Trip Breakers.

After plant is stabilized per ESP-0.1, Reactor Trip Response, the crew will transition to __(2)__

	(1)	(2)
A.✓	IS	ESP-0.2, Natural Circulation Cooldown to Prevent Reactor Vessel Head Steam Voiding.
B.	IS	UOP-2.3, Shutdown of Unit Following Reactor Trip.
C.	IS NOT	ESP-0.2, Natural Circulation Cooldown to Prevent Reactor Vessel Head Steam Voiding.
D.	IS NOT	UOP-2.3, Shutdown of Unit Following Reactor Trip.

Plausibility and Answer Analysis

A Correct. (1) RX trip breakers will not open automatically therefore manual action is required.
(2) RCPs are not available and Cooldown to $T_{cold} \leq 325°F$ in 12h 15m is required per TS. 3.4.10. which satisfies the conditional statement of ESP-0.1 step 20.1.2 RNO, therefore **Transition to ESP-0.2, Natural Circulation Cooldown to Prevent Reactor Vessel Head Steam Voiding.**

B Incorrect. The RTB will need to be manually operated but, the transition to UOP-2.3 is incorrect.

Plausible: This is the correct transition if a Cooldown wasn't required by TS 3.4.10. OR if RCPs were restored before exit.

C Incorrect. RX trip breakers will not open automatically, therefore manual action is required. However, the transition is correct.

Plausible: a LOSP would result in a loss of all RCPs and therefore would result in a RX trip if > P-7

D Incorrect. (1) RX trip breakers will not open automatically therefore manual action is required. (2) the stated transition is also incorrect.

Plausible: This is the correct transition if a Cooldown wasn't required by TS 3.4.10 OR if RCPs were restored before exit.

K/A statement -007EA2.02 Reactor Trip- **Ability to determine or interpret *the following* as they apply to a reactor trip.** • *Proper actions to be taken if the automatic safety functions have not taken place*

Importance Rating: 4.3 4.6

Technical Reference: ESP-0.2, version 18.
ESP-0.1, version 29

References to be provided: None

Learning Objective: OPS-52201I07: RECALL AND DESCRIBE the operation and function of the following reactor trip signals, permissives and control interlocks, and engineered safeguards actuation signals associated with the Reactor Protection system.

OPS-62531B01: ASSESS the facility conditions associated with the ESP-0.1 and based on that assessment: DETERMINE if transition to another section of the procedure or to another procedure is required.

Question origin: Modified FNP Bank: ESP-0.1-52531B08 004

Comments: K/A match:Rx Trip breaker operation/P-4 is a safety function that has not occured automatically and a manual action (manual rx trip) is required per E-0.

Although no automatic reactor trip signal has occurred, E-0 is entered directly based on the recognized condition or as directed by 4.4 of AOP-5.0, and/or AOP-19 step 3. Step 1 of E-0 verifies the reactor trip, and if not tripped the trip breakers are manually opened. IF AOP-4.0 entered instead, then step 7.2 will open Rx trip breakers.

Requires interpreting plant conditions to determine if the Rx trip breakers are or are not automatically opened. In the given circumstance, the Rx is tripped (rods are dropped due to MG set de-energization) but the Rx Trip breakers will not be open and P-4 will not be satisfied automatically.

SRO justification: Requires detailed knowledge of the decision point within a procedure requiring transition to a contingency or NON-major EOP procedure entry.

The loss of RCP alone will not require the cooldown and TS are satisfied for the RCP loss after Rx trip breakers are opened. However, the 3.4.10 completion time would be exceeded if the plant were stabilized at current temp per UOP.

Question # 77

K/A 007EA2.02

REFERENCE Docs

Step	Action/Expected Response	Response NOT Obtained
17.4	WHEN emergency bus(es) re-energized from offsite power, THEN perform the following for affected bus(es):	
17.4.1	Locally reset the loss of voltage indicating lamp on the B1F (B1G) sequencer auxiliary panel.	
17.4.2	At the EPB for the B1F (B1G) sequencer, push the LAMP RESET pushbuttons.	
___18	**Evaluate Technical Specification 3.8.1 and perform any required actions.**	
___19	**Determine controlling procedure.**	
19.1	Check at least one RCP - STARTED.	19.1 Perform the following.
		19.1.1 Notify Chemistry to secure the zinc addition system (ZAS).
		19.1.2 IF cooldown required, THEN go to FNP-1-ESP-0.2, NATURAL CIRCULATION COOLDOWN TO PREVENT REACTOR VESSEL HEAD STEAM VOIDING.
19.2	Go to FNP-1-UOP-2.3, SHUTDOWN OF UNIT FOLLOWING REACTOR TRIP.	

Plausible Flow option 1

Plausible Flow option 2

-END-

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.10 Pressurizer Safety Valves

LCO 3.4.10 Three pressurizer safety valves shall be OPERABLE with lift settings $\geq$ 2460 psig and $\leq$ 2510 psig.

APPLICABILITY: MODES 1, 2, and 3,
MODE 4 with all RCS cold leg temperatures > 325°F.

---NOTE---
The lift settings are not required to be within the LCO limits during MODES 3 and 4 for the purpose of setting the pressurizer safety valves under ambient (hot) conditions. This exception is allowed for 54 hours following entry into MODE 3 provided a preliminary cold setting was made prior to heatup.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One pressurizer safety valve inoperable.	A.1 Restore valve to OPERABLE status.	15 minutes
B. Required Action and associated Completion Time not met. <u>OR</u> Two or more pressurizer safety valves inoperable.	B.1 Be in MODE 3. <u>AND</u> B.2 Be in MODE 4 with any RCS cold leg temperatures $\leq$ 325°F.	6 hours 12 hours

Original Bank question.

1. ESP-0.1-52531B08 004

Unit 1 is in Mode 3 with the following conditions:

- The shutdown banks are withdrawn.
- A cooldown IAW Technical Specification 3.4.10 due to an inoperable PRZR code safety valve is in progress.

A complete Loss of Site Power occurs. All emergency equipment operates normally. The operators stabilize the plant per ESP-0.1, Reactor Trip Response. ACC reports it will be 12 hours before off-site power can be restored.

Which one of the following is the correct course of action?

A.✓ Transition to ESP-0.2, Natural Circulation Cooldown to Prevent Reactor Vessel Head Steam Voiding.

B. Transition to ESP-0.3, Natural Circulation Cooldown with Allowance for Reactor Vessel Head Steam Voiding.

C. Transition to UOP-2.1, Shutdown of Unit from Minimum Load to Hot Standby, start a RCP as soon as possible, then transition to UOP-2.2, Shutdown of Unit from Hot Standby to Cold Shutdown.

D. Maintain the plant in a stable condition per ESP-0.1, Reactor Trip Response until a RCP is started. Then transition to UOP-2.1, Shutdown of Unit from Minimum Load to Hot Standby.

Original Bank question.

Original Bank question.

Meets 10 CFR 55.43 (b) 5 requirements for SRO level question.

ESP-0.1
Cooldown to ≤325°F in 12h 15m is required per TS. 3.4.10. For this reason, waiting 12 hours to start a RCP prior to starting a cooldown is not an option. A natural circ cooldown is required. The last step of ESP-0.1 directs a cooldown per ESP-0.2 IF no RCPs are running, AND Cooldown Required which is the case. Exceeding the limits (≤ 25°F/ HR) of ESP-0.2 is not required (cooldown from 547°F to 300°F @ 21°F/hr would take 11.8 hours), therefore, ESP-0.3 does not have to be entered.

A. Correct. **Transition to ESP-0.2, Natural Circulation Cooldown to Prevent Reactor Vessel Head Steam Voiding.**
ESP-0.1 will be completed and the last step directs to ESP-0.2. A natural circ cooldown will be conducted to comply with the tech spec action statement.

B. Incorrect. ESP-0.3 is never entered until after the first 10 steps of ESP-0.2 are complete. Then, it is only entered if the cooldown limits of ESP-0.2 must be exceeded (25°F/min) which is not the case.

C. Incorrect. ESP-0.1 will be completed, and would direct to UOP-2.1 ONLY if a RCP was running.

D. Incorrect. Stopping in ESP-0.1 instead of continuing on in the procedure violates the rules of procedure usage per FNP-0-SOP-0.8. Correct procedure useage dictates proceeding in ESP-0.1, THEN transitioning either to UOP-2.1 (only if any RCP running) OR ESP-0.2 (if no RCP running).

2004 NRC exam

000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1
SRO –G2.4.4 – Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures.

2. Evaluate plant conditions to determine if entry into ESP-0.1 is required. (OPS52531B02)

Original Bank question.

78. 007G2.4.2 001/NEW/SRO/C/A 4.5/4.6/007G2.4.2/N/4/HBF/VER 4 EDITORIAL

Unit 1 is at 100% with the following conditions:

- Pressurizer pressure control is in AUTO.
- PT-445, PRZR PRESS, pressure transmitter fails HIGH.

Which one of the following describes:

1) the PRT system response for the PT-445 failure **with no operator actions for 30 minutes**,

AND

2) the basis for the limit of T.S. 3.4.13, RCS Operational Leakage, if leakage occurs into the PRT after the PORV is closed?

A. 1) The PRT pressure will remain below rupture disc setpoint.

2) The leakage limit is a reasonable minimum detectable amount that the leak detection processes can detect within a reasonable period of time.

B✓ 1) The PRT pressure will remain below rupture disc setpoint.

2) The leakage limit is well within the capability of the makeup system and does not interfere with the identification of other leakage.

C. 1) The PRT will pressurize until the rupture disc ruptures.

2) The leakage limit is well within the capability of the makeup system and does not interfere with the identification of other leakage.

D. 1) The PRT will pressurize until the rupture disc ruptures.

2) The leakage limit is a reasonable minimum detectable amount that the leak detection processes can detect within a reasonable period of time.

PT-445 failing high results in PCV-445 opening fully (when in auto) until Pressure falls below P-11. The operation of PK-444A will return pressure to > 2000 psig, at which time PCV-445 will reopen to reduce pressure. The OT△T Setpoint will be penalized but will remain at or above 100.5% (101.5% demonstrated by laptop simulator), therefore no reactor trip will occur. The PRT pressure will remain below rupture disc setpoint for over an hour under these conditions.

Should a similiar failure occur on PT-444, then the combined response of PRZR Sprays, and PORV operation would result in both a RX Trip on OT△T (if starting at 100%) or Low RCS Pressure (if <100%), and an SI on Low RCS pressure following the Rx Trip. The result is that the SI flow will fill the PRZR solid and the resultant water fill of the PRT would exceed its capacity-- causing the PRT rupture disc to rupture.
The rupture of the PRT rupture disc occurs in 27 mins after the failure as demonstrated by the laptop simulator.

Plausibility and Answer Analysis

A Incorrect. The stated basis is that of **UN**IDENTIFIED LEAKAGE, PRT inleakage is categorized as IDENTIFIED LEAKAGE.

Plausible: The stated basis is that of **UN**IDENTIFIED LEAKAGE.

B Correct. The tank is designed to accept a steam discharge from the pressurizer equal to 110 percent of the volume above the full power pressurizer water level setpoint. The Sparger and 70% water level in the PRT will dissipate the pressure for over 1 hour with the stated failure as demonstrated by the simulator (final pressure 70.0 psig and level 82% per laptop simulator).

T.S. B3.4.13: "Up to 10 gpm of IDENTIFIED LEAKAGE is considered allowable because LEAKAGE is from known sources that **do not interfere with detection of unidentified LEAKAGE and is well within the capability of the RCS Makeup System."**

C Incorrect. P-11 will prevent the PORV from remaining open and the PRT is designed to recieve this discharge without exceeding 205°F and 100 psig.

Plausible: This would be the correct response if a PORV had failed or stuck open (ie "a continuous discharge from the pressurizer"). The PRT is NOT designed for a continuous discharge from the pressurizer.

D Incorrect. See C & See B.

K/A statement: 007G2.4.2 Pressurizer Relief Tank / Quench Tank System-
Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.

Importance Rating: 4.5 4.6

Technical Reference: T.S. Basis 3.4.13-3
AOP-100, ver 9.0
FSAR 5.5.11.1 (rev 22)
EEP-0 ver 38
SOP-0.3, Appendix G ver 39.0

References to be provided: None

Learning Objective: OPS-52101E07; **SELECT AND ASSESS** the pressurizer system instrument/equipment response expected when performing pressurizer system evolutions, including the normal condition, the failed condition, Associated alarms, associated trip setpoints, to include components found on Figure 3.

Question origin: NEW

Comments: Validated on laptop simulator.

K/A match: EOP entry conditions--- AOP-100 provides the specific guidance for this failure.

Interlocks/setpoints ---- P-11 (2000 psig) will actuate to prevent a continuous discharge into the PRT preventing rupture of the rupture disc (design/automatic response of sparger/water level).

PRT system---Must demonstrate knowledge of design capability of the PRT/quench system (intermittent vs continuous discharge [P-11]) as a result of a failure of PRZR PORV control system.

SRO justification: Knowledge of tech spec bases that is required to analyze tech spec required actions and terminology.

Question # 78

K/A 007G2.4.2

REFERENCE Docs

BASES

LCO

RCS operational LEAKAGE shall be limited to:

a. Pressure Boundary LEAKAGE

No pressure boundary LEAKAGE is allowed, being indicative of material deterioration. LEAKAGE of this type is unacceptable as the leak itself could cause further deterioration, resulting in higher LEAKAGE. Violation of this LCO could result in continued degradation of the RCPB. LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.

b. Unidentified LEAKAGE

One gallon per minute (gpm) of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the containment air monitoring and containment sump level monitoring equipment can detect within a reasonable time period. Violation of this LCO could result in continued degradation of the RCPB, if the LEAKAGE is from the pressure boundary.

c. Identified LEAKAGE

Up to 10 gpm of identified LEAKAGE is considered allowable because LEAKAGE is from known sources that do not interfere with detection of unidentified LEAKAGE and is well within the capability of the RCS Makeup System. Identified LEAKAGE includes LEAKAGE to the containment from specifically known and located sources, but does not include pressure boundary LEAKAGE or controlled reactor coolant pump (RCP) seal leakoff (a normal function not considered LEAKAGE). Violation of this LCO could result in continued degradation of a component or system.

d. Primary to Secondary LEAKAGE Through Any One SG

The limit of 150 gpd per each SG is based on the operational LEAKAGE performance criterion in NEI 97-06, Steam Generator Program Guidelines (Ref. 4). The Steam Generator Program operational LEAKAGE performance criterion in NEI 97-06 states, "The RCS operational primary to secondary leakage through any one SG shall be limited to 150 gallons per day." The limit is based on operating experience with SG tube degradation mechanisms that result in tube leakage. The operational leakage rate criterion in conjunction with the implementation of the Steam Generator Program is an effective measure for minimizing the frequency of steam generator tube ruptures.

E. All girth and longitudinal full penetration welds.

F. Manway attachment welds.

The liner within the safe-end nozzle region extends beyond the weld region to maintain a uniform geometry for ultrasonic inspection.

Peripheral support rings are furnished for the removable insulation modules.

The pressurizer quality assurance program is given in table 5.5-10.

5.5.11 PRESSURIZER RELIEF TANK

5.5.11.1 Design Bases

Design data for the PRT are given in table 5.5-11. Codes and materials of the tank are given in section 5.2.

The tank is designed to accept a steam discharge from the pressurizer equal to 110 percent of the volume above the full power pressurizer water level setpoint. The tank is not designed to accept a continuous discharge from the pressurizer. The volume of water in the tank is capable of absorbing the heat from the assumed discharge, assuming an initial temperature of 120°F and increasing to a final temperature of 205°F. If the temperature in the tank rises above 120°F during plant operation, the tank is cooled by spraying cool water and draining out the warm mixture to the waste processing system.

The PRT will normally be cooled by circulating the contents through the reactor coolant drain tank heat exchanger (RCDTH). The heat transfer capacity of the RCDTH is sufficient to cool the contents of the PRT to 120°F within 8 h following a design steam discharge. A backup for this cooling mode is provided by spraying in cool water and draining out the tank to the recycle holdup tank via the RCDT pumps.

5.5.11.2 Design Description

The PRT condenses and cools the discharge from the pressurizer safety and relief valves. Discharge from smaller relief valves located inside or outside the containment and the reactor vessel head vent system (RVHVS) is also piped to the relief tank. The tank normally contains water and a predominantly nitrogen atmosphere.

Steam is discharged through a sparger pipe under the water level. This condenses and cools the steam by mixing it with water that is near ambient temperature. A flanged nozzle is provided on the tank for the pressurizer discharge line connection.

SECTION 1.1

PRESSURIZER PRESSURE

SYMPTOMS

- One or more of the following annunciators may be in alarm:

  HC1 -- PRZR PRESSURE HI-LO (FNP-1-ARP-1.8)

  HD1-- PRZR PRESS REL VLV445A OR B/U HTRS ON

  HD3 -- PRZR CONT PRESS OUTPUT

  HC2 -- PRZR HI-LO PRESS ALERT (FNP-1-ARP-1.8)

  HC3 -- PRZR PRESS LO SI ALERT

  HD2 -- PRZR PRESS SI PORV BLOCK P-11

- Failed or erroneous reading on the following instruments.

Control	Protection
PI-444	PI-455
PI-445	PI-456
	PI-457

AUTOMATIC ACTIONS:

- Possible PORV lifting
- Back Up Heaters ON
- Possible pressurizer spray actuation.
- Reactor Trip 2/3 Protection pressure transmitters <1865 psig rate compensated
- Reactor Trip 2/3 Protection pressure transmitters > 2385 psig
- Safety Injection 2/3 Protection pressure transmitters < 1850 psig
- PRZR PORV's Q1B13PCV444B and Q1B13PCV445A are automatically blocked to prevent opening on decreasing pressure when 2/3 Protection pressure transmitters see pressurizer pressure less than 2000 psig.

PERMISSIVES

Permissive	Source	Setpoint	Coincidence & Light Status	Function
7. P-11 Pzr Low Press. Permissive Interlock	Pzr Press Instr. 455, 456, and 457	2000 psig	2/3 > setpoint no light	Below Setpoint 1. Allows manual block of SI from pzr lo press by turning Both Train A & B Pzr Press SI block switches to block. 2. Auto interlocks pzr power relief valves shut. Above Setpoint 1. Auto reinstates pzr lo press. SI. 2. Allows pzr power relief valves to be opened. 3. Opens SI accumulator isolation valves, if shut and handswitch is in AUTO.
8. P-12 Lo Lo T_{avg} Interlock	Primary Loop Temp. Instr. 412, 422, and 432	543°F	2/3 < setpoint Lit < setpoint permission to block SI	Below Setpoint Prevents rapid cooldown of primary sys. from a stm line rupture or blowdown through the stm dumps. 1. Provides temp. sig. portion of Hi stm flow with Lo Lo T_{avg} stm line isolation. 2. Interlocks stm dump valves shut. Allows manual block of low stm line press safety injection by turning both Train A & B steam line SI block switches to BLOCK. Above Setpoint 1. Auto unblocks low stm line pressure safety injection. 2. Allows stm dump valves to open.

79. 008AA2.15 001/BANK/SRO/C/A 3.9/4.2/008AA2.15/N/3/HBF/VER 4 MODIFIED

Both units are at 100% power, and the following plant conditions exist :

- Unit 1 has one Block valve closed and de-energized to isolate a PORV that is partially stuck open.
- Unit 2 has both Block valves closed and still energized to isolate both PORVs which have excessive seat leakage.

Which **ONE** of the units would be required to be shutdown due to **INOPERABLE** PORV / Block valve status per Tech Spec 3.4.11, Pressurizer PORVs, and states the correct bases?

__(1)__ must be shutdown; both PORVs are required to be capable of __(2)__

(1)	(2)
A. Unit 1	automatically cycling to limit RCS pressure following the blowdown of a faulted Steam Generator.
B. Unit 2	automatically cycling to limit RCS pressure following the blowdown of a faulted Steam Generator.
C✓ Unit 1	being manually cycled to control RCS pressure following a Steam Generator Tube Rupture.
D. Unit 2	being manually cycled to control RCS pressure following a Steam Generator Tube Rupture.

Plausibility and Answer Analysis

A. Incorrect. Manual operation of the PORVs is required, not automatic.

Plausible: Automatic operation may be considered required since the PORVs are regularly operated in automatic. This basis discussion exists (inadvertent SI condition--equivocal to that after the blowdown of a S/G in a E-2 scenario used to improve plausibility by holding discussion with regard to SG casualty) in the BASIS section, but **requires manual operation not automatic**.

T.S. B3.4.11-2

"For Inadvertent Operation of ECCS during power, the safety analysis assumes that manual operator actions are required to mitigate the event. AT least one PORV is assumed to be unblocked and available for water relief prior to reaching a water-solid condition."

B. Incorrect. Unit 2 can operate until the next outage in the condition stated; also, Manual operation of the PORVs is required, not automatic.

Plausible: a shutdown is required to repair this condition, and TS B3.4.11-4 states: "This Condition is only intended to permit operation of the **plant for a limited period of time not to exceed the next refueling outage** (MODE 6) [...]." therefore may be construed that a shutdown is required. Further, automatic operation may be considered required since the PORVs are regularly operated in automatic.

C. Correct. Both PORVs must be capable of being **<u>manually cycled</u>** and this is the correct bases for Identified leakage. T.S. B3.4.11-2 through 3;

By maintaining two PORVs and their block valves OPERABLE, the single failure criterion is satisfied.

The OPERABILITY of the PORVs [...] is determined on [...thier capability...] to perform the following functions: A. **Manual control** of PORVs to control reactor coolant system pressure. This is a function that is used **for the steam generator tube rupture accident**, the inadvertent operation of ECCS during power operation event, and for plant shutdown.

D. Incorrect. Unit 2 can operate until the next outage in the condition stated. Unit incorrect, basis is correct.

Plausible: See B.

K/A statement - 008AA2.15-PRESSURIZER Vapor Space Accident- **Ability to determine and interpret the** *ESF control board, valve controls, and indicators* **as they apply to the Pressurizer Vapor Space Accident**.

Importance Rating:	3.9 4.2
Technical Reference:	T.S. 3.4.11 Basis
References to be provided:	None
Learning Objective:	OPS-62101E01;**RECALL AND APPLY** the information form the LCO BASES sections: Background, applicable safety analysis, actions, surveillance requirements, for any technical specifications or TRM requirements associated with the Pressurizer Systemem components and attendant equipment alignment.
Question origin:	Vogtle 2007 SRO exam. (modified for psychometrics)
Comments:	K/A match: Interpret given post-PRZR vapor space accident conditions, determine the allowable conditions per T.S.
SRO justification:	Knowledge of tech spec bases, and actions > 1 hour.

Question #	79
K/A	008AA2.15

REFERENCE Docs

BASES

APPLICABLE SAFETY ANALYSES

Plant operators employ the PORVs to depressurize the RCS in response to certain plant transients if normal pressurizer spray is not available. For the Steam Generator Tube Rupture (SGTR) event, the safety analysis assumes that manual operator actions are required to mitigate the event. A loss of offsite power is assumed to accompany the event, and thus, normal pressurizer spray is unavailable to reduce RCS pressure. The PORVs are assumed to be used for RCS depressurization, which is one of the steps performed to equalize the primary and secondary pressures in order to terminate the primary to secondary break flow and the radioactive releases from the affected steam generator.

For the Inadvertent Operation of ECCS During Power Operation event, the safety analysis assumes that manual operator actions are required to mitigate the event. At least one PORV is assumed to be unblocked and available for water relief prior to reaching a water-solid condition. Use of at least one PORV precludes subcooled water relief through the Pressurizer Safety Relief Valves (PSRVs) by depressurinzing the RCS below the pressure where the PSRVs reseat. Should water relief through the PORV(s) occur, the PORV block valve(s) would be available to isolate the RCS.

The PORVs are used in safety analyses for events that result in increasing RCS pressure for which departure from nucleate boiling ratio (DNBR) criteria are critical. By assuming PORV manual actuation, the primary pressure remains below the high pressurizer pressure trip setpoint; thus, the DNBR calculation is more conservative. Events that assume this condition include a loss of RCS flow and a turbine trip (Ref. 2).

Pressurizer PORVs satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO requires the PORVs and their associated block valves to be OPERABLE for manual operation to mitigate the effects associated with an SGTR or an inadvertent operation of ECCS during power operation event.

The OPERABILITY of the PORVs and block valves is determined on the basis of their being capable of performing the following functions:

(continued)

BASES

LCO (continued)

A. Manual control of PORVs to control reactor coolant system pressure. This is a function that is used for the steam generator tube rupture accident, the inadvertent operation of ECCS during power operation event, and for plant shutdown.

B. Maintaining the integrity of the reactor coolant pressure boundary. This is a function that is related to controlling identified leakage and ensuring the ability to detect unidentified reactor coolant pressure boundary leakage.

C. Manual control of the block valve to: (1) unblock an isolated PORV to allow it to be used for manual control of reactor coolant system pressure (Item A), and (2) isolate a PORV with excessive seat leakage (Item B).

D. Manual control of a block valve to isolate a stuck-open PORV.

By maintaining two PORVs and their associated block valves OPERABLE, the single failure criterion is satisfied. The block valves are available to isolate the flow path through either a failed open PORV or a PORV with excessive leakage. Satisfying the LCO helps minimize challenges to fission product barriers.

APPLICABILITY

In MODES 1, 2, and 3, the PORV and its block valve are required to be OPERABLE to limit the potential for a small break LOCA through the flow path. The most likely cause for a PORV small break LOCA is a result of a pressure increase transient that causes the PORV to open. Imbalances in the energy output of the core and heat removal by the secondary system can cause the RCS pressure to increase to the PORV opening setpoint. The most rapid increases will occur at the higher operating power and pressure conditions of MODES 1 and 2. The PORVs are also required to be OPERABLE in MODES 1, 2, and 3 to minimize challenges to the pressurizer safety valves.

Pressure increases are less prominent in MODE 3 because the core input energy is reduced, but the RCS pressure is high. Therefore, the LCO is applicable in MODES 1, 2, and 3. The LCO is not applicable in MODE 4 when both pressure and core energy are decreased and the pressure surges become much less significant. The RHR relief

(continued)

BASES

APPLICABILITY (continued)

valves or an RCS vent of ≥ 2.85 inches squared is used for overpressure protection in MODES 4, 5, and 6 with the reactor vessel head in place. LCO 3.4.12 addresses the overpressure protection requirements in these MODES.

ACTIONS

A Note has been added to clarify that all pressurizer PORVs are treated as separate entities, each with separate Completion Times (i.e., the Completion Time is on a component basis).

A.1

With the PORVs inoperable and capable of being manually cycled, either the PORVs must be restored or the flow path isolated within 1 hour. The block valves should be closed but power must be maintained to the associated block valves, since removal of power would render the block valve inoperable. Although a PORV may be designated inoperable, it may be able to be manually opened and closed, and therefore, able to perform its function. PORV inoperability may be due to seat leakage, instrumentation problems related to remote manual operation of the PORVs, or other causes that do not prevent manual use and do not create a possibility for a small break LOCA. For these reasons, the block valve may be closed but the Action requires power be maintained to the valve. This Condition is only intended to permit operation of the plant for a limited period of time not to exceed the next refueling outage (MODE 6) so that maintenance can be performed on the PORVs to eliminate the problem condition.

Quick access to the PORV for pressure control can be made when power remains on the closed block valve. The Completion Time of 1 hour is based on plant operating experience that has shown that minor problems can be corrected or closure accomplished in this time period.

(continued)

BASES

ACTIONS (continued)

B.1, B.2, and B.3

If one PORV is inoperable and not capable of being manually cycled, it must be either restored or isolated by closing the associated block valve and removing the power to the associated block valve. The Completion Times of 1 hour are reasonable, based on challenges to the PORVs during this time period, and provide the operator adequate time to correct the situation. If the inoperable valve cannot be restored to OPERABLE status, it must be isolated within the specified time. Because there is at least one PORV that remains OPERABLE, an additional 72 hours is provided to restore the inoperable PORV to OPERABLE status. If the PORV cannot be restored within this additional time, the plant must be brought to a MODE in which the LCO does not apply, as required by Condition D.

C.1 and C.2

If one block valve is inoperable, then it is necessary to either restore the block valve to OPERABLE status within the Completion Time of 1 hour or place the associated PORV in manual control. The prime importance for the capability to close the block valve is to isolate a stuck open PORV. Therefore, if the block valve cannot be restored to OPERABLE status within 1 hour, the Required Action is to place the PORV in manual control to preclude its automatic opening for an overpressure event and to avoid the potential for a stuck open PORV at a time that the block valve is inoperable. The Completion Time of 1 hour is reasonable, based on the small potential for challenges to the system during this time period, and provides the operator time to correct the situation. Because at least one PORV remains OPERABLE, the operator is permitted a Completion Time of 72 hours to restore the inoperable block valve to OPERABLE status. The time allowed to restore the block valve is based upon the Completion Time for restoring an inoperable PORV in Condition B, since the PORVs are not capable of mitigating an overpressure event when placed in manual control. If the block valve is restored within the Completion Time of 72 hours, the power will be restored and the PORV restored to OPERABLE status. If it cannot be restored within this additional time, the plant must be brought to a MODE in which the LCO does not apply, as required by Condition D.

(continued)

1. 008AA2.15 001/1/1/PRZR VAPOR SPACE ACC/C/A - 4.2/NEW/S/NRC SRO/TNT / RLM

Given the following plant conditions with both units at 100% power:

- Unit 1 has one Block valve closed and de-energized to isolate a PORV that is partially stuck open.

- Unit 2 has both Block valves closed and still energized to isolate both PORVs which have excessive seat leakage.

Which **ONE** of the units would be required to shutdown due to **INOPERABLE** PORV / Block valve status per Tech Specs and what is the **CORRECT** bases?

A. Unit 1 - both PORVs are required to be capable of automatically cycling to limit RCS pressure following the blowdown of a faulted Steam Generator.

B. Unit 2 - both PORVs are required to be capable of automatically cycling to mitigate events such as a Steam Generator Tube Rupture or Loss of Heat Sink.

C✓ Unit 1 - both PORVs are required to be capable of being manually cycled to mitigate events such as a Steam Generator Tube Rupture or Loss of Heat Sink.

D. Unit 2 - both PORVs are required to be capable of being manually cycled to limit RCS pressure following the blowdown of a faulted Steam Generator.

K/A

008 Pressurizer Vapor Space Accident

AA2.15 Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident.

ESF control board, valve controls, and indicators

K/A MATCH ANALYSIS

Question gives a plausible scenario where both units have PORVs closed to due either excessive seat leakage or stuck open PORVs. The candidate must determine which unit is required to shutdown per Tech Specs and the Tech Spec bases.

Question meets 10CFR55.43(b) criteria for item # 2 - Facility operating limits in Tech Specs and their bases.

ANSWER / DISTRACTOR ANALYSIS

A. Incorrect. Plausible the candidate may think both PORVs have to automatically cycle and this is not a correct bases.

B. Incorrect. Plausible the candidate may think both PORVs have to automatically cycle and this is the correct bases.

C. Correct. Both PORVs must be capable of being manually cycled and this is a correct bases.

D. Incorrect. Plausible the candidate may know both capable of manually cycling but this is an incorrect bases.

REFERENCES

Technical Specification 3.4.11 and bases for PORVs and Block Valves

VEGP learning objectives:

LO-LP-39208-02, Given a set of Tech Specs and the bases, determine for a specific set of plant conditions, equipment availability, and operational mode:

a. Whether any Tech Spec LCOs of section 3.4 are exceeded.

80. 014A2.04 001/NEW/SRO/C/A 3.4/3.9/014A2.04/N/3/HBF/VER 4 MODIFIED

The following plant conditions exist on Unit 1:

- A reactor startup is being performed per UOP-1.2, Startup of Unit From Hot Standby to Minimum Load.
- The reactor is subcritical.
- All Control Bank D (CB D) rod heights indicated by DRPI and group step counters are at 18 steps.

A failure occurs on CB D rod H-2 CRDM such that its lift coil does not energize.

Then, a **14 second rod** withdrawal is performed.

Which one of the following states the expected amount of misalignment and the required recovery actions per AOP-19, Malfunction of Rod Control System?

The misalignment between DRPI and group step counters will be __(1)__ steps.

AOP-19 will direct the operator to __(2)__.

	(1)	(2)
A.	11 steps	Trip the reactor.
B.	14 steps	Trip the reactor.
C.✓	11 steps	Insert CB D in Manual to 18 steps.
D.	14 steps	Insert CB D in Manual to 18 steps.

Plausibility and Answer Analysis

A Incorrect. Rod misalignment (speed) is correct.

Second part is incorrect due to the given failure, the rod would be determined as immovable per AOP-19 step 18. Consequently, restoration per step 19 RNO and the rod alignment would be restored by moving the Bank back to the position of the immovable rod.

Plausible: This is the correct action if multiple rods were dropped, or if uncontrolled rod motion were occurring. Further, one might believe that TS 3.1.4 would require a trip to comply with ACTION A.2 .

B Incorrect. Rod misalignment (speed) is incorrect.
, action for an immovable rod (SEE A)

Plausible: Rod misalignment (speed) is plausible should the examinee utilize the Shutdown bank rod speed (62 spm X 14 sec X 1 min/60sec) = 14 steps

C Correct. first part correct, Rod speed of Control Banks, while in Manual is 48 steps per min. (48 spm X 14 sec X 1min/60 sec) = 11 steps.

Correct second part due to the rod being immovable due to the given failure, Step 19 RNO actions would direct inserting CB D to match the misaligned rod's height. This strategy is also stated within T.S. 3.1.4 basis.

D Incorrect. incorrect Rod misalignment (speed)

Plausible see B.

Correct second part

K/A statement - 014A2.04 Rod Position Indication System
Ability to (a) predict the impacts of Misaligned rod **on the RPIS; and (b) based on those on those predictions, use procedures to correct, control, or mitigate the consequences of** Misaligned rod.

Importance Rating:	3.4 3.9
Technical Reference:	AOP-19.0, ver 26.0.
References to be provided:	None
Learning Objective:	OPS-52201E03; Relate and Identify the operational characteristics including design features, capacities, and protective interlocks associated with the Rod Control System. OPS-62520S02; Evaluate plant conditions and determine if transition to another section of AOP-19 is required.
Question origin:	NEW
Comments:	Given a failure that will result in an immovable rod during a manual rod withdrawal, the examinee must utilize system knowledge of rod speed and predict the resultant misalignment. Then, with the given misalignment the examinee must exercise AOP-19 requirements to mitigate the condition.
SRO justification:	Requires assessing plant conditions and then prescribing a procedure or section of a procedure to mitigate, recover, or with which to proceed. (a detailed knowledge of diagnostic step or decision point within a procedure which is NOT a high level step nor a high level procedure)

Question # 80

K/A 014A2.04

REFERENCE Docs

Step	Action/Expected Response	Response Not Obtained
__ 17	**Check that the misaligned rod can be restored in accordance with the conditions of Attachment 4**	17 Perform the following. 17.1 Shutdown unit in accordance with appropriate operating procedures. • FNP-1-UOP-3.1, POWER OPERATION • FNP-1-UOP-2.1, SHUTDOWN OF UNIT FROM MINIMUM LOAD TO HOT STANDBY 17.2 Subsequent actions which move affected rod(s) for testing or recovery should NOT be performed until plant shutdown is complete

---

NOTE: IF the rod can be determined moveable OR immoveable from tracking its position, THEN step 18 is not required to be performed AND proceeding to step 19 is appropriate.

__ 18 **IF required to determine if misaligned rod is movable,**
THEN perform the following:

18.1 [CA] WHEN cause of misaligned rod has been determined AND repaired, THEN determine if misaligned rod is movable.

18.1.1 Place ROD CONTROL BANK SELECTOR SWITCH to affected bank.

18.1.2 Record misaligned bank step counter indications in reactor operator's log.

Step 18 continued on next page

__Page Completed

Step	Action/Expected Response	Response Not Obtained
18.1.3	Check misaligned rod movable. • Insert affected bank up to 10 steps. OR • Withdraw affected bank up to 10 steps.	
18.1.4	IF desired, THEN restore misaligned bank to position recorded in reactor operator's log.	

****

CAUTION: Control rods must remain above the rod insertion limit at all times.

****

****

CAUTION: ΔI must be maintained within the limits specified in the COLR at all times. Maintaining ΔI ± 5% of the target value helps ensure ΔI will stay within the limits specified in the COLR during transients.

****

NOTE: It is permissible to perform ATTACHMENT 2, MISALIGNED ROD RECOVERY or MAINTENANCE TESTING more than once if there are multiple rods to be aligned.

Plausible distractor

Step	Action/Expected Response	Response Not Obtained
19	**IF misaligned rod movable AND cause of the misalignment has been repaired, THEN perform rod realignment using ATTACHMENT 2, MISALIGNED ROD RECOVERY or MAINTENANCE TESTING.**	19 Perform the following. 19.1 Adjust misaligned bank as close to misaligned rod as possible. 19.2 Adjust turbine load OR boron concentration as necessary to maintain RCS TAVG within 2°F of TREF.

Step 19 continued on next page

__ Page Completed

Step	Action/Expected Response	Response Not Obtained
	verify moveable by moving bank in/ out 10 steps When complete rod should remain aligned if malf corrected.	19.3 Consult Operations Manager to evaluate continued operation. 19.4 Dispatch personnel to correct cause of misaligned rod. 19.5 [CA] WHEN misaligned rod repaired, THEN return to step 18.
__ 20	**[CA] WHEN rod realigned, THEN go to procedure and step in effect.**	

-END-

__ Page Completed

81. 015G2.4.11 002/NEW/SRO/C/A 4.0/4.2/015G2.4.11/Y/3/HBF/

Unit 1 startup is in progress using UOP-1.2, Startup of Unit from Hot Standby to Minimum Load. Reactor power is being maintained 2-4%, when the following occurs:

- N-44, Power Range NI, fails high.

Which one of the following describes the procedure containing the required response to the failure, and the ability to enter Mode 1 upon completing the AOP actions, IAW Tech Spec 3.3.1, Reactor Trip System Instrumentation, Conditions D and E and Tech Spec 3.0.4?

REFERENCE PROVIDED

__(1)__ contains all of the required actions; after completing the AOP actions.

Mode 1 entry __(2)__ permitted by Tech Specs.

A.✓ 1) AOP-100, Instrumentation Malfunction.

2) IS

B. 1) AOP-100, Instrumentation Malfunction.

2) IS NOT

C. 1) AOP-19, Malfunction of Rod Control System.

2) IS

D. 1) AOP-19, Malfunction of Rod Control System.

2) IS NOT

Plausibility and Answer Analysis

A Correct. 1) Section 1.11 of AOP-100 provides the necessary directions

2) AOP-100 establishes the conditions necessary to satisfy all timed actions of TS 3.3.1 conditions D & E and both have actions that allow for continued operation in MODE 1 for an "unlimited period of time". Per T.S. 3.0.4.a, these conditions permit entry into MODE 1.

B Incorrect. 1) See A #1 for discussion
2) entry into MODE 1 is allowed. See A #2 for discussion.

Plausible: 1) See A #1
2) Generally TS 3.0.4 prevents mode change to a higher mode where an unsatisfied LCO would be applicable. Failing to apply TS 3.0.4 exceptions would lead to the belief that a mode change is not permitted.

C Incorrect. 1) This AOP does not provide the necessary direction for N-44 failure, nor is the entry conditions met for this procedure due to being below C-5, Rods will not be in automatic control and there will be no "unexplained rod motion".

2) See A #2

Plausible: 1) AOP-19, would be applicable if rods were in Automatic (>C5) concurrent with the failure, and any failure in rod control EXCEPT for input signals.

2) See A#2

D Incorrect. 1) See C #1

2) See B#2 for Plausibility

K/A statement -
015 Nuclear Instrumentation System
G2.4.11 Knowledge of abnormal condition procedures.

Importance Rating:	4.0 4.2
Technical Reference:	AOP-100 rev 9 TS 3.0.4; 3.3.1
References to be provided:	REFERENCES PROVIDED ARE FOR APPLICABLE CONDITIONS-- **Other information on the same page has been deleted or covered over.** T.S. 3.3.1 pg 3.3.1-2 through 3.3.1-3 (Obscure condition C data and F data); T.S. 3.3.1-14 (obscure function 1, 4);
Learning Objective:	OPS-62302A02 Recall and Apply the information of the generic LCO requirements (LCO 3.0.1 thru 3.07; SR 4.0.1 thru 4.0.4).
Question origin:	NEW
Comments:	K/A match: knowledge of the response for the N44 failure is contained within an AOP;
SRO justification:	Generic LCO Application of 3.0.4.a to allow mode change must be evaluated.

Question #	81
K/A	015G2.4.11

REFERENCE Docs

1.7 RCS LOOP FLOW INSTRUMENTATION

RCS LOOP	RCS LOOP FLOW		
	CH I	CH II	CH III
A	FI-414	FI-415	FI-416
B	FI-424	FI-425	FI-426
C	FI-434	FI-435	FI-436

1.8 RCS TEMPERATURE INDICATION

RCS LOOP	RCS TEMPERATURE			
	ΔT	OPΔT	OTΔT	TAVG
A	TI-412A	TI-412B	TI-412C	TI-412D
B	TI-422A	TI-422B	TI-422C	TI-422D
C	TI-432A	TI-432B	TI-432C	TI-432D

1.9 HYDROGEN TEMPERATURE INDICATION

TI-4067

1.10 NUCLEAR INSTRUMENTATION SYSTEM INDICATION – SR/IR

NI	CH A	CH B
SR FLUX	N-31	N-32
IR FLUX	N-35	N-36

1.11 NUCLEAR INSTRUMENTATION SYSTEM INDICATION - PR

NI	CH I	CH II	CH III	CH IV
PR FLUX	N-41	N-42	N-43	N-44

SECTION 1.11

NUCLEAR INSTRUMENTATION – POWER RANGE CHANNEL

SYMPTOMS

- One or more of the following annunciators may be in alarm.

  FB4 PR UPPER DET HI FLUX DEV OR AUTO DEF (FNP-1-ARP-1.6)
  FB5 PR LOWER DET HI FLUX DEV OR AUTO DEF (FNP-1-ARP-1.6)
  FC1 PR HI FLUX - HI RNG RX TRIP ALERT (FNP-1-ARP-1.6)
  FC2 PR HI FLUX - LO RNG RX TRIP ALERT (FNP-1-ARP-1.6)
  FC3 PR HI FLUX RATE ALERT (FNP-1-ARP-1.6)
  FC5 PR CH DEV (FNP-1-ARP-1.6)
  FD2 PR OVERPOWER AUTO/MAN ROD STOP (FNP-1-ARP-1.6)

- Erratic, inconsistent or divergent indication between the Power Range Channels: N-41, N-42, N-43, N-44

- Improper overlap of Power and Intermediate Range Channels.

- Power Range Trip Status Lights illuminated.

- Rapid inward motion of control rods in automatic rod control.

AUTOMATIC ACTIONS

- Automatic and Manual Rod Withdrawal is Inhibited. (FD2)

MAJOR ACTIONS

- Stabilize the plant.

- Perform actions required by Technical Specifications.

- Defeat affected channel and place in trip.

- Initiate repairs and restore channel when repairs complete.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One channel or train inoperable.	C.1 Restore channel or train to OPERABLE status. <u>OR</u> C.2 Open RTBs.	48 hours 49 hours
D. One Power Range Neutron Flux channel inoperable.	--------------------NOTE---------------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing and setpoint adjustment of other channels. -- D.1.1 Place channel in trip. <u>AND</u> D.1.2 Reduce THERMAL POWER to ≤ 75% RTP. <u>OR</u> D.2.1 Place channel in trip. <u>AND</u>	 72 hours 78 hours 72 hours (continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. (continued)	D.2.2	-----------NOTE------------ Only required to be performed when the Power Range Neutron Flux input to QPTR is inoperable. ------------------------------- Perform SR 3.2.4.2.	Once per 12 hours
	OR		
	D.3	Be in MODE 3.	78 hours
E. One channel inoperable.	-----------------NOTE----------------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ---		
	E.1	Place channel in trip.	72 hours
	OR		
	E.2	Be in MODE 3.	78 hours
F. THERMAL POWER > P-6 and < P-10, one Intermediate Range Neutron Flux channel inoperable.	F.1	Reduce THERMAL POWER to < P-6.	24 hours
	OR		
	F.2	Increase THERMAL POWER to > P-10.	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;

(continued)

REFERENCE PROVIDED

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One Power Range Neutron Flux channel inoperable.	------------------NOTE---------------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing and setpoint adjustment of other channels. --	
	D.1.1 Place channel in trip.	72 hours
	<u>AND</u>	
	D.1.2 Reduce THERMAL POWER to ≤ 75% RTP.	78 hours
	<u>OR</u>	
	D.2.1 Place channel in trip.	72 hours
	<u>AND</u>	
		(continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. (continued)	D.2.2	-----------NOTE------------ Only required to be performed when the Power Range Neutron Flux input to QPTR is inoperable. ------------------------------- Perform SR 3.2.4.2.	 Once per 12 hours
	OR		
	D.3	Be in MODE 3.	78 hours
E. One channel inoperable.	-----------------NOTE----------------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ---		
	E.1	Place channel in trip.	72 hours
	OR		
	E.2	Be in MODE 3.	78 hours

82. 022A2.01 001/NEW/SRO/C/A 2.5/2.7/022A2.01/Y/3/HBF/VER 5 MODIFIED

UNIT 1 is in Mode 1, when the following conditions and sequence of events occur:

CTMT CLR FANS SEL switches are positioned as follows:

- A Train selected to 1A
- B Train selected to 1D

1300 Aug 06: Containment Spray Pump 1A declared INOPERABLE.

1900 Aug 08: While performing STP-17.0, Containment Cooling System Train A(B) Operability Test, the following deficiencies were discovered or occurred:

- 1A and 1B CTMT CLRs were determined to be clogged with maximum attainable SW flow through either cooler being 500 gpm.
- BA3, 1C CTMT CLR FAN FAULT, came into alarm due to 1C CTMT CLR Fan Slow Speed breaker tripping open when started.

0327 Aug 09: 1A Containment Spray Pump was returned to OPERABLE status.

Which one of the following states the **latest** time and date that Mode 3 must be (have been) entered without violating Tech Spec 3.6.6, Containment Spray and Cooling Systems?

Mode 3 must be (have been) achieved no later than August __(date)__ at __(time)__.

REFERENCE PROVIDED

	DATE	TIME
A.	09	0200
B.	09	1900
C.	12	0100
D.✓	16	0100

Plausibility and Answer Analysis

Date	6	7	8	9	10	11	12	13	14	15	16	M3 DATE	Time (+6hrs)
	Time of entry/required exit												
3.6.6 (10 days)	13										13	16	19
Spray pump (72hr)	13			13								9	19
A coolers (7 day)			19							19		16	1
A clr & spray (72hr)			19			19						12	1
3.0.3			19									9	2

A Incorrect. This time is associated with Condition F which is NOT applicable. 1A, 1B and 1C CTMT fan coolers and the CTMT Spray pump are all inoperable, however since only 1 slow speed fan is required per train, and since B Train fan coolers AND B train CTMT Spray remain operable, ONLY 2 trains are inoperable, NOT 3 trains. Furthermore, if TS 3.0.3 were entered, then Condition F (TS 3.0.3) could be exited at 0327 Aug 9th when the 1A CTMT spray pump were made operable and mode 3 would no longer be required. Plausible if the examinee evaluates this as condition F and does not properly exit the condition when satisfied.
(If 3.0.3 then 8/08 1900+7 hrs = 8/09 0200)

B Incorrect. This time is associated with Conditon A entry, this 72 hr limitation ends at 0327 Aug 9th. This is plausible if the candidate improperly assumes Condition A applies to a CTMT Cooler Train instead of the SPRAY train, or if candidate does not properly exit the condition when that condition is satisfied.
(8/6 1300 + 72 hrs + 6 hrs for mode 3 = 8/9 1900)
8/9-1300 1900 8/9

C Incorrect. This time is associated with Condition D. Plausible if the candidate incorrectly assesses operability of the CNMT coolers or if the candidate believes the two cooling trains are spray and ctmt coolers and implements condition D, a 72 hr Restoration allowance.

(8/8 1900 +72 hrs + 6 hrs = 8/12 0100)

D Correct. This is the time associated with the 7 day requirement of condition C and more limiting than the 10 day from failure to meet the LCO. Condition C is entered and then Condition E will add 6 hours to the 7 day LCO.

The concurrent failure extension rules which would, if applied, require a more restrictive limit of 24 hrs from original entry (limiting to Aug 10 1900) discussed in TS 1.3; the application of this limit **does NOT apply** since the completion times have a modified "time zero."(reference TS 1.3-2 last paragraph).

(8/8 1900 +7 days + 6 hrs = 8/16 0100)

K/A statement - 022A2.01-Contianment Cooling System (CCS) - Ability to (a) **predict the impacts of** *Fan motor over-current* **on the CCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of** *Fan motor over-current.*

Importance Rating:	2.5 2.7
Technical Reference:	T.S. 3.6.6 and section 1.0 and 3.0
References to be provided:	T.S. 3.6.6-1 through 3.6.6-2
Learning Objective:	OPS-62102C01; Recall and apply the information from the LCO bases sections [...] associated with the containment spray and cooling system components and attendant equipment.
Question origin:	NEW
Comments:	K/A match Requires CTMT cooler breaker failure a) prediction of impact on system operability and then based on those predictions/assessments b) implement the 1.0 & 3.0 section of TS to determine the appropriate mitigating/control actions required. The part a) prediction portion of this K/A is an *implied* aspect of the decision/selection of the correct TS response. 500 gpm was provided to demonstrate an inoperable cooler. SR 3.6.6.3 requires $\geq$1600 gpm but basis document requires only $\geq$ 600 gpm. 500 gpm value was selected because NMP-AD-012 would declare this component "OPERABLE but Degraded" if flow were 600 gpm or greater; if it were still capable of performing its safety function just with less margin.
SRO justification:	Application an LCO requirement in accordance with the rules of application requirements (section 1) to determine the response required to mitigate the consequences of the failures.

Question #	82
K/A	022A2.01

REFERENCE Docs

1.0 USE AND APPLICATION

1.3 Completion Times

PURPOSE

The purpose of this section is to establish the Completion Time convention and to provide guidance for its use.

BACKGROUND

Limiting Conditions for Operation (LCOs) specify minimum requirements for ensuring safe operation of the unit. The ACTIONS associated with an LCO state Conditions that typically describe the ways in which the requirements of the LCO can fail to be met. Specified with each stated Condition are Required Action(s) and Completion Time(s).

DESCRIPTION

The Completion Time is the amount of time allowed for completing a Required Action. It is referenced to the time of discovery of a situation (e.g., inoperable equipment or variable not within limits) that requires entering an ACTIONS Condition unless otherwise specified, providing the unit is in a MODE or specified condition stated in the Applicability of the LCO. Required Actions must be completed prior to the expiration of the specified Completion Time. An ACTIONS Condition remains in effect and the Required Actions apply until the Condition no longer exists or the unit is not within the LCO Applicability.

If situations are discovered that require entry into more than one Condition at a time within a single LCO (multiple Conditions), the Required Actions for each Condition must be performed within the associated Completion Time. When in multiple Conditions, separate Completion Times are tracked for each Condition starting from the time of discovery of the situation that required entry into the Condition.

Once a Condition has been entered, subsequent trains, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition, unless specifically stated. The Required Actions of the Condition continue to apply to each additional failure, with Completion Times based on initial entry into the Condition.

However, when a subsequent train, subsystem, component, or variable expressed in the Condition is discovered to be inoperable or not within

(continued)

1.3 Completion Times

DESCRIPTION (continued)

limits, the Completion Time(s) may be extended. To apply this Completion Time extension, two criteria must first be met. The subsequent inoperability:

a. Must exist concurrent with the first inoperability; and

b. Must remain inoperable or not within limits after the first inoperability is resolved.

The total Completion Time allowed for completing a Required Action to address the subsequent inoperability shall be limited to the more restrictive of either:

a. The stated Completion Time, as measured from the initial entry into the Condition, plus an additional 24 hours; or

b. The stated Completion Time as measured from discovery of the subsequent inoperability.

The above Completion Time extensions do not apply to those Specifications that have exceptions that allow completely separate re-entry into the Condition (for each train, subsystem, component, or variable expressed in the Condition) and separate tracking of Completion Times based on this re-entry. These exceptions are stated in individual Specifications.

The above Completion Time extension does not apply to a Completion Time with a modified "time zero." This modified "time zero" may be expressed as a repetitive time (i.e., "once per 8 hours," where the Completion Time is referenced from a previous completion of the Required Action versus the time of Condition entry) or as a time modified by the phrase "from discovery . . ." Example 1.3-3 illustrates one use of this type of Completion Time. The 10 day Completion Time specified for Conditions A and B in Example 1.3-3 may not be extended.

1.3 Completion Times

EXAMPLES (continued)

EXAMPLE 1.3-3

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One Function X train inoperable.	A.1 Restore Function X train to OPERABLE status.	7 days AND 10 days from discovery of failure to meet the LCO
B. One Function Y train inoperable.	B.1 Restore Function Y train to OPERABLE status.	72 hours AND 10 days from discovery of failure to meet the LCO
C. One Function X train inoperable. AND One Function Y train inoperable.	C.1 Restore Function X train to OPERABLE status. OR C.2 Restore Function Y train to OPERABLE status.	72 hours 72 hours

(continued)

1.3 Completion Times

EXAMPLES

EXAMPLE 1.3-3 (continued)

When one Function X train and one Function Y train are inoperable, Condition A and Condition B are concurrently applicable. The Completion Times for Condition A and Condition B are tracked separately for each train starting from the time each train was declared inoperable and the Condition was entered. A separate Completion Time is established for Condition C and tracked from the time the second train was declared inoperable (i.e., the time the situation described in Condition C was discovered).

If Required Action C.2 is completed within the specified Completion Time, Conditions B and C are exited. If the Completion Time for Required Action A.1 has not expired, operation may continue in accordance with Condition A. The remaining Completion Time in Condition A is measured from the time the affected train was declared inoperable (i.e., initial entry into Condition A).

The Completion Times of Conditions A and B are modified by a logical connector with a separate 10 day Completion Time measured from the time it was discovered the LCO was not met. In this example, without the separate Completion Time, it would be possible to alternate between Conditions A, B, and C in such a manner that operation could continue indefinitely without ever restoring systems to meet the LCO. The separate Completion Time modified by the phrase "from discovery of failure to meet the LCO" is designed to prevent indefinite continued operation while not meeting the LCO. This Completion Time allows for an exception to the normal "time zero" for beginning the Completion Time "clock". In this instance, the Completion Time "time zero" is specified as commencing at the time the LCO was initially not met, instead of at the time the associated Condition was entered.

(continued)

APPLICABLE SAFETY ANALYSES (continued)

Containment cooling train performance for post accident conditions is given in Reference 3. The result of the analysis is that each train having at least one OPERABLE fan unit with at least 600 gpm SW flow can provide 100% of the required peak cooling capacity during the post accident condition. The train post accident cooling capacity under varying containment ambient conditions, required to perform the accident analyses, is also shown in Reference 5.

The modeled Containment Cooling System actuation from the containment analysis is based upon a response time associated with exceeding the containment High-1 pressure setpoint to achieving full Containment Cooling System air and safety grade cooling water flow.

The Containment Cooling System total response time of 87 seconds, includes signal delay, DG startup (for loss of offsite power), and service water pump startup times (Ref. 4).

The Containment Spray System and the Containment Cooling System satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

During a DBA, a minimum of one containment cooling train with a single OPERABLE fan unit and one containment spray train are required to maintain the containment peak pressure and temperature below the design limits (Ref. 3). Additionally, one containment spray train is also required to remove iodine from the containment atmosphere and maintain concentrations below those assumed in the safety analysis. To ensure that these requirements are met, two containment spray trains and two containment cooling trains with a single OPERABLE fan unit per cooling train with at least 600 gpm SW flow must be OPERABLE. Therefore, in the event of an accident, at least one train in each system operates, assuming the worst case single active failure occurs.

Each Containment Spray System typically includes a spray pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon an ESF actuation signal and manually transferring suction to the containment sump.

Each Containment Cooling System typically includes cooling coils, dampers, fans, instruments, and controls to ensure an OPERABLE flow path.

3.6 CONTAINMENT SYSTEMS

3.6.6 Containment Spray and Cooling Systems

LCO 3.6.6 Two containment spray trains and two containment cooling trains shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One containment spray train inoperable.	A.1 Restore containment spray train to OPERABLE status.	72 hours AND [Distractor choice B] 10 days from discovery of failure to meet the LCO
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 84 hours
C. One containment cooling train inoperable.	C.1 Restore containment cooling train to OPERABLE status.	7 days [Correct choice D] AND 10 days from discovery of failure to meet the LCO

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. Two containment cooling trains inoperable.	D.1	Restore one containment cooling train to OPERABLE status.	72 hours Distractor choice C
E. Required Action and associated Completion Time of Condition C or D not met.	E.1 AND E.2	Be in MODE 3. Be in MODE 5.	6 hours 36 hours
F. Two containment spray trains inoperable. OR Any combination of three or more trains inoperable.	F.1	Enter LCO 3.0.3.	Immediately Distractor choice A

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.6.1	Verify each containment spray manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.	31 days
SR 3.6.6.2	Operate each required containment cooling train fan unit for ≥ 15 minutes.	31 days
SR 3.6.6.3	Verify each containment cooling train cooling water flow rate is ≥ 1600 gpm.	31 days

< required flow per surveillance

Basis provides a minimum value of 600 gpm to perform function.

Date	6	7	8	9	10	11	12	13	14	15	16	M3 DATE	Time (+6hrs)
	Time of entry/required exit												
3.6.6 (10 days)	13										13	16	19
Spray pump (72hr)	13			13								9	19
A coolers (7 day)			19							19		16	1
A clr & spray (72hr)			19			19						12	1
3.0.3			19									9	2

83. 022AG2.4.50 001/MODIFIED BANK/SRO/C/A 4.2/4.0/022AG2.4.50/N/3/HBF/VER 4 MODIFIED

The following plant conditions exist on Unit 2:

AT 1000:

- 100% power.
- A Train is on service.
- 2A CCW pump is tagged out to investigate a pump trip which occurred 3 hours earlier.
- 2A Charging pump is in service.

AT 1010, the following event occurs:

- EA3, CHG PUMP LUBE OIL TEMP HI, comes into alarm.
- The Radside systems operator reports the 2A charging pump local temperature is 156°F and rising.

Which one of the following states the **required actions** per EA3, CHG PUMP LUBE OIL TEMP HI, and those actions required to comply with Tech Spec 3.5.2, ECCS-Operating?

A. • Immediately stop the 2A charging pump, then start 2B charging pump.

• Enter T.S. 3.0.3, and place the unit in mode 3 in the next 7 hours.

B. • Immediately stop the 2A charging pump, then start 2B charging pump.

• Rack out DF06, 2A charging pump breaker, AND verify open MOV-8132A and B, CHG PUMP DISCH HDR ISO, within the next 72 hrs.

C. • Start 2B charging pump, then stop the 2A charging pump.

• Enter T.S. 3.0.3, and place the unit in mode 3 in the next 7 hours.

D✓ • Start 2B charging pump, then stop the 2A charging pump.

• Rack out DF06, 2A charging pump breaker, AND verify open MOV-8132A and B, CHG PUMP DISCH HDR ISO, within the next 72 hrs.

Plausibility and Answer Analysis

Initial condition provides the conditions that explain why the plant is not in the "NORMAL" split train alignment. AOP-9.0 would shift the Chg pump to A train, then work to restore the "off-service train"; however since the plant is online, swapping the ON-Service train without both the 2A and 2C CCW pumps available will not be procedurally allowed. Since the ON-service train is in service and capable of continued plant operation, then AOP-9.0 would be exited at step 13 "go to procedure step in effect."

A Incorrect. First part is not correct; this ARP action is correct only if temp were

≥160°F.

The second part is not correct. The T.S. action is not, although both trains of ECCS are inoperable, 100% ECCS flow equivalent is available with B Chg pump aligned to A train (A train On-service). T.S. 3.5.2 is satisfied.

TRM 13.1.5 is also **satisfied** by one pump (Condition A) since the "operability" of the charging pump addresses the ability to borate from the RWST and/or BAT with a charging pump. In this TRM, operability does not require ECCS auto start capability, it only requires the capability of delivering flow from the Borated water sources to the RCS and powered from an operable DG. B Chg pump support conditions are available, and it is aligned to the A train DG, therefore B is an Operable charging pump for the purpose of this TRM and 13.0.3 would **not** be applicable either.

Plausible: This would be the correct--

1) ARP response if temp were ≥ 160°F

2) T.S. action if unable to maintain 100% ECCS flow equivalent avail.

ALSO, if TRM 13.1.5 is inappropriately applied; --- 13.0.3 (3.0.3 equivalent) might be applied since there are NO actions for loss of both "required" charging pumps.

B Incorrect. First part is not correct; ARP-1.5 directs immediate shutdown of the Chg pump only with temp ≥160°F lube oil temp.

The second part is correct which is the TS action.

Due to the B train CCW inoperability, and the unavailability of A Chg pump, in order to gain operability of an ECCS train (TS 3.5.2 - 72 hr) then the A charging pump brkr must be racked out and the discharge cross connects must be verified open SR 3.5.2.1.

C Incorrect. First part, ARP response is correct.

The second part, T.S. Action is incorrect--See A.

Plausible: For T.S. plausibility see A.

D Correct. First part, waiting to stop the 2A charging pump is correct per ARP when temps are less than 160°F.

The second part is correct. The listed actions for T.S. would satisfy T.S. 3.5.2.

K/A statement - 022AG2.4.50-**Loss of Reactor Coolant Makeup**- Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.

Importance Rating:	4.2 4.0
Technical Reference:	FNP-2-ARP-1.5, ver 45.0 T.S. 3.5.2
References to be provided:	None
Learning Objective:	CVCS-52101F02; State the symptoms and predict the impact a loss or malfunction of chemical and volume control system components will have on the operation of CVCS OPS-62520K01: Determine and apply the information form the LCO bases sections for any TS or TRM requirements associated with AOP-16.
Question origin:	Significantly Modified from CVCS-52101F02 18
Comments:	K/A match: System alarm and setpoint which requires action -- immediate action if > 160F otherwise utilize procedure to reduce impact of rising temps; the ARP directs manipulation of controls.
SRO justification:	Requires application surveillance requirements to regain operability of the Charging pump; must apply the generic LCO requirements and knowledge of LCO/TRM information that is listed BELOW-the-line and within the basis.

NOTE TO EXAMINER: a portion of this test item is similiar to that of the simulator JPM g. It was deteremined as not a double jeopardy issue for the following reasons:

1) Although the same annuciator actuates, the cause and the circumstance of the alarm are different. JPM g, the cause is a loss of the support system, whereas the failure in the above question is a failure of the chg pump itself--- with the opposite stby support system inoperable.

2) The MODE and plant impact is different, and the above question challenges a different TS evaluation/action.

3) Although the decision point is common, the pertinent parameters and required actions for each of the two are different.

Question #	83
K/A	022AG2.4.50

REFERENCE Docs

A3	
	CHG PUMP LUBE OIL TEMP HI

SETPOINT: 140°F

ORIGIN: 1. Charging Pump 1A:
a) Temp. Indicating Switch (N1E21TISH3306AA)
b) Temp. Indicating Switch (N1E21TISH3306AB)
2. Charging Pump 1B:
a) Temp. Indicating Switch (N1E21TISH3306BA)
b) Temp. Indicating Switch (N1E21TISH3306BB)
3. Charging Pump 1C:
a) Temp. Indicating Switch (N1E21TISH3306CA)
b) Temp. Indicating Switch (N1E21TISH3306CB)

PROBABLE CAUSE

1. Loss of Component Cooling Water.
2. Improper lineup for Component Cooling Water supply to Oil Coolers.
3. Charging Pump 1A, 1B or 1C bearings overheated or damaged.
4. Instrument failure.

AUTOMATIC ACTION

NONE

OPERATOR ACTIONS

NOTE:	**The requirements in step 1 are for pump consideration only.**

1. Dispatch operator to determine the affected pump and the actual temperature as indicated on the local temperature indicators. IF local temperature indication is:
   1.1 Between 140°F and 155°F, THEN operation may continue during subsequent troubleshooting.
   1.2 Between 155°F and 160°F, THEN consider shutdown of pump.
   1.3 ≥ 160°F, THEN immediately shutdown the affected charging pump.
2. IF a loss of CCW has occurred, THEN perform the actions required by FNP-1-AOP-9.0 LOSS OF COMPONENT COOLING WATER.
3. Start another charging pump and stop the affected pump, in accordance with FNP-1-SOP-2.1, CHEMICAL AND VOLUME CONTROL SYSTEM PLANT STARTUP AND OPERATION.
4. Notify appropriate personnel to locate and correct the cause of the alarm.
5. Refer to Technical Specifications LCOs 3.5.2 and 3.5.3, and Technical Requirements TRs 13.1.2, 13.1.3, 13.1.4, and 13.1.5.

A new Loss of CCW has NOT occurred— step 2 would be N/A. However, if AOP-9.0 entered, then complying with "INTENT" would start the stby chg pump (unaffected) and then stop the running (affected) pump. However, STRICT compliance with AOP-9.0 will align Fire water to an operating Charging pump, (or not address Chg pump cooling at all) since the unaffected TRAIN of CCW or CHG pump in unaffected TRAIN can not be started. (Strict compliance options are not available as an answer).

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.2 ECCS — Operating

LCO 3.5.2 Two ECCS trains shall be OPERABLE.

---NOTES---

1. In MODE 3, the Residual Heat Removal or the Centrifugal Charging Pump flow paths may be isolated by closing the isolation valves for up to 2 hours to perform pressure isolation valve testing per SR 3.4.14.1.

2. Upon entry into MODE 3 from MODE 4, the breaker or disconnect device to the valve operators for MOVs 8706A and 8706B may be locked open for up to 4 hours to allow for repositioning from MODE 4 requirements.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more trains inoperable. AND At least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available.	A.1 Restore train(s) to OPERABLE status.	72 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	6 hours 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.2.1	------------------------NOTE------------------------ Only required to be performed for valves 8132A and 8132B when Centrifugal Charging Pump A is inoperable. --- Verify the following valves are in the listed position with power to the valve operator removed. Number — Position — Function 8884, 8886 — Closed — Centrifugal Charging Pump to RCS Hot Leg 8132A, 8132B — Open — Centrifugal Charging Pump discharge isolation 8889 — Closed — RHR to RCS Hot Leg Injection	12 hours
SR 3.5.2.2	Verify each ECCS manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.5.2.3	Verify each ECCS pump's developed head at the test flow point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.5.2.4	Verify each ECCS automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	18 months

BASES

APPLICABLE SAFETY ANALYSES (continued)

pump delivers sufficient fluid to maintain RCS inventory. For a small break LOCA, the steam generators continue to serve as the heat sink, providing part of the required core cooling.

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

LCO

In MODES 1, 2, and 3, two independent (and redundant) ECCS trains are required to ensure that sufficient ECCS flow is available, assuming a single failure affecting either train. Additionally, individual components within the ECCS trains may be called upon to mitigate the consequences of other transients and accidents.

In MODES 1, 2, and 3, an ECCS train consists of a centrifugal charging subsystem and an RHR subsystem. Each train includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon an SI signal and transferring suction to the containment sump.

During an event requiring ECCS actuation, a flow path is required to provide an abundant supply of water from the RWST to the RCS via the ECCS pumps and their respective supply headers to each of the three cold leg injection nozzles. Each centrifugal charging pump must inject ≥ 495.6 gpm and each RHR pump must inject ≥ 3402 gpm at 40 psig RCS pressure. These flows, in conjunction with the RWST minimum boron concentration, provide sufficient cooling water and negative reactivity to ensure that the ECCS acceptance criteria are satisfied. In the long term, this flow path may be switched to take its supply from the containment sump and to supply its flow to the RCS hot and cold legs.

The flow path for each train must maintain its designed independence to ensure that no single failure can disable both ECCS trains.

The LCO is modified by two notes. Note 1 provides an exception to the LCO which allows the centrifugal charging subsystem flowpath or the RHR subsystem flowpath to be isolated. Both the centrifugal charging and the RHR subsystems may be isolated but not at the same time. Each ECCS subsystem flow path may be isolated for 2 hours in MODE 3, under controlled conditions, to perform pressure isolation valve testing per SR 3.4.14.1. The flow path is readily restorable.

(continued)

BASES

ACTIONS

A.1

With one or more trains inoperable and at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available, the inoperable components must be returned to OPERABLE status within 72 hours. The 72 hour Completion Time is based on an NRC reliability evaluation (Ref. 5) and is a reasonable time for repair of many ECCS components.

An ECCS train is inoperable if it is not capable of delivering design flow to the RCS. Individual components are inoperable if they are not capable of performing their design function or supporting systems are not available.

The LCO requires the OPERABILITY of a number of independent subsystems. Due to the redundancy of trains and the diversity of subsystems, the inoperability of one component in a train does not render the ECCS incapable of performing its function. Neither does the inoperability of two different components, each in a different train, necessarily result in a loss of function for the ECCS. The intent of this Condition is to maintain a combination of equipment such that 100% of the ECCS flow equivalent to a single OPERABLE ECCS train remains available. This allows increased flexibility in plant operations under circumstances when components in opposite trains are inoperable.

Although the A chg pump is INOPERABLE, the functionality of the B charging pump (albeit also INOPERABLE) maintains the OPERABILITY of the A TRAIN ECCS.

Furthermore, despite the impending damage, the A chg pump WOULD autostart until manual action is take to prevent it. This further satisfies the immediate "functionality" of the charging pumps until manual action can be taken thereby the capability to maintain 100% ECCS flow equivalent.

An event accompanied by a loss of offsite power and the failure of an EDG can disable one ECCS train until power is restored. A reliability analysis (Ref. 5) has shown that the impact of having one full ECCS train inoperable is sufficiently small to justify continued operation for 72 hours.

Reference 6 describes situations in which one component, such as an RHR crossover valve, can disable both ECCS trains. With one or more component(s) inoperable such that 100% of the flow equivalent to a single OPERABLE ECCS train is not available, the facility is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be immediately entered.

(continued)

13.1 Reactivity Control Systems

TR 13.1.5 Charging Pumps - Operating

Condition A is entered (mandatory) upon the failure of A Chg pump.

and can be exited after C charging pump is restored OR A charging pump is restored assuming B charging pump remains operable by this TRM's definition of operable.

TR 13.1.5 Two charging pumps shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required charging pump inoperable	A.1 Restore at least two charging pumps to OPERABLE status.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3.	6 hours
	AND	
	B.2 Borate to a SHUTDOWN MARGIN specified in the COLR for MODE 5 at 200°F.	6 hours
	AND	
	B.3 Restore at least two charging pumps to OPERABLE status.	7 days
C. Required Action and associated Completion Time of Condition B not met.	C.1 Be in Mode 5.	30 hours

B 13.1 REACTIVITY CONTROL SYSTEMS

BASES

SHUTDOWN MARGIN

TR 13.1.1 Shutdown Margin

A sufficient SHUTDOWN MARGIN ensures that:

1) the reactor can be made subcritical from all operating conditions,
2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and
3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

SHUTDOWN MARGIN requirements vary throughout core life as a function of fuel depletion, RCS boron concentration, and RCS Tavg. The most restrictive condition occurs at EOL, with Tavg at no load operating temperature, and is associated with a postulated steam line break accident and resulting uncontrolled RCS cooldown. In the analysis of this accident, a minimum SHUTDOWN MARGIN as specified in the COLR is required to control the reactivity transient. Accordingly, the SHUTDOWN MARGIN requirement is based upon this limiting condition and is consistent with FSAR safety analysis assumptions.

Having a STBY charging pump (B chg aligned to A train) maintains the "capability" to provide a boron injection path.

The B chg pump has cooling available (CCW support), also has an "OPERABLE" diesel available (A Train DG is not impacted by the loss of A chg pump nor B train CCW pump) therefore support conditions required for this TS are satisfied, as is the chg pump requirement.

Auto-START (SSPS) capability is not required to satisfy this TRM requirement.

BORATION SYSTEMS

TR 13.1.2 Boration Flow Path- Shutdown
TR 13.1.3 Boration Flow Paths- Operating
TR 13.1.4 Charging Pump- Shutdown
TR 13.1.5 Charging Pumps- Operating
TR 13.1.6 Borated Water Source- Shutdown
TR 13.1.7 Borated Water Sources- Operating

The boron injection system ensures that negative reactivity control is available during each mode of facility operation. The components required to perform this function include 1) borated water sources, 2) charging pumps, 3) separate flow paths, 4) boric acid transfer pumps, and 5) an emergency power supply from OPERABLE diesel generators. With the RCS average temperature above 200°F, a minimum of two boron injection flow paths are required to ensure single functional capability in the event an assumed failure renders one of the flow paths inoperable. The boration capability of either flow path is sufficient to provide the required SHUTDOWN MARGIN from expected operating conditions after xenon decay and cooldown to 200°F. The maximum expected boration capability requirement occurs at EOL from full power equilibrium xenon conditions and requires 11,336 gallons of 7000 ppm borated water from the boric acid storage tanks or 44,826 gallons of 2300 ppm borated water from the refueling water storage tank.

(continued)

2. CVCS-52101F02 018

Given the following plant conditions:

- Unit 1 is operating at 100% power.
- 1A charging pump is on service.
- A Train is the on service train.

EA3, CHG PUMP LUBE OIL TEMP HI, annunciator has come into alarm. The Radside systems operator reports the 1A charging pump local temperature is 165°F and rising. When the 1B charging pump is started and the 1A charging pump is secured IAW SOP-2.1, CVCS system Plant Startup and Operation. Gas intrusion into the CVCS suction piping is indicated by which one of the following?

A. CHG HDR PRESS, PI-121, oscillating and VCT level dropping rapidly.

B.✓ CHG FLOW, FI-122A, oscillating and charging pump motor ammeter oscillating.

C. CHG FLOW, FI-122A, dropping off slowly after an initial spike and VCT level dropping rapidly.

D. CHG HDR PRESS, PI-121, dropping off rapidly after an initial spike and charging pump motor ammeter higher than normal.

This is a reoccurring problem at FNP. We are currently venting the suction piping of the Chg pumps on a routine basis and at present have found some indications of gas/ H2 in the suction piping.

A. Incorrect - Chg Hdr press might oscillate but VCT level will not drop rapidly. It will rise if anything due to the letdown flow and little to no chg flow.

B. Correct - **CHG FLOW FI-122A oscillating and charging pump motor ammeter oscillating.**
EB1 shows the indications of air or gas intrusion into the suction of the chg pump in a caution statement.
CAUTION: Oscillating flow indications and/or oscillating ammeter indications could be indicative of air or gas intrusion into the charging pump suction.

C. Incorrect - If 122 was not closed, flow would initially spike and drop off to a lower value and steady out. This is normal. VCT level would not drop.

D. Incorrect -This is the correct response to a pump start and motor amps would be higher than normal if the pump had more load, not less as in the case of gas in the suction.

ARP- EA3 Correct actions
START ANOTHER CHARGING PUMP AND STOP THE AFFECTED PUMP, IN ACCORDANCE WITH FNP-1-SOP-2.1, CHEMICAL AND VOLUME CONTROL SYSTEM PLANT STARTUP AND OPERATION.

2004 NRC exam

000022 Loss of Rx Coolant Makeup /2 Ability to operate and/or monitor the following as they apply to the loss of RC pump makeup: AA1.01 – CVCS letdown and charging

Predict and explain the following instrument/equipment response expected when performing Chemical and Volume Control System evolutions including the fail condition, alarms, trip setpoints. (OPS40301F08).
• FT-122 Charging Flow
• PI-121 Charging Header Pressure
• FI-122 Charging Flow
• PI-117 VCT Pressure
• LI-115, LI-112 VCT Level
12. Evaluate abnormal plant or equipment conditions associated with the Chemical and Volume Control System and determine the local actions needed to mitigate the consequence of the abnormality. (OPS40301F12)

84. 026A2.04 001/MODIFIED BANK/SRO/C/A 3.9/4.2/026A2.04/N/3/HBF/VER 5 EDITIORIAL

Given the following conditions on Unit 1:

- ESP-1.3, Transfer to Cold Leg Recirculation, is in progress.
- Both A and B ECCS Trains have just been aligned for cold leg recirculation.
- 1A Containment Cooler is tagged out.
- Containment pressure is 29 psig and ↓.
- RWST level is 4.3 feet.
- 1A Containment Spray pump discharge flow drops to 900 gpm, jumps to 1300 gpm, and then begins falling again.
- 1B Containment Spray pump discharge flow reads 2400 gpm and is stable.

Then annunciator CA1, 1A CS PUMP OVERLOAD TRIP, comes into alarm.

Which one of the following describes the potential impact, if any, on the Containment Spray **design function;** and the action required by procedure for this failure?

A. • Containment Iodine may exceed design limits.

• Go to ECP-1.3, Loss of Emergency Coolant Recirculation Caused by Sump Blockage, and stop the 1B CS pump.

B. • Containment Iodine will **NOT** exceed design limits.

• Go to ECP-1.3, Loss of Emergency Coolant Recirculation Caused by Sump Blockage, and stop the 1B CS pump.

C. • Containment Iodine may exceed design limits.

• Continue in ESP-1.3, Transfer to Cold Leg Recirculation, and align both CS pump suctions for Cold Leg Recirculation.

D✓ • Containment Iodine will **NOT** exceed design limits.

• Continue in ESP-1.3, Transfer to Cold Leg Recirculation, and align both CS pump suctions for Cold Leg Recirculation.

PRESUMED: Operational situation, pump bearing overheat and seizure-- results in slowing of motor, break free then seizure until overcurrent/overload --- may be evaluated as cavitation from MCB.

Distractor Analysis:

A. Incorrect, 1) Iodine will not exceed limits; ONLY one Containment Spray train is required to remove iodine from containment atmosphere and maintain concentrations below those assumed in the safety analysis. A loss of 1A CS pump does not impact this requirement since the 1B CS pump is still running. Furthermore, based on procedure completion through alignment of both ECCS trains, it is unlikely that the 1B CS pump would be secured, since alignment is imminent.

2) The 1A Containment spray pump is not cavitating but is showing similar signs of cavitation, and **even IF** ESP-1.3 step 8 were implemented with the assumption that 1A CS pump was caviting, then the RNO action would be evaluated; however, the RNO actions are not appropriate since both LHSI and HHSI are still operating properly, as is the 1B CS pump.

Plausible: 1) Both one CS pump and 1 Ctmt Fan cooler is required for operability per T.S. 3.6.6; required to keep cnmt pressures within safety analysis limits.
2) This would be correct if either the Charging pump or RHR pump were cavitating (Continuous Action step 8 RNO and step 3 of ECP-1.3 with RWST level < 4.5 ft). Securing 1B CS pump is also within alignment of the Continuous Action step 1 of ESP-1.3 with a delay in alignment of the 1B CS pump (not imminent).

B. Incorrect 1) Correct. See A for discussion
2) Incorrect. See A for discussion and plausibility.

C. Incorrect, 1) See A for why condition is incorrect.
2) Correct: Procedure and actions are correct step 10 of ESP-1.3.

Plausible: See A for discussion and plausibility.

D. Correct, 1) one CS pump and one fan is sufficient to prevent any of the parameters exceed their design limits. One Containment Spray train is required to remove iodine from the containment atmosphere and maintain concentrations below those assumed in the safety analysis. A loss of 1A CS pump does not impact this requirement since the 1B CS pump is still running.

2) Procedure and actions are correct step 10 of ESP-1.3.

TS Bases 3.6.6 During a DBA, "a minimum of one containment cooling train with a single OPERABLE fan unit and one containment spray train are required to maintain the containment peak pressure and temperature below the design limits (Ref. 3). Additionally, **one containment spray train is also required to remove iodine from the containment atmosphere and maintain concentrations below those assumed in the safety analysis."**

K/A statement - 026 Containment Spray System--**Ability to (a) predict the impacts of the** *Failure of spray pump* **on the CSS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of** *Failure of spray pump*:

Importance Rating:	3.9 4.2
Technical Reference:	TS Bases 3.6.6 ESP-1.3, ver 19.
References to be provided:	None
Learning Objective:	OPS-62102C01; Assess the facility condition associated with the Containment spray and cooling system components, and based on that assessment, Select the appropriate procedures for normal and abnormal situations.
Question origin:	FNP Bank CS&COOL-62102C01 002 (2006 NRC exam)--Modified to fit part (b) of K/A.
Comments:	K/A match: Requires analysis of the failed pump's impact on the design capability of the CSS; Requires procedural actions for the given failure.
SRO justification:	Evaluation of satisfying facility license requirements utilizing Knowledge of Tech spec bases, also detailed knowledge of procedure not HIGH level.

Question #	84
K/A	026AA2.04

REFERENCE Docs

APPLICABLE SAFETY ANALYSES (continued)

Containment cooling train performance for post accident conditions is given in Reference 3. The result of the analysis is that each train having at least one OPERABLE fan unit with at least 600 gpm SW flow can provide 100% of the required peak cooling capacity during the post accident condition. The train post accident cooling capacity under varying containment ambient conditions, required to perform the accident analyses, is also shown in Reference 5.

The modeled Containment Cooling System actuation from the containment analysis is based upon a response time associated with exceeding the containment High-1 pressure setpoint to achieving full Containment Cooling System air and safety grade cooling water flow.

The Containment Cooling System total response time of 87 seconds, includes signal delay, DG startup (for loss of offsite power), and service water pump startup times (Ref. 4).

The Containment Spray System and the Containment Cooling System satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

During a DBA, a minimum of one containment cooling train with a single OPERABLE fan unit and one containment spray train are required to maintain the containment peak pressure and temperature below the design limits (Ref. 3). Additionally, one containment spray train is also required to remove iodine from the containment atmosphere and maintain concentrations below those assumed in the safety analysis. To ensure that these requirements are met, two containment spray trains and two containment cooling trains with a single OPERABLE fan unit per cooling train with at least 600 gpm SW flow must be OPERABLE. Therefore, in the event of an accident, at least one train in each system operates, assuming the worst case single active failure occurs.

Each Containment Spray System typically includes a spray pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon an ESF actuation signal and manually transferring suction to the containment sump.

Each Containment Cooling System typically includes cooling coils, dampers, fans, instruments, and controls to ensure an OPERABLE flow path.

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: To ensure that SI recirculation flow is maintained at all times, the following steps should be performed without delay.

****

****

CAUTION: No Function Restoration Procedure should be implemented until step 7 has been completed.

****

****

CAUTION: Switchover to recirculation may cause high radiation levels in the auxiliary building.

****

___ 1 [CA] IF RWST level less than 4.5 ft AND alignment for recirculation NOT imminent, THEN stop any pump taking suction from the RWST.

Stopping the CS pump is an attractive distractor since RWST level is <4.5 ft., but since ECCS alignment is complete, then alignment step 9&10 is imminent.

Also, the correct answer choice does NOT preclude stopping the pump if a perceived Delay is expected following the tripped pump.

___Page Completed

Step	Action/Expected Response	Response NOT Obtained

CAUTION: Pump damage will occur if a charging pump or RHR pump is started in a train in which a flow path from the containment sump to the RCS cannot be established or maintained.

Step	Action/Expected Response	Response NOT Obtained
___ 7	**Align ECCS for cold leg recirculation.**	
7.1	Check containment sump level - GREATER THAN 2.4 ft{3.0 ft}. CTMT SUMP LVL [] LI 3594A POST ACCIDENT CTMT WTR LVL [] LR 3594B	7.1 IF both containment sump level indications less than 2.4 ft{3.0 ft}, THEN go to FNP-1-ECP-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION.
7.2	Verify recirculation valve disconnects - CLOSED USING ATTACHMENT 1.	
7.3	Stop both RHR PUMPs.	
7.4	Close RWST TO 1A RHR PUMP Q1E11MOV8809A.	7.4 Perform the following. 7.4.1 Stop the running A train CHG PUMP. 7.4.2 Proceed to step 7.9.
7.5	Align CTMT sump to 1A RHR PUMP. CTMT SUMP TO 1A RHR PUMP [] Q1E11MOV8811A open [] Q1E11MOV8812A open	7.5 Perform the following. 7.5.1 Stop the running A train CHG PUMP. 7.5.2 Proceed to step 7.9.
7.6	Close RHR to RCS HOT LEGS XCON Q1E11MOV8887A.	

Step 7 continued on next page.

____Page Completed

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: Any charging pump with suction aligned to an RHR pump should be stopped prior to stopping the RHR pump.

****

****

CAUTION: Charging pump or spray pump damage will occur if suction is lost and the pump is not secured.

****

NOTE:
- Erratic pump parameters (flow, discharge pressure, amps, etc.) are indications of pump cavitation.
- Step 8 is a continuous action step which applies any time ECCS pumps are aligned to the sump.

___ 8 **Verify ECCS pumps not affected by sump blockage.**

8.1 [CA] Monitor ECCS pump suction conditions - NO INDICATION OF CAVITATION.

CHG PUMP
[] 1A
[] 1B
[] 1C

RHR PUMP
[] 1A
[] 1B

CS PUMP
[] 1A
[] 1B

8 IF both trains are affected such that at least one train of SI recirculation flow cannot be maintained,
THEN go to FNP-1-ECP-1.3, LOSS OF EMERGENCY COOLANT RECIRCULATION CAUSED BY SUMP BLOCKAGE.

Distractor analysis:

If it assumed that a loss of the CS pump is caused by cavitation. .

CS is NOT included in the SI recirculation Flow criteria.

Distractor analysis:
Cnmt pressure > 27 psig with flow <1000 gpm in BOTH trains would result in FRP-Z.1

If <27 psig with flow <1000gpm in both trains then FRP-Z.1 would not be applicable.

____Page Completed

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

9 [CA] Check containment spray.- IN OPERATION.

If stopped before this step is encountered, pump would be restarted for alignment of step 10.

9.1 Check any containment spray pump - STARTED.

CS PUMP
- [] 1A
- [] 1B

RNO 9.1 Verify all available containment spray pumps - RUNNING.

if tripped <27 psig, else FRP-Z.1 will direct these actions

9.2 Check cont … flow in both trains - GREATER THAN 0 gpm.

CS FLOW
- [] FI 958A
- [] FI 958B

RNO 9.2 Perform the following.

9.2.1 <u>IF</u> RWST - GREATER THAN 4.5 ft, <u>THEN</u> verify containment spray pump suction aligned for injection.

N/A- RWST is 4.3 ft

…T TO
…(1B) CS PUMP

- [] Q1E13MOV8817A open
- [] Q1E13MOV8817B open

9.2.2 Verify containment spray pump discharge aligned.

CS PUMP TO SPRAY HDR ISO

- [] Q1E13MOV8820A open
- [] Q1E13MOV8820B open

9.2.3 <u>IF</u> unable to establish spray flow in a train, <u>THEN</u> secure containment spray pump in affected train.

- [] CS RESET
  TRN A(B) containment spray signals - RESET (Annunciator EE4 clear).
- [] CTMT SPRAY PUMP 1A(B) - STOPPED in affected train

___Page Completed

Step	Action/Expected Response	Response NOT Obtained
___10	**[CA] <u>WHEN</u> RWST level less than 4.5 ft, <u>THEN</u> align containment spray for recirculation.**	
	10.1 Reset PHASE B CTMT ISO. [] MLB-3 1-1 not lit [] MLB-3 6-1 not lit	
	10.2 Open containment spray pump containment sump suction isolation valves. CTMT SUMP TO 1A(1B) CS PUMP [] Q1E13MOV8826A [] Q1E13MOV8827A [] Q1E13MOV8826B [] Q1E13MOV8827B	alignment without a CS pump running relies on a check valve to prevent reverse flow into the RWST, but this is not the desired action and the only restart direction for a CS pump is in step 9. IF the CS pump was secured per CA step 1, then this alignment still occurs
	10.3 Close containment spray pump RWST suction isolation valves. RWST TO 1A(1B) CS PUMP [] Q1E13MOV8817A [] Q1E13MOV8817B	
	10.4 [CA] <u>WHEN</u> containment spray recirculation flow has been established for at least 8 hours, <u>AND</u> containment pressure is less than 16 psig, <u>THEN</u> stop both CS PUMPs.	
	10.5 Makeup to the RWST as necessary.	
	10.5.1 Makeup to the RWST in accordance with FNP-1-SOP-2.3, CHEMICAL AND VOLUME CONTROL SYSTEM REACTOR MAKEUP CONTROL SYSTEM. <u>OR</u> 10.5.2 Consult TSC staff to determine alternate method of makeup to the RWST.	

___Page Completed

Step	Action/Expected Response	Response NOT Obtained
___11	**[CA] Determine criteria to be used for Transfer to Hot-Leg Recirculation requirements.**	
11.1	Check FNP-1-EEP-1, LOSS OF REACTOR OR SECONDARY COOLANT procedure in effect.	11.1 Consult TSC to determine Transfer to Hot-Leg Recirculation requirements.
___12	**Go to procedure and step in effect.**	

-END-

START	STEP	CONTINUOUS ACTION
☐	1	[CA] IF RWST level less than 4.5 ft AND alignment for recirculation NOT imminent, THEN stop any pump taking suction from the RWST.
☐	8	8.1 [CA] Monitor ECCS pump suction conditions - NO INDICATION OF CAVITATION.
☐	9	[CA] Check containment spray.- IN OPERATION.
☐	10	[CA] WHEN RWST level less than 4.5 ft, THEN align containment spray for recirculation. 10.4 [CA] WHEN containment spray recirculation flow has been established for at least 8 hours, AND containment pressure is less than 16 psig, THEN stop both CS PUMPs.
☐	11	[CA] Determine criteria to be used for Transfer to Hot-Leg Recirculation requirements.

1. CS&COOL-62102C01 002

Given the following conditions on Unit 1:

- 1A Containment Cooler is tagged out and still selected on the Containment Cooler A Train selector switch.
- The plant was at 95% power when a large-break LOCA occurred inside Containment.
- The crew has taken required response actions.
- Safety Injection and Containment Spray have actuated per design.
- RWST level has decreased to 4.3 feet, and Containment Spray has been aligned to the Containment sump.

Which one of the following statements is correct if 1A Containment Spray pump tripped on overload at this time ?

A. Containment Pressure, Temperature and Iodine will exceed their design limits.

B. Containment Pressure and Temperature will exceed design limits, Iodine will not exceed design limits.

C. Containment Temperature and Iodine will exceed design limits, Pressure will not exceed design limits.

D✓ Containment Pressure, Temperature and Iodine will not exceed their design limits.

Distractor Analysis:

A. Incorrect, none will exceed their limits.

B. Incorrect, none will exceed their limits.

C. Incorrect, none will exceed their limits.

D. Correct, one CS pump and one fan will not let any of the parameters exceed their design limits.

TS Bases 3.6.6; OPS-52102C

OPS-52102C
One spray train adequately provides the required heat removal capability inside containment for all postulated accidents. This capability equates to that of three containment cooling fans. Thus, the containment spray system provides adequate back-up cooling capacity. The cooling units cannot provide back-up capability to the containment spray system because the units cannot remove iodine.
The containment spray system consists of two redundant and independent containment spray trains. They are designed so that a single active failure during the injection phase or a single active or passive failure during the recirculation phase following a reactor coolant system (RCS) failure does not result in loss of the protective function.

TS Bases 3.6.6 During a DBA, a minimum of one containment cooling train with a single OPERABLE fan unit and one containment spray train are required to maintain the containment peak pressure and temperature below the design limits (Ref. 3). Additionally, one containment spray train is also required to remove iodine from the containment atmosphere and maintain concentrations below those assumed in the safety analysis. To ensure that these requirements are met, two containment spray trains and two containment cooling trains with a single OPERABLE fan unit per cooling train with at least 600 gpm SW flow must be OPERABLE. Therefore, in the event of an accident, at least one train in each system operates, assuming the worst case single active failure occurs.

2006 NRC exam

K/A: Containment Spray System (CSS) - Knowledge of the effect that a loss or malfunction of the CSS will have on the following: CCS.

85. 027AA2.04 001/NEW/SRO/C/A 3.7/4.3/027AA2.04/N/3/HBF/VER 4 EDITORIAL

Unit 2 is at 100% power when the following occurs:

PK-444C, 2A Loop Spray Vlv, controller **output** sticks at an intermediate value and can **NOT** be raised or lowered in auto or manual.

- PCV-444C, 2A Loop Spray Vlv, is in manual control and the closed indication is **NOT** LIT.
- PCV-444D, 2B Loop Spray Vlv, is in manual control and the closed indication is LIT.
- All PRZR heaters are energized in manual.
- PRZR Press is 2205 psig and stable.
- The plant has not been tripped due to stable PRZR pressure.
- I & C will require 1 hour to repair PK-444C.

Which one of the following describes Tech Spec 3.4.1, RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits, REQUIRED ACTIONS, and the **minimum** permission required to authorize returning PK-444C to automatic control after repairs are made and RCS pressure is returned to normal?

A.✓ • Stabilize plant at current power level.

• The Shift Manager authorizes returning PK-444C to automatic control.

B. • Stabilize plant at current power level.

• The Shift Supervisor authorizes returning PK-444C to automatic control.

C. • Immediately begin a downpower until pressure is restored.

• The Shift Manager authorizes returning PK-444C to automatic control.

D. • Immediately begin a downpower until pressure is restored.

• The Shift Supervisor authorizes returning PK-444C to automatic control.

Plausibility and Answer Analysis

A Correct. PRZR Pressure is below T.S. limit, 2 hours (condition A) is allotted to restore RCS pressure.
Since the transient is no longer in progress, the SM must approve recovery efforts. NMP-OS-007, 5.5.8.3 states that the SM must be consulted for recovery efforts.

B Incorrect. the SM has this authority per NMP-OS-007, section 5.5.8.

Plausible: The SS has the authority to direct actions in accordance with applicable plant procedures **until conditions are stable and a transient conditions no longer exists.** (NMP-OS-007 para 5.5.8.2)

C Incorrect. Immediate down power is not required by T.S., since Condition A provides 2 hour action time. TS 3.4.1 DNB spec is to ensure that the minimum DNBR will be met for each of the analyzed transients. Short term perturbations are acceptable and 2 hours is sufficient time to identify the cause and restore to within limits.

Plausible Safety limit DNB criterion requires Mode 3 **within 1 hour.** Since Safety limits address DNB parameters this 1 hour limit might be misapplied.

Also, AOP-100 states that a Rx Trip is required before dropping below 2100 psig. In the given circumstances this trip criteria is not warranted (and not initiated; as stated in the stem), but may be perceived as an urgent requirement which could be construed to require immediate implementation of a shutdown without knowledge of the completion time or the basis of the completion time.

D Incorrect. See C. See B.

K/A statement - 027AA2.04 PZR PCS Malfunction- **Ability to determine and interpret** *Tech-Spec limits for RCS pressure* **as they apply to the PZR PCS Malfunction.**

Importance Rating:	3.7 4.3
Technical Reference:	TS 3.4.1/ B3.4.1 NMP-OS-007 ver 4.0 ACP-16.1, ver 6.0
References to be provided:	none
Learning Objective:	OPS-62521Q01; Determine and apply the information from the LCO bases [...] for any TS or TRM requirements associated with AOP-100.
Question origin:	NEW
Comments:	K/A match: Requires knowledge of (determine) the T.S. Completion Time and/or basis (interpret) of the T.S. for RCS DNB pressure limit.
SRO justification:	SRO knowledge of T.S. Completion time basis and/or knowledge of completion time >1 hour. Also requires knowledge of SS/SM responsibilities of NMP-OS-007.

Question # 85

K/A 027AA2.42

REFERENCE Docs

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits

LCO 3.4.1 RCS DNB parameters for pressurizer pressure, RCS average temperature, and RCS total flow rate shall be within the limits specified in the COLR. The minimum RCS total flow rate shall be ≥ 263,400 GPM when using the precision heat balance method, ≥ 264,200 GPM when using the elbow tap method, and ≥ the limit specified in the COLR.

APPLICABILITY: MODE 1.

-----------------------------------NOTE-----------------------------------
Pressurizer pressure 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. One or more RCS DNB parameters not within limits.	A.1 Restore RCS DNB parameter(s) to within limit.	2 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 2.	6 hours

2.12 RCS DNB Parameters for Pressurizer Pressure, RCS Average Temperature, and RCS Total Flow Rate (Specification 3.4.1)

2.12.1 RCS DNB parameters for pressurizer pressure, RCS average temperature, and RCS total flow rate shall be within the limits specified below:

a. Pressurizer pressure ≥ 2209 psig;
b. RCS average temperature ≤ 580.3 °F; and
c. The minimum RCS total flow rate shall be ≥ 263,400 GPM when using the precision heat balance method and ≥ 264,200 GPM when using the elbow tap method.

5.5.3.3 Personnel or equipment safety require it, or

5.5.3.4 Unusual circumstances warrant it.

5.5.4 Maintains a broad perspective of operational conditions affecting the safety of the plant as a matter of highest priority at all times. During plant transients or an emergency, he should not become totally involved in any single operation that distracts him from the remainder of the control room. The Shift Supervisor shall refrain from the manipulation of plant controls or operation of plant equipment so as to avoid focusing attention on a narrow perspective. (Commitments 5029 FNP, 199030615 HNP, 1991300139 HNP, NUREG 0737)

5.5.5 In accordance with the requirements of procedure NMP-OS-001, "Reactivity Management Program" and any associated instruction and guidelines, the Shift Supervisor maintains responsibility and oversight of activities that could affect core reactivity. The Shift Supervisor (SS) has the authority and responsibility for controlling the reactor core and maintaining the highest standards of nuclear safety. His approval must be obtained prior to conducting any evolutions or testing that affect core reactivity. Implementation of any recommendations affecting reactor operation must have the concurrence of the Shift Supervisor and other management as appropriate. (SOER 96-02).

5.5.6 Ensures that plant operations are conducted per the Technical Specifications, Holtec HI-STAR/HI-STORM TS (HTS), Technical Requirements, ODCM, and approved procedures. A senior licensed operator on shift makes operability declarations per NMP-AD-012, "Operability Determinations and Functionality Assessments for Resolution of Degraded and Nonconforming Conditions Adverse to Quality or Safety". (Commitment 1989301023, 1989301024 HNP)

5.5.7 In direct charge of unit operation during startup, power operation, and shutdown. (Commitment 5881 FNP)

5.5.8 Ensures response to plant transients is appropriate; including ascertaining plant response is as expected.

5.5.8.1 During a transient, the SS will verify immediate operator actions being performed by the Reactor Operators.

5.5.8.2 After assessing the situation, the SS will direct subsequent operator actions in accordance with applicable procedures until conditions are stable and a transient condition no longer exists.

5.5.8.3 Following plant stabilization and/or termination of the transient, consults the SM to ascertain the necessary recovery efforts of the plant.

5.5.9 Keep the SM informed of unit status. (Commitment 5881 FNP) Promptly notifies the SM for:

- Any entry into an unplanned LCO,
- Any AOP/EOP entry,
- Any time there is a decision which is being made in knowledge base instead of rule base in response to a failure or transient.

BASES

APPLICABILITY

In MODE 1, the limits on pressurizer pressure, RCS coolant average temperature, and RCS flow rate must be maintained during steady state operation in order to ensure DNBR criteria will be met in the event of an unplanned loss of forced coolant flow or other DNB limited transient. In all other MODES, the power level is low enough that DNB is not a concern.

A Note has been added to indicate the limit on pressurizer pressure is not applicable during short term operational transients such as a THERMAL POWER ramp > 5% RTP per minute or a THERMAL POWER step > 10% RTP. These conditions represent short term perturbations where actions to control pressure variations might be counterproductive. Also, since they represent transients initiated from power levels < 100% RTP, an increased DNBR margin exists to offset the temporary pressure variations.

The DNBR limit on DNB related parameters is provided in SL 2.1.1, "Reactor Core SLs." The conditions that define the DNBR limit are less restrictive than the limits of this LCO, but violation of a Safety Limit (SL) merits a stricter, more severe Required Action. Should a violation of this LCO occur, the operator must check whether or not an SL may have been exceeded.

ACTIONS

A.1

RCS pressure and RCS average temperature are controllable and measurable parameters. With one or both of these parameters not within LCO limits, action must be taken to restore parameter(s).

RCS total flow rate is not a controllable parameter and is not expected to vary during steady state operation. If the indicated RCS total flow rate is below the LCO limit, power must be reduced, as required by Required Action B.1, to restore DNB margin and eliminate the potential for violation of the accident analysis bounds.

The 2 hour Completion Time for restoration of the parameters provides sufficient time to adjust plant parameters, to determine the cause for the off normal condition, and to restore the readings within limits, and is based on plant operating experience.

(continued)

11. 027G2.2.42 001/NEW/SRO/C/A 3.9/4.6/027G2.2.42/NO/4/HBF/VER 5 MODIFIED

Unit 1 is in Mode 5, preparing to enter Mode 4 with the following plant conditions:

- STP-16.14, ECCS Recirculation Fluid pH Control System Verification, has just been completed with the following results:
  - **1A Basket** is reported to have broken mesh, the Trisodium Phosphate (TSP) is spilling out, and level is between the MIN and MAX level mark.
  - **1B Basket** is reported to have level equal to the MAX level mark.
  - **1C Basket** level is equal to the MIN level mark and the TSP is lumped/caked up.

Which one of the following states the operability status of the Recirc sump per TS 3.5.6, The ECCS Recirculation Fluid pH Control System, and the reason?

The ECCS Recirculation Fluid pH control System is __(1)__, because the __(2)__

	(1)	(2)
A.	Operable	volume is sufficient in all three baskets.
B.	Operable	volume and integrity is sufficient in 2 of 3 baskets.
C.	Inoperable	integrity of 1A basket is unacceptable and the lumped/caked TSP in the 1C basket is unacceptable.
D.✓	Inoperable	integrity of ONLY 1A basket is unacceptable.

NOTE: TS 3.5.6 is not applicable in MODE 5, however, the STP-16.14 is performed while in MODE 5 prior to entry into MODE 4, therefore although the TS is not "applicable" while in MODE 5, the system would still be "INOPERABLE" and required to be restored to "OPERABLE" prior to Mode 4 entry.

Plausibility and Answer Analysis

A Incorrect. Although levels in all baskets are adequate, the basket's integrity **is also** required for the system to be considered operable.

Plausible: The contents of the basket > min is adequate to adjust pH to required levels post accident. TSP dissolves into the Recirculation sump and it would be plausible to believe that adequate volume is all required to satisfy operability (REQUIRES knowledge of SR 3.5.6.1); STP-16.14 contains a note that states, "broken, crimped or oxidized screen mesh is acceptable" assuming the contents are contained.

incorrect CONDITION: 3/3 level only=operable

B Incorrect. **All three** baskets are required for the system to be considered operable.

Plausible: 2 of 3 is the standard redundancy of ECCS system and could be assumed to be applied to the TSP baskets.

incorrect CONDITION: 2/3 = operable

C Incorrect. The reason is incorrect, the 1B ECCS sump TSP basket meets the operability requirements of SR 3.5.6.1 (STP-16.14); the lumps in the 1C TSP basket is, per T.S. basis, an analyzed condition, and acceptable.

Plausible: Because since the lumps/caking of the TSP may be considered outside of allowance.

incorrect Condition: 2/3 inoperable

D Correct. The clumps in 1C are within design. Also, the 1B integrity is satisfied since the contents of the basket are contained. ONLY the 1A basket is not satisfying the operability requirements, and since all 3 baskets are required, the system is inoperable.

Correct Condition: 1/3 inoperable.

K/A statement - 027 Containment Iodine Removal System
2.2.42 **Ability to recognize system parameters that are entry-level conditions for Technical Specifications.**

Importance Rating:	3.9 4.6
Technical Reference:	STP-16.14, ver 5.0 TS Basis B3.5.6-5 rev 0.
References to be provided:	None
Learning Objective:	OPS-62102C01; Recall and apply the information form the LCO bases sections for any TS or TRM requirements associated with the containment spray and cooling system and attendant equipment alignment to include: TS 3.5.6
Question origin:	NEW
Comments:	K/A match -- Requires recognition of TSP basket conditions regarding SR 3.5.6 requirements to determine operability of ECCS pH system.
SRO justification:	Knowledge of TS bases (and Surveillance requirements) to analyze satisfaction of LCO.

Question #	86
K/A	027G2.2.42

REFERENCE Docs

BASES

APPLICABILITY (continued)

In MODES 5, and 6, the probability and consequences of an event requiring the ECCS Recirculation Fluid pH Control System are reduced due to the pressure and temperature limitations in these MODES. Thus, the ECCS Recirculation Fluid pH Control System is not required OPERABLE in MODES 5 and 6.

ACTIONS

A.1

With the ECCS Recirculation Fluid pH Control System inoperable, the system must be restored to OPERABLE status within 72 hours.

The ability to adjust the recirculation fluid pH to the required range and the resulting iodine retention and corrosion protection may be reduced in this condition. The 72 hour Completion Time is based on the passive nature of the system design and the low probability of an event occurring during this time that would require the ECCS Recirculation Fluid pH Control System function.

B.1 and B.2

If the ECCS Recirculation Fluid pH Control System cannot be restored to OPERABLE status within the required Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 84 hours. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner without challenging plant systems. The extended interval to reach MODE 5 allows additional time for restoration of the system and is reasonable considering that the driving force for a release of radioactive material from the RCS is reduced in MODE 3.

SURVEILLANCE REQUIREMENTS

SR 3.5.6.1

In order to achieve the desired pH range of 7.5 to 10.5 in the post-LOCA recirculation solution a total of between 10,000 pounds (185 ft^3) and 12,900 pounds (215 ft^3) of TSP (or appropriate weights/volumes for equivalent compounds) is required. A visual inspection is performed to verify the structural integrity and content volume of the

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.6.1 (continued)

three TSP storage baskets. The baskets are marked with a minimum and maximum fill level that corresponds to a total TSP volume of between 185 ft^3 and 215 ft^3. The verification that the storage baskets contain the required amount of trisodium phosphate is accomplished by verifying that the TSP level is between the indicated fill marks on the baskets. The intent of the surveillance requirement is to verify containment of the TSP by visual inspection. Therefore, broken, crimped, or oxidized screen mesh is acceptable as long as the contents are contained. Also, lumps/caking is an analyzed condition. The 18 month frequency is based on the passive nature of the system and the low probability of an undetected change in the TSP volume occurring during the surveillance interval.

REFERENCES

1. FSAR, Section 6.2.
2. FSAR, Section 15.

FARLEY NUCLEAR PLANT
UNIT 1
SURVEILLANCE TEST PROCEDURE STP-16.14

ECCS RECIRCULATION FLUID pH CONTROL SYSTEM VERIFICATION

1.0 Purpose

To verify the operability of the ECCS Recirculation Fluid pH Control System.

2.0 Acceptance Criteria

2.1 Verify that the three (3) trisodium phosphate storage baskets are in place.

2.2 Verify that the trisodium phosphate baskets have maintained their structural integrity.

2.3 Verify that the trisodium phosphate level in the storage baskets is between the indicated fill marks (MIN LEVEL and MAX LEVEL).

NOTE: Asterisk (*) indicates steps associated with Acceptance Criteria.

3.0 Initial Condition

_____ 3.1 The version of this procedure has been verified to be the current version. (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 unit is shutdown.

_____ 3.4 The containment building is open for access.

4.0 Precautions and Limitations

4.1 Steps and substeps of 5.1.1, 5.1.2, 5.1.3 and 5.1.4 may be performed in any order.

5.0 Instructions

5.1 Perform a visual inspection of the ECCS Recirculation Fluid pH Control System as follows:

____ *5.1.1 Verify that the three (3) trisodium phosphate storage baskets are in place. (Refer to Figure 1 for basket locations.)

NOTE: The basis for the integrity check is to verify that the storage baskets are capable of physically containing the trisodium phosphate. Therefore, broken, crimped, or oxidized screen mesh is acceptable as long as the contents of the basket are contained. However, CRs should be submitted on all noted deficiencies.

*5.1.2 Visually inspect the 1A Trisodium Phosphate Basket (Q1E13K003A) for integrity and proper trisodium phosphate level as follows:

____ 5.1.2.1 Verify there are no tears, in the mesh that is accessible, that are preventing the mesh from retaining the contents of the basket.

____ 5.1.2.2 Verify there are no holes, in the basket structure that is accessible, that are preventing the basket from retaining the contents of the basket.

____ 5.1.2.3 Verify the inspection cover is lifted or removed as necessary to gain access for level verification.

NOTE: The trisodium phosphate should be approximately leveled with a gloved hand or other suitable device to ensure an accurate level indication of the contents.

____ 5.1.2.4 Verify the trisodium phosphate surface is leveled side to side in the basket to the extent necessary to provide an accurate level indication.

____ 5.1.2.5 Verify level of the contents in the 1A Trisodium Phosphate Basket (Q1E13K003A) is between the MIN LEVEL and MAX LEVEL marks.

87. 065AG2.4.47 014/BANK/SRO/C/A 4.2/4.2/065AG2.4.47/Y/3/HBF/VER 4 MODIFIED

Unit 1 is at 100% power when an air line break results in a High Penetration Room Pressure Isolation signal actuation and the following conditions:

- KD2, INSTRUMENT AIR PRESSURE LO, is in alarm.
- RCP Seal injection flow to RCPs are as follows:
  - FI-130A, 1A RCP = 13.6 gpm
  - FI-127A, 1B RCP = 13.5 gpm
  - FI-124A, 1C RCP = 11.3 gpm
- Avg. PZR pressure is 2235 psig and rising.
- PI-121, CHG HDR PRESS = 2420 psig.

After repairs, the seal injection parameters are stabilized as follows:

- HIK-186, Seal WTR Injection, is set to 25%.
- RCP Seal injection flow to RCPs are as follows:
  - FI-130A, 1A RCP = 8.5 gpm
  - FI-127A, 1B RCP = 8.5 gpm
  - FI-124A, 1C RCP = 8.3 gpm
- Avg. PZR pressure is 2235 psig and stable.
- PI-121, CHG HDR PRESS = 2420 psig.

Given the above conditions, which one of the following states the requirement to adjust seal injection flow, if any, AND the basis for maintaining Seal Injection flow within the limits T.S. 3.5.5, Seal Injection Flow Limits?

Adjustment of the individual RCP seal injection throttle valves __(1)__ required;

The seal injection flow **HIGH** limit of T.S. 3.5.5 is to ensure __(2)__

REFERENCE PROVIDED

	(1)	(2)
A.✓	IS	adequate ECCS flow is available following a LOCA.
B.	IS	RCP seal integrity is maintained.
C.	IS NOT	RCP seal integrity is maintained.
D.	IS NOT	adequate ECCS flow is available following a LOCA.

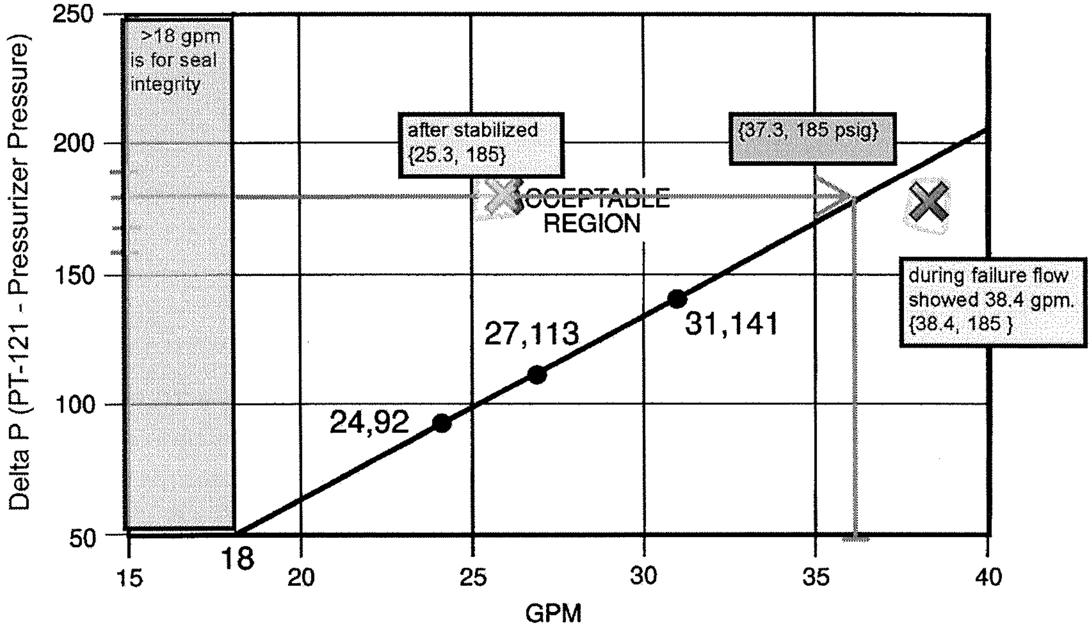
Plausibility and Answer Analysis

This TS ensures "that seal injection [...] will be **sufficient for RCP seal integrity but limited** so that the **ECCS trains** will be **capable of delivering sufficient water** to match boil-off rates soon enough to minimize uncovering of the core f**ollowing a large LOCA**". (TS B3.5.5-1).

LOW limit = LIGHT vertical line at 18 gpm {F(y)= 18} for seal integrity requirements (STP-8.0 fig. 1; clarifies demonstration of limit).

HIGH LIMIT = DARK line shown { f(x)= 7*(x+18) +50}

This evaluation must be performed with **HIK-186 full open** per TSR 3.5.5.1. The flow conditions during the loss of air [with HIK-186 full open] (required by TSR 3.5.1) with the differential pressure of 180 psid demonstrates that the throttle valves require adjustment.



A Correct. 1) Lowering seal injection flow **IS** required. The operating point {38.4 gpm, 180 psid} revealed due to the loss of air is below and to of the right of curve. Reduction of SI flow is required to return to acceptable region for same DP conditions with HCV-186 full open.
2) high limit for ECCS flow; see excerpt from above.

B Incorrect. 1) Lowering seal injection flow **IS** required. See A.
2) Incorrect but plausible since the LOW limit shown on the curve >18 gpm is for seal integrity; the HIGH Limits shown by line { f(x)= 7*(x+18) +50} is to ensure ECCS flow is sufficient during certain Large LOCA conditions.

C Incorrect. 1) See A #1 Plausible : The operating point {25.3 gpm, 185 psid} is in the "acceptable region", however this is the inappropriate evaluation of Seal injection flow since HIK-186 is throttled. (SR 3.5.5.1).

Normally, TS compliance is NOT evaluated during a transient, or using the transient parameters. HOWEVER, in this case, SR 3.5.5.1 compliance is confirmed by establishing the same parameters created by the given failure (STP-8.0)--- also P&L STP-8.0 State immediate evaluation of seal injection flow is required when changes are made to the letdown conditions (2 to 1 orifice). The condition of Letdown is not required to be stated since the evaluation of the TS is directed, and the _recognition of the need f_or the evaluation _is not required._
2) See B#2

D Incorrect. 1) Incorrect See C #1

2) Correct See A#2.

K/A statement - Loss of Instrument Air- Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.

Importance Rating:	4.2 4.2
Technical Reference:	D-175034 sheets 2 and 3 T.S. 3.5.5 T.S B3.5.5-1 through 3 STP-8.0, ver 20.0
References to be provided:	TS 3.5.5-1 through 3.5.5-3, Seal injection Flow
Learning Objective:	OPS-62101F01; Recall and apply the information from the LCO bases sections for any TS or TRM requirement associated with the CVCS and attendant equipment alignment to include: TS 3.5.5
Question origin:	NEW
Comments:	The initial conditions demonstrate system trends and alarms expected for an air leak, with mal-adjusted seal injection throttle valves. The loss of air condition creates the system trends necessary to properly identify this mal-adjustment. The Chg pump has a degraded condition initially to establish the necessary conditions to challenge the limits of this Spec. However the pump remains operable per the pressure requirements of the TRM. Also, the system pressures are provided within the requirements of SR 3.5.5.1 to allow proper evaluation of the parameters both before and after the failure. P&L STP-8.0 State immediate evaluation of seal injection flow is required when changes are made to the letdown conditions (2 to 1 orifice). This condition of Letdown is not required to be stated since the evaluation of the TS is directed in the stem, and the recognition of the need for the evaluation is not required. K/A match: trend evaluation is necessary to properly evaluate TS 3.5.5. MCR reference material is satisfied by providing TS 3.5.5 for evaluation of required action.
SRO justification:	SRO level achieved based on implementation of TS Surveillance and "Below the line" figure of TS.

Question #	87
K/A	065AG2.4.47

REFERENCE Docs

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.5 Seal Injection Flow

LCO 3.5.5 Reactor coolant pump seal injection flow shall be within limits.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Seal injection flow not within limit.	A.1	Adjust manual seal injection throttle valves in accordance with SR 3.5.5.1.	4 hours
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 3.	6 hours
	AND		
	B.2	Be in MODE 4.	12 hours

SURVEILLANCE REQUIREMENTS

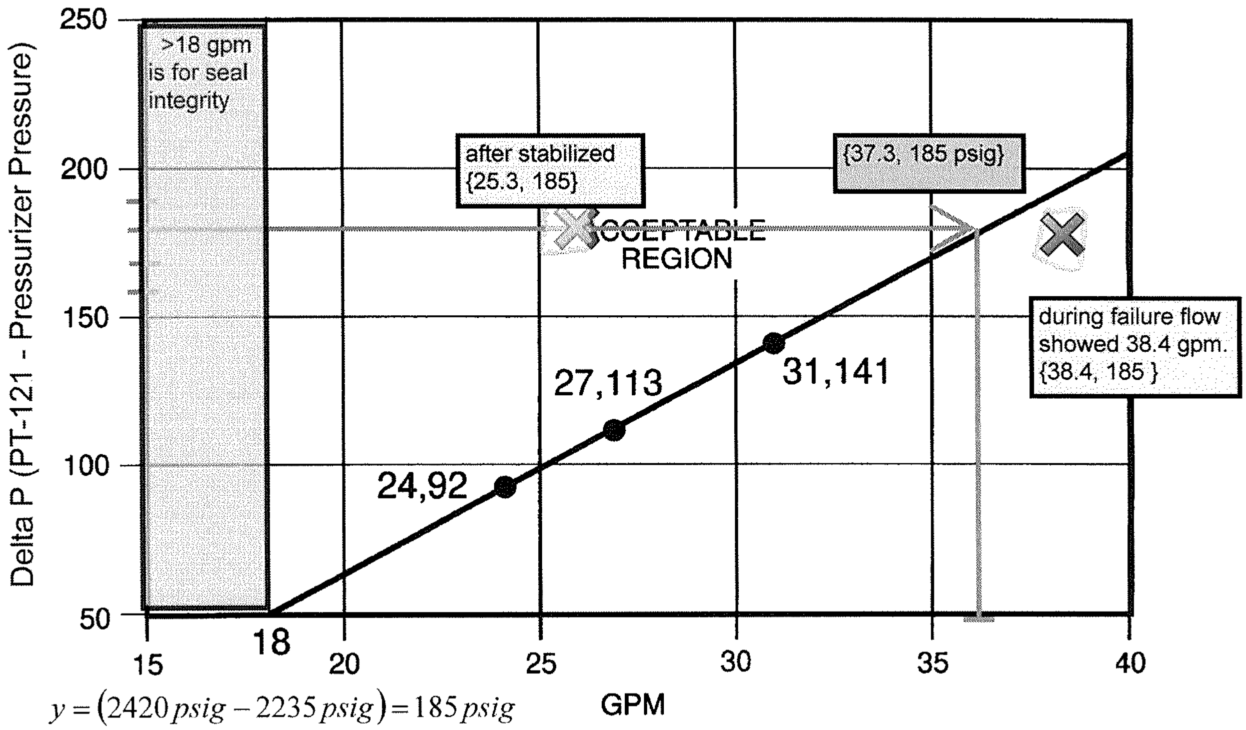
SURVEILLANCE		FREQUENCY
SR 3.5.5.1	-------------------------------NOTE---------------------------- Not required to be performed until 4 hours after the Reactor Coolant System pressure stabilizes at ≥ 2215 psig and ≤ 2255 psig. -- Verify manual seal injection throttle valves are adjusted to give a flow within the limits of Figure 3.5.5-1 with the seal water injection flow control valve full open.	31 days

$$y = (2420\,psig - 2240\,psig) = 180\,psig$$

$$x_{lim} = \left(\frac{180 - 50}{7}\right) + 18 = 36.6\,gpm$$

$$x_{actual} = 13.6 + 13.5 + 11.3 = 38.4\,gpm$$

$$x_{actual} > x_{lim}$$



$$y = (2420\,psig - 2235\,psig) = 185\,psig$$

$$x_{lim} = \left(\frac{185 - 50}{7}\right) + 18 = 37.3\,gpm$$

Current values for Seal injection inappropriately utilized:

$$x_{actual} = 8.5 + 8.5 + 8.3 = 25.3\,gpm$$

$x_{actual} < x_{lim}$, if this were a correct assessment, then no adjustement requried.

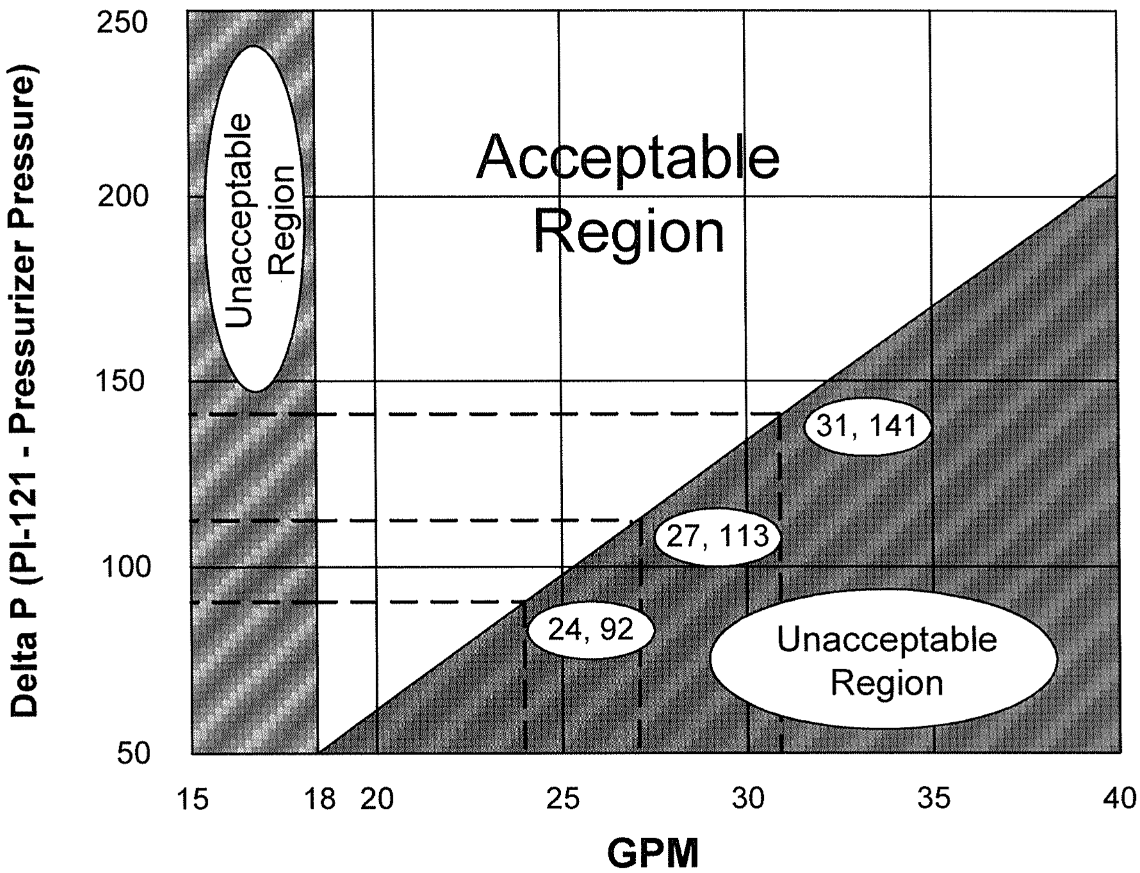
IF HK-186 opened, then flow would return to failure flows:

$$x_{actual} = 13.6 + 13.5 + 11.3 = 38.4\,gpm$$

$$x_{actual} > x_{lim}$$

Figure 3.5.5-1 Seal Injection Flow Limits

FIGURE 1



*** FOR Delta P's > 250 PSID the Flow Limit is 40 GPM.**

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.5 Seal Injection Flow

BASES

BACKGROUND

This LCO is applicable only to those units that utilize the centrifugal charging pumps for safety injection (SI). The function of the seal injection throttle valves during an accident is similar to the function of the ECCS throttle valves in that each restricts flow from the centrifugal charging pump header to the Reactor Coolant System (RCS).

The restriction on reactor coolant pump (RCP) seal injection flow limits the amount of ECCS flow that would be diverted from the injection path following an accident. This limit is based on safety analysis assumptions that are required because RCP seal injection flow is not isolated during SI.

APPLICABLE SAFETY ANALYSES

One ECCS train (i.e. one RHR and one centrifugal charging pump) is assumed to fail during a large break loss of coolant accident (LOCA) at full power (Ref. 1). The LOCA analysis establishes the minimum flow for the ECCS pumps. The centrifugal charging pumps are also credited in the small break LOCA analysis. This analysis, and the LOCA mass and energy release analysis, establish the flow and discharge head at the design point for the centrifugal charging pumps. The steam generator tube rupture, main feedwater line break, and main steam line break event analyses also credit the centrifugal charging pumps, but are not limiting in their design. Reference to these analyses is made in assessing changes to the Seal Injection System for evaluation of their effects in relation to the acceptance limits in these analyses.

This LCO ensures that seal injection flow with the seal water injection flow control valve full open, will be sufficient for RCP seal integrity but limited so that the ECCS trains will be capable of delivering sufficient water to match boiloff rates soon enough to minimize uncovering of the core following a large LOCA. It also ensures that the centrifugal charging pumps will deliver sufficient water for a small LOCA and sufficient boron to maintain the core subcritical. For smaller LOCAs, the charging pumps alone deliver sufficient fluid to overcome the loss and maintain RCS inventory. Seal injection flow satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

The intent of the LCO limit on seal injection flow is to make sure that flow through the RCP seal water injection line is low enough to ensure that sufficient centrifugal charging pump injection flow is directed to the RCS via the injection points (Ref. 2).

The LCO is not strictly a flow limit, but rather a flow limit based on a flow line resistance. In order to establish the proper flow line resistance, a pressure and flow must be known. The flow line resistance is established by adjusting the reactor coolant pump seal injection needle valves to provide a total seal injection flow in the Acceptable Region of Figure 3.5.5-1 at a given pressure differential between the charging header pressure and the pressurizer pressure. The centrifugal charging pump discharge header pressure remains essentially constant through all the applicable MODES of this LCO. A reduction in RCS pressure would result in more flow being diverted to the RCP seal injection line than at normal operating pressure. The valve settings established at the prescribed centrifugal charging pump discharge header pressure result in a conservative valve position should RCS pressure decrease. The additional modifier of this LCO, the seal water injection flow control valve being full open, is required since the valve is designed to fail open for the accident condition. With the discharge pressure and control valve position as specified by the LCO, a resistance limit is established. It is this resistance limit that is used in the accident analyses.

The limit on seal injection flow (operation in the Acceptable Region of Figure 3.5.5-1) and an open wide condition of the seal water injection flow control valve, must be met to render the ECCS OPERABLE. If these conditions are not met, the ECCS flow will not be as assumed in the accident analyses.

APPLICABILITY

In MODES 1, 2, and 3, the seal injection flow limit is dictated by ECCS flow requirements, which are specified for MODES 1, 2, 3, and 4. The seal injection flow limit is not applicable for MODE 4 and lower, however, because high seal injection flow is less critical as a result of the lower initial RCS pressure and decay heat removal requirements in these MODES. Therefore, RCP seal injection flow must be limited in MODES 1, 2, and 3 to ensure adequate ECCS performance.

ACTIONS

A.1

With the seal injection flow exceeding its limit, the amount of charging flow available to the RCS may be reduced. Under this Condition, action must be taken to restore the flow to below its limit. The operator has 4 hours from the time the flow is known to be above the limit to perform SR 3.5.5.1 and correctly position the manual valves and thus be in compliance with the accident analysis. The Completion Time minimizes the potential exposure of the plant to a LOCA with insufficient injection flow and provides a reasonable time to restore seal injection flow within limits. This time is conservative with respect to the Completion Times of other ECCS LCOs; it is based on operating experience and is sufficient for taking corrective actions by operations personnel.

B.1 and B.2

When the Required Actions cannot be completed within the required Completion Time, a controlled shutdown must be initiated. The Completion Time of 6 hours for reaching MODE 3 from MODE 1 is a reasonable time for a controlled shutdown, based on operating experience and normal cooldown rates, and does not challenge plant safety systems or operators. Continuing the plant shutdown begun in Required Action B.1, an additional 6 hours is a reasonable time, based on operating experience and normal cooldown rates, to reach MODE 4, where this LCO is no longer applicable.

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1

Verification every 31 days that the manual seal injection throttle valves are adjusted to give a flow within the limits (operation in the acceptable region of Figure 3.5.5-1) ensures that proper manual seal injection throttle valve position, and hence, proper seal injection flow, is maintained. A differential pressure that is above the reference minimum value is established between the charging header (PT-121, charging header pressure) and the pressurizer, and the total seal injection flow is verified to be within the limits determined in accordance with the ECCS safety analysis. The Frequency of 31 days is based on engineering judgment and is consistent with other ECCS valve Surveillance Frequencies. The Frequency has proven to be acceptable through operating experience.

(continued)

OPERATOR ACTION (CONT'D)

2.3 IF the INSTRUMENT AIR PRESSURE LO annunciator (K-D2) is in the alarm condition, THEN refer to FNP-1-AOP-6.0, LOSS OF INSTRUMENT AIR.

2.4 IF the INSTRUMENT AIR PRESSURE LO annunciator (K-D2) is NOT in the alarm condition, THEN open the following valves:

  2.4.1 INST AIR SUPPLY ISOL VALVE 1-IA-HV-3825.

  2.4.2 INST AIR SUPPLY ISOL VALVE 1-IA-HV-3885.

  2.4.3 INST AIR SUPPLY TO CTMT 1-IA-HV-3611.

2.5 Dispatch Operations and Health Physics personnel to survey the penetration rooms to identify the cause of the high pressure.

2.6 WHEN instrument air is restored to containment AND it is determined that a letdown line break was NOT the cause of the high pressure, THEN re-establish normal letdown as in accordance with section 4.4 of FNP-1-SOP-2.1, CVCS.

2.7 IF normal letdown CAN NOT be established, THEN perform the following:

  2.7.1 Establish excess letdown per FNP-1-SOP-2.7, CVCS - EXCESS LETDOWN.

  2.7.2 Throttle charging flow as required using Q1E21FCV122 to maintain pressurizer level at program value.

  2.7.3 Adjust seal injection flow control valve Q1E21HCV186 as required to maintain seal injection flow approximately 8 gpm per pump.

2.8 Determine the source of the high penetration room pressure and ensure properly isolated.

2.9 Return the following systems to normal operation unless isolation is required.

  2.9.1 S/G Blowdown per FNP-1-SOP-16.1, STEAM GENERATOR BLOWDOWN PROCESSING SYSTEM.

  2.9.2 Nitrogen system per FNP-0-SOP-33.0, NITROGEN SYSTEM.

  2.9.3 Sample system.

2.10 Return the penetration room filtration system to normal operation per FNP-1-SOP-60.0, PENETRATION ROOM FILTRATION SYSTEM.

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.5 Seal Injection Flow

LCO 3.5.5 Reactor coolant pump seal injection flow shall be within limits.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Seal injection flow not within limit.	A.1 Adjust manual seal injection throttle valves in accordance with SR 3.5.5.1.	4 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. <u>AND</u> B.2 Be in MODE 4.	6 hours 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.5.1	----------NOTE---------- Not required to be performed until 4 hours after the Reactor Coolant System pressure stabilizes at $\geq$ 2215 psig and $\leq$ 2255 psig. ------------------------------ Verify manual seal injection throttle valves are adjusted to give a flow within the limits of Figure 3.5.5-1 with the seal water injection flow control valve full open.	31 days

PROVIDED REFERENCE

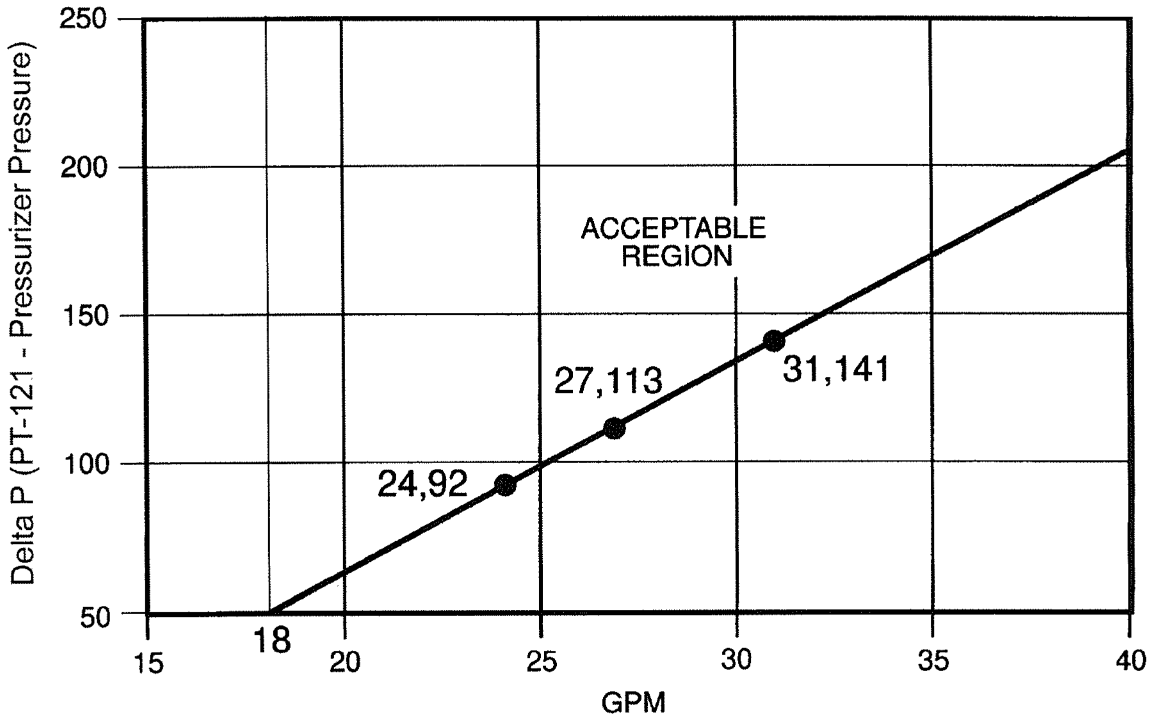


Figure 3.5.5-1 Seal Injection Flow Limits

88. 076G2.4.11 002/NEW/SRO/C/A 4.1/4.4/076G2.4.11/N/3/HBF/

Given the following:

- Unit 1 is at 100% power with B Train on service.
- 1E Service Water pump tripped.
- AE4, SW PUMP TRIPPED, is in alarm.

Which one of the following procedures, upon completion, is the **earliest** that B Train Service Water can be declared OPERABLE?

A. ARP-1.1, AE4, SW Pump Tripped

B. AOP-10.0, Loss of Service Water

C✓ SOP-24.0, Service Water System

D. SOP-36.6, Circuit Breaker Racking Procedure

A. Incorrect. Step 2 of ARP-1.1, AE4 will restore "functionality" of the B train SW system by starting a stby pump in that train. HOWEVER, the 1C SW pump is required to Auto start to be considered operable and ARP-1.1 does not provide this guidance (directly). Since ARP AE4 response is to "refer to SOP-24" AT STEP 4, completion of AE4 MAY OR MAY NOT be completed before operability is restored and operability is determined at the end of the SOP-24 alignment.
Plausible: This ARP provides will start the 1C SW pump which regains functionality. -- Completion of this procedure after SOP-24D would allow for a procedural reminder to declare SW inoperable/operable after actions completed.

B. Incorrect. EXIT from AOP-10 is made after establishing 60 psig in the both SW headers, but provides no guidance to restore operability of the SW system. It does however restore functionality of the SW system by verifying the start of the 1C SW pump.

Plausible: EXIT from AOP-10 is accomplished only after restoring Pressure >60 psig. This is not the requirement of operability per TS 3.8.9.

C. Correct. SOP-24 section 4.6, and Appendix 24D will be used to ensure that the 1C SW pump is mechanically and electrically aligned to the B train and selected to auto-start in place of the 1E SW pump as well as electrically "bump" the pump to confirm it is "OPERABLE".

D. Incorrect. This procedure is used to align the 1C SW pump electrically to the B train (if needed), but does not contain sufficient guidance to restore operability due to the "train selector switch" manipulation must also be completed to restore operability. Additionally, this procedure is used to disable the 1E SW pump, and allow for troubleshooting or corrective actions after a trip.

Plausible: Swing train components are often made operable by racking out the designated train component. For example: B charging pump, for it to become "OPERABLE" for the A Charging pump, the A charging pump breaker must first be racked out using SOP-36.6, otherwise it will not auto-start following a SI.

FSD 181001

3.1.5.1 The Service Water pumps shall be automatically started by a signal from the LOSP or ESS sequencer. The Service Water swing pump shall be automatically started by a signal from the LOSP or ESS sequencer when in service replacing one of the train oriented pumps. (References 6.7.039 and 6.1.009)

K/A statement - Service Water System- .
G2.4.11 Knowledge of abnormal condition procedures.

Importance Rating:	4.0 4.2
Technical Reference:	TS 3.7.8 TS 3.8.1 AOP-10, ver 15 SOP-24, ver 71 ARP-1.1 ver 50
References to be provided:	none
Learning Objective:	OPS-62102F01; Recall and Apply the information from the LCO bases sections [...] for any TS or TRM requirements associated with the Service water System components and attendant equipment alignment, to include [...] 3.7.8 Service Water System.
Question origin:	NEW
Comments:	KA match- SW pump trip is the abnormal condition, knowledge of the required mitigating procedures for that abnormal condition is required to identify when/which procedure restores operability of the SW system.
SRO justification:	Knowledge of Tech Spec bases that is required to analyze "operability" of the SW system; two pumps AND controls required to perform the safety related function.

Question #	88
K/A	076G2.4.11

REFERENCE Docs

LOCATION AE4

E4
SW PUMP TRIPPED

SETPOINT: Not Applicable

ORIGIN: 52-b Contact on any one of the following breakers.

1. DK03-1A SW Pump
2. DK04-1B SW Pump
3. DK05-1C SW Pump A Train
4. DL05-1C SW Pump B Train
5. DL03-1D SW Pump
6. DL04-1E SW Pump

PROBABLE CAUSE

Service Water Pump tripped due to an overload or an electrical fault.

AUTOMATIC ACTION

NONE

OPERATOR ACTION

AOP-24 restores operability; may or may not be completed before this ARP (AP-6)

If ARP completed after directing SOP actions, then NOT FIRST... if completed after SOP actions then NOT FIRST

1. Check indications and determine which Service Water Pump has tripped.
2. Start another Service Water Pump in the same train as the tripped pump.
3. Refer to FNP-1-AOP-10.0, LOSS OF SERVICE WATER.
4. Refer to FNP-1-SOP-24.0, SERVICE WATER SYSTEM, step 4.5 or step 4.6 as required to align 1C service water pump to A or B train.
5. Notify appropriate personnel to determine and correct the cause of the alarm.
6. Return the Service Water electrical and component lineup to normal as soon as possible.
7. Refer to Technical Specification 3.7.8 for LCO requirements with a loss of train A or B service water.

References: A-177100, Sh. 74A, B & C; D-172747; D-172748; D-172749; D-172750; D-172751; D-172752; Technical Specification 3.7.8

Step	Action/Expected Response	Response Not Obtained

NOTE: SW TO TURB BLDG ISO A(B) TRN valves will automatically close if SW flow in either train is greater than 17,600 gpm.

__ **1** **Verify affected SW 4160 V supply breakers closed.**

[ ] BKR DF02 closed
[ ] BKR DG02 closed

__ **2** **<u>IF</u> SW PUMP tripped, <u>THEN</u> verify any available SW PUMP in affected train started.**

__ **3** **<u>IF</u> SW pressure in both trains greater than 60 psig, <u>THEN</u> go to procedure and step in effect.**

EXIT with functionality only-- IF >60 psig.

****

<u>CAUTION:</u> A running diesel generator will overheat if adequate SW flow is not provided. Steps 4 through 7 must be performed immediately to verify adequate SW flow to a running diesel generator.

****

__ **4** **Verify all available SW PUMPs STARTED.**

__ **5** **Secure any running diesel generator <u>NOT</u> needed for electrical power using ATTACHMENT 1, SECURING A DIESEL GENERATOR.**

__Page Completed

Step	Action/Expected Response	Response Not Obtained
__ 16	**Evaluate event classification and notification requirements using FNP-0-EIP-9, EMERGENCY CLASSIFICATION AND ACTIONS.**	
__ 17	**Check pressure in both SW trains - GREATER THAN 60 psig.**	17 Perform the following.

17.1 Verify affected train SW PUMP MINI FLOW valves closed. (SWIS)

17.2 Dispatch personnel to inspect SW system for leakage.

17.3 WHEN SW system leakage source is identified,
THEN isolate leakage.

17.4 Close affected train dilution bypass line isolation valve.

Affected train	A	B
DILUTION BYPASS ISOLATION VALVE Q1P16V	[] 558 (1C DG RM)	[] 557 (2C DG RM)

EXIT if >60 psig.
NOT OPERABLE BUT FUNCTIONAL.

17.5 IF pressure in both SW trains greater than 60 psig, ,
THEN go to procedure and step in effect,
IF NOT proceed to step 19.

__ 18 **Go to procedure and step in effect.**

__Page Completed

Step	Action/Expected Response	Response Not Obtained

NOTE: No evaluation has been performed to demonstrate that the Unit 2 'B' Train Service Water System is capable of supplying the cooling requirements for 1B and 2B diesel at the same time. Therefore any diesel running under these conditions should be closely monitored and Technical Specification operability must be considered.

19.2 IF 'B' train affected with 1B diesel generator needed AND Unit 2 SW is available,
THEN align Unit 2 SW supply to 1B diesel generator.

1B DIESEL GENERATOR
SW SUPP
TO/FROM UNIT 2
[ ] Q1P16V522/530 open

1B DIESEL GENERATOR
SW SUPP
TO/FROM UNIT 1
[ ] Q1P16V523/531 closed

****

CAUTION: To prevent a leak on one train from affecting both trains, 1C SW pump must not be realigned to a train with an unisolated leak.

****

****

CAUTION: Based on plant needs, shifting electrical trains in FNP-1-SOP-24.0, SERVICE WATER SYSTEM, may be delayed. Subsequent shifting of electrical trains is required for train separation.

****

__ **20 IF affected train NOT leaking,**
THEN evaluate aligning 1C SW pump to affected train using FNP-1-SOP-24.0, SERVICE WATER SYSTEM.

If Pressure not restored >60 psig and no stby pump aligned.

__Page Completed

Step	Action/Expected Response	Response Not Obtained
__ 21	**Align 1C battery charger room cooler to non-affected train using FNP-1-SOP-37.1, 125 VOLT D.C. AUXILIARY BUILDING DISTRIBUTION SYSTEM.**	
__ 22	**Align 1B charging pump to non-affected train using FNP-1-SOP-2.1, CHEMICAL AND VOLUME CONTROL SYSTEM PLANT STARTUP AND OPERATION.**	
__ 23	**Monitor 600 V load centers cooled by affected train.**	
23.1	IF load center operation is degraded, THEN evaluate transferring loads to a non affected load center using FNP-1-SOP-36.3, 600, 480 AND 208/120 VOLT AC ELECTRICAL DISTRIBUTION SYSTEM.	
__ 24	**Check pressure in both SW trains - GREATER THAN 60 psig.**	24 Return to step 1.
__ 25	**Go to procedure and step in effect.**	

If <60 psig, then remain within AOP-10. Transition from AOP-10 does not restore operability;

IF <60 psig then SOP-24 would be completed before Exit of AOP-10, therefore SOP-24 restores operability "FIRST"....

IF >60 psig before completion of SOP-24, then exit of AOP-10 before operability gained. and AOP-10 is NOT FIRST.

-END-

__Page Completed

3.0 Precautions and Limitations

3.1 Service water pump 1C train A and B isolation valves Q1P16V506 and Q1P16V507 should not be open or stroking simultaneously to prevent cross connection of trains.

3.2 Service water pump 1C must be aligned electrically and mechanically to the same train.

3.3 Service Water pump 1C may be selected for auto-start from the ESS or the LOSP sequencers, instead of an A Train or B Train pump, by using key-interlocked selector switches at the SW local control panels. Normal position of both the A Train and B Train selector switches will be the 1C position and 1C SW pump will not autostart.

3.4 DO NOT operate service water pumps when wet pit level is less than EL 161.0 ft.

3.5 At least one service water pump should be running in each header during normal operation.

3.6 DO NOT operate a service water pump with the discharge valve fully closed for greater than 3 minutes during normal operating conditions.

3.7 Maintain service water pump motor cooling water flow when pump is operating.

3.8 Maintain service water pump lubricating and seal water flow at all times.

3.9 Frequent starting may damage the service water pump motor. Limit pump starts as follows:

- 3.9.1 Two successive starts from ambient temperature.
- 3.9.2 One start at rated temperature.
- 3.9.3 For any subsequent starts, allow 30 minutes running time at full speed or 60 minutes idle time between successive starts.

3.10 SW to TB may isolate due to a hi flow signal when starting, stopping, or swapping SW pumps. Verify SW TO TURB BLDG A(B) TRN Q1P16V515 (Q1P16V514) and Q1P16V516 (Q1P16V517) valves remain open when starting, stopping, or swapping SW pumps.

3.11 At least two independent service water loops shall be operable while in operational modes 1, 2, 3, and 4 as defined in the Technical Specifications.

3.12 In the event of a controller failure causing a miniflow valve to fail open, the miniflow must be manually isolated to keep from degrading pumps due to excess flow.

4.4 Placing UNIT 1 SERVICE WATER CYCLONE SEPARATOR, N1P16K501 in service.

4.4.1 IF aligning lube and cooling from A train, THEN open or verify open the following:

- CYCLONE SEPARATOR OUTLET ISO, Q1P16V722A.
- CYCLONE SEPARATOR INLET ISO, Q1P16V723A.

4.4.2 IF aligning lube and cooling from B train, THEN open or verify open the following:

- CYCLONE SEPARATOR OUTLET ISO, Q1P16V722B.
- CYCLONE SEPARATOR INLET ISO, Q1P16V723B.

4.4.3 Open one of the following MOV's below for whichever train is being placed in service in the following sequence.

a. Place the handswitch in OPEN and hold it there till the valve is open and start the cyclone separator by placing its control switch in AUTO and verify the cyclone separator has started.

b. WHEN the cyclone separator is started, THEN release the MOV handswitch, returning it to AUTO.

c. IF desired, THEN open or verify open the remaining MOV.

4.4.3.1 A Train: CYCLONE SEPARATOR INLET MOV A TRAIN, Q1P16V721A.

4.4.3.2 B Train: CYCLONE SEPARATOR INLET MOV B TRAIN, Q1P16V721B.

4.4.4 Energize the Sullectron Electronic Water Treater by closing breaker #1 in AUX POWER DIST PANEL, N1R58G608A-N

4.4.5 Verify cyclone separator discharge is approximately 125 psi.

4.5 Aligning 1C service water pump to A Train.

4.5.1 To align 1C service water pump to A Train, perform FNP-1-SOP-24.0C.

4.6 Aligning 1C service water pump to B Train.

4.6.1 To align 1C service water pump to B Train, perform FNP-1-SOP-24.0D.

3.0 Selecting 1C SW pump for B Train auto-start

NOTES:	
•	**The following steps may be performed even if 1C SW pump is already running.**
•	**IF 1C SW pump is running on B trn as indicated by a red running light on DL05 handswitch, THEN only section 2.0 of the alignment need be completed.**
•	**IF 1C SW pump is selected for auto-start in B Train, THEN the 1D or the 1E SW pump it replaces will NOT sequence on following an SI or LOSP.**
•	**IF it is not desired to select the 1C SW Pump for B Train auto-start, THEN section 3.0 may be marked "N/A". (CR 2008109373)**

_____ 3.1 Verify that 1C SW pump is aligned mechanically and electrically to B Train per the above sections 1.0 and 2.0.

NOTE: The following step is performed to ensure that the 1C SW Pump will start and run normally prior to selecting it for autostart. (OR 2-98-070) IF the 1C SW Pump is already running, THEN step 3.2 may be marked N/A.

_____ 3.2 Bump the 1C Service Water Pump to verify that it will start and run normally.

_____ 3.3 IF NOT obtained in section 1.0, THEN obtain Key # 1454 from the Shift Support Supervisor.

_____ 3.4 On the UNIT ONE "A" TRAIN SPARE SW PUMP SELECTOR SWITCH, check the switch in the 1C position. IF NOT, THEN stop and notify the Shift Supervisor.

NOTE: Key may only be inserted or removed if switch is in the 1C position.

_____ 3.5 Insert Key # 1454 into the UNIT ONE "B" TRAIN SPARE SW PUMP SELECTOR SWITCH lock. (Directly above spare pump selector switch.)

__/__ 3.6 Turn Key #1454 clockwise. The key is now held in place. Select lD or 1E SW position on the UNIT ONE "B" TRAIN SPARE SW PUMP SELECTOR SWITCH. Record position selected.
CV

______________________________ Position

CAUTION: THERE IS NO INDICATION OR ALARM ON THE MCB FOR THE SPARE PUMP SELECTOR SWITCH POSITION.

_____ 3.7 Place a caution tag on the MCB B Train handswitch for SW pump 1C noting the spare pump selector switch position.

89. 078G2.2.42 001/NEW/SRO/C/A 3.9/4.6/078G2.2.42/N/4/HBF/

The following plant conditions exist on Unit 1:

- The Reactor was manually tripped from 100% power due to a complete Loss of Instrument Air.
- ESP-0.1, Reactor Trip Response, is in progress.
- The crew has identified an unisolable rupture downstream of the Instrument Air Dryers.
- PZR Level is 64% and increasing.

Which one of the following describes the appropriate procedural strategy of controlling PZR level for the given conditions, and the operability per Tech Spec 3.4.9, Pressurizer?

Isolate charging flow and __(1)__; The Pressurizer is __(2)__

A. 1) maintain T_{avg} stable as directed by AOP-6, Loss of Instrument Air, until repairs are made.

2) inoperable.

B✓ 1) cool down as required to restore pressurizer level as directed by AOP-16, CVCS Malfunction.

2) inoperable.

C. 1) maintain T_{avg} stable as directed by AOP-6, Loss of Instrument Air, until repairs are made.

2) operable.

D. 1) cool down as required to restore pressurizer level as directed by AOP-16, CVCS Malfunction.

2) operable.

NOTE: MFIVs close, Stm dumps and ARVs do not operate automatically, and Letdown isolates at <85 psig at LCV-459/460 actuators which would lead to plausibility as to why PZR level is so high.

T.S. 3.4.9 **exception provided by NOTE:** >10% Step change in RTP, **does not apply** in this case since the >10% step change is NOT the cause for the high level, and is NOT a "*Short term operational transient*".

Furthermore, ESP-0.1 and AOP-6.0 and AOP-16.0 are all applicable
ESP-0.1 and AOP-6.0 direct-- STABILIZE Tavg
AOP-16.0 directs Cooldown with UOP-2.2.
Due to the given failure (unisolable air leak) AOP-16.0 provides the long term

mitigation strategy to maintain a bubble in the PZR to remain within the accident analyses assumptions.

This is appropriate per SOP-0.8 para. 3.14 which states:

"There are some instances where actions directed by non-ERP procedures would be in conflict with recovery strategy directed by the ERP's. In these cases, the operator should use the guidance contained in the ERP's as well as his knowledge of the overall recover strategy to determine the correct course of action."

Plausibility and Answer Analysis

A Incorrect. 1) Remaining in this condition "UNTIL REPAIRS ARE MADE" is not correct since there is an indefinite time before repairs can be made.

Once AOP-6.0 step 11 is encountered (stabilize Tavg) the operator is in a "DO-LOOP" that attempts to recover instrument air, **with the assumption** that recovery is possible, and PZR level rise is controllable between 20-50%. Maintaining a Stable Tavg, with NO letdown flow available, would result in eventually filling the PZR solid with seal injection flow (>92% in 1 hour and 24 mins).

2) LCO 3.4.9 is not satisfied and the Pressurizer is NOT operable, this condition must be addressed upon exit from ESP-0.1.

Plausible: 1) this is the correct strategy per ESP-0.1 & AOP-6.0 step 7 for conditions when level <50% and operation of 8107/8108 is available for przr level control.

B Correct. 1) AOP-6 step **7 says : Maintain PRZR level between 20-50%. When that can not be accomplished which is where the stem of the question puts the user, the RNO column says to go to** AOP-16.0. Step 5 RNO will direct performing attachment 1 which will establish manual charging control and step 12 and 13 will direct a cooldown per UOP-3.1. This note in AOP-16 explains the intent:

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, POWER OPERATION 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 15 will have the unit cooled down per UOP-2.2.

AOP-16 provides the long term mitigation strategy for this condition by cooling down to recover Przr level AND if necessary initiating draining via RCS sample paths if required.

Maintaining a Stable Tavg (as directed by AOP-6 and ESP-0.1) with NO letdown flow available, the PZR will eventually fill solid with seal injection flow (>92% in 1 hour and 24 mins).

2) TS 3.4.9 is modified with a NOTE, but the **exception provided:** >10% Step change in RTP, **does not apply** in this case since the >10% step change is NOT the cause for the high level, and is NOT a "*Short term operational transient*".

C Incorrect. 1) strategy is incorrect---SEE A #1;
2) Pressurizer is not operable---See B #2; but plausible: T.S. 3.4.9 is modified by the NOTE: stating that PZR level limit does not apply when thermal power steps >10%.

D Incorrect. 1) Action is correct --See B#1
2) Pressurizer is not operable-- SEE B#2

K/A statement - 078 Instrument Air System
2.2.42 **Ability to recognize system parameters that are entry-level conditions for Technical Specifications.**

Importance Rating:	3.9 4.6
Technical Reference:	AOP-6.0, ver 35 AOP-16, ver 14 TS 3.4.9-1 TS B3.4.9-0 rev 0 SOP-0.8, ver 18.0
References to be provided:	None
Learning Objective:	OPS-62520F01; Evaluate plant conditions and Determine if transition to another section fo AOP-6 or another procedure is required. OPS-52101E01: Recall and apply the LCO and applicability for [...] TS 3.4.9 [...]
Question origin:	NEW
Comments:	Requires identification of Pressurizer LCO entry conditions and applicability of the NOTE which modifies the applicability of this TS- requires understanding of intent/bases of note for LCO 3.4.9. K/A match: a loss of Instrument air has resulted in PZR level to exceed LCO 3.4.9.
SRO justification:	• Requires SRO familiarity with procedural strategy between AOP-6.0 and AOP-16; • Conflicting procedural recovery/stabilization guidance between the two applicable procedures (AOP-6 and AOP-16). • Although the knowledge of the NOTE of 3.4.9 is RO knowledge, knowledge of the bases is required to recognize its non-applicability for this instance.

Question # 89

K/A 078G2.2.42

REFERENCE Docs

A. **Purpose**

This procedure provides actions for response to a loss of instrument air pressure..

This procedure is applicable at all times.

B. **Symptoms or Entry Conditions**

1 This procedure is entered by either of the following:

[ ] A loss of instrument air is determined to exist by the indication on instrument air pressure indicator PI-4004B.

[ ] Loss of control or erratic operation of air operated valves is experienced by the operating crew.

2 This procedure may be entered from the following Annunciator Response Procedures.

[ ] KD1 IA TO PENE RM PRESS LO (FNP-1-ARP-1.10)
[ ] KD2 IA PRESS LO
[ ] KD3 SA PRESS LO

C. **Automatic Actions**

NOTE: TABLE 1 provides a list of AOVs, their failed position and whether or not a manual operator is available.

1	SERVICE AIR ISOLATES AT	80 PSIG FALLING
2	INST AIR DRYERS ARE BYPASSED AT	70 PSIG FALLING
3	INST AIR TO SERVICE BLDG ISOLATES AT	55 PSIG FALLING
4	INST AIR TO TURBINE BLDG ISOLATES AT	45 PSIG FALLING

Step	Action/Expected Response	Response Not Obtained
__ 7	**Maintain PRZR level between 20-50%.**	Since level is > 50% this would be an appropriate transition, HOWEVER due to step 7.1 being accomplished this transition is not "REQUIRED" here.
7.1	Alternately cycle open and closed one of the following MOVs for charging control as required. CHG PUMPS TO REGENERATIVE HX [ ] Q1E21MOV8107 [ ] Q1E21MOV8108	7.1 Go to FNP-1-AOP-16.0, CVCS MALFUNCTION while continuing with this procedure.
__ 8	**Maintain SG narrow range levels between 35-69%.**	

****

CAUTION: The TDAFW Pump steam admission valves will fail closed within two hours if emergency air is not aligned.

****

Step	Action/Expected Response	Response Not Obtained
8.1	WHEN TDAFW Pump is started, THEN vary TDAFW Pump Speed to control AFW flow. TDAFWP SPEED CONT [ ] SIC 3405 adjusted	8.1 IF the TDAFW Pump steam admission valves fail closed, THEN align emergency air using FNP-1-SOP-62.0, EMERGENCY AIR SYSTEM.

__Page Completed

Step	Action/Expected Response	Response Not Obtained

NOTE: PORV BKUP air supply Q1P19HV2228 fails closed on a loss of 'B' train DC.

Since the operator is in a "DO-Loop",

and in the conditions of the stem Air will not be restored for a significant period of time.

Therefore PRZR level would continue to rise at a rate of 18 gpm (6 gpm seal inj per pump) = 1%/3 min

1hr and 24 mins would result in PZR lvl >92%

TS 3.9.2

__ **10 Align nitrogen supply to PRZR PORVs using FNP-1-SOP-62.1, BACKUP-UP AIR OR NITROGEN SUPPLY TO THE PRESSURIZER POWER OPERATED RELIEF VALVES.**

__ **11 Stabilize RCS TAVG at existing value.**

11.1 Control the SG atmospheric reliefs valves using the FNP-1-SOP-62.0, EMERGENCY AIR SYSTEM.

1A(1B,1C) MS ATMOS REL VLV
- [ ] PC-3371A adjusted
- [ ] PC-3371B adjusted
- [ ] PC-3371C adjusted

RNO: 11.1 Manually control the SG atmospheric reliefs valves with local handwheels.(127 ft, AUX BLDG main steam valve room)

1A(1B,1C) MS ATMOS REL VLV
- [ ] Q1N11PV3371A
- [ ] Q1N11PV3371B
- [ ] Q1N11PV3371C

__ **12 Check that instrument air restored.**

RNO: 12 Return to step 7.

__ **13 Establish normal control of the AFW system.**

13.1 Establish normal control of the MDAFW Pump flow control valves using FNP-1-SOP-22.0, AUXILIARY FEEDWATER SYSTEM.

Step 13 continued on next page

__Page Completed

B. Purpose

This procedure provides actions for response to malfunctions of the Charging and Letdown portions of the Chemical Volume and Control System. If Letdown is manually secured or isolates due to system parameters the normal system operating procedure may be used for restoration.

B. Symptoms or Entry Conditions

1 Procedure is entered when a loss or malfunction of normal Letdown or Charging systems is experienced. This may be indicated by the following:

a. Pressurizer level deviation due to the loss or malfunction of normal Letdown or Charging systems.

b. One or more of the following annunciators in alarm:

[ ] DE1 REGEN HX LTDN FLOW DISCH TEMP HI
[ ] DE3 LTDN ORIF ISO VLV REL LINE TEMP HI annunciator in alarm (FNP-1-ARP-1.4)
[ ] DE4 LTDN HX OUTLET PRESS HI annunciator in alarm.(FNP-1-ARP-1.4)
[ ] DF3 VCT LVL HI-LO
[ ] EA2 CHG HDR FLOW HI-LO(FNP-1-ARP-1.5)
[ ] EB1 CHG PUMP OVERLOAD TRIP
[ ] HA2 PRZR LVL DEV HI B/U HRS ON annunciator in alarm. (FNP-1-ARP-1.8)
[ ] HB1 PRZR LVL HI (FNP-1-ARP-1.8)
[ ] HB2 PRZR LVL DEV LO

c. Operating team observes a loss or malfunction of the normal Letdown or Charging systems.

B. Automatic Actions

1 Letdown isolation valves Q1E21V367 (LCV460) and Q1E21V368 (LCV459) isolate when pressurizer level decreases to 15%.

2 Letdown orifice isolation valves close when either LT459 or LT460 sense pressurizer level of 15%.

3 LTDN LINE PENE RM ISO valves Q1E21V565A (HV8175A) and Q1E21V565B (HV8175B) isolate on hi energy line break sensor actuation.

4 "T" Signal - closes LTDN LINE CTMT ISO Q1E21HV8152 and all Orifice Isolation valves.

5 If the operating charging pump trips on an overload condition, the associated swing or dedicated pump in the same train will automatically start.

Step	Action/Expected Response	Response Not Obtained
		14.5.5 Verify a boric acid pump running.
		14.5.6 Verify boric acid flow. MAKEUP FLOW TO CHG/VCT [ ] BA [ ] FI 113
__ 15	**Maintain PZR Level - 20-60%**	
	15.1 Maintain seal injection flow to each RCP 6-13 gpm	
	15.2 Maintain VCT level - 20-60%	
	15.2.1 Position Q1E21V198, VCT DRN TO RHT No. 1, as necessary to control VCT level (121 ft AUX BLDG, VCT valve room)	
	15.3 Check reactor - NOT CRITICAL	15.3 IF reactor is critical, THEN return to step 12.
	15.4 Cooldown as necessary to maintain PZR level using FNP-1-UOP-2.2, SHUTDOWN OF UNIT FROM HOT STANDBY TO COLD SHUTDOWN.	possible course of action
	15.5 Check PRZR level rise - ACCEPTABLE	15.5 Direct Chemistry to open as many RCS sample paths as the sample cooling unit will allow.
	15.6 Check any letdown path - RESTORED	15.6 Evaluate a CTMT entry to restore letdown, excess letdown, or low pressure letdown when conditions permit.

__ Page Completed

Step	Action/Expected Response	Response Not Obtained
__ 16	**Monitor letdown flow paths:**	
16.1	Check letdown paths - ANY ESTABLISHED • Normal letdown flow OR • Excess letdown flow	16.1 Go to step 15.
16.2	Evaluate plant conditions to determine next course of action.	

****

CAUTION: Decreasing CHG flow significantly will increase LTDN temperature. Maintain sufficient CHG flow to prevent LTDN temperature at the LTDN heat exchanger outlet from exceeding 135°F.

****

NOTE: With FK-122 M/A station in AUTO flow controller FK-122 limits high flow to 130 gpm and low flow to 18 gpm.

Step	Action/Expected Response	Response Not Obtained
__ 17	**Determine Charging Status:**	
17.1	Check charging - AFFECTED BY MALFUNCTION • CHG FLOW, FI-122A - ABNORMAL FLOW INDICATED	17.1 IF charging is normal, THEN go to procedure and step in effect.

Step 17 continued on next page

__Page Completed

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.	6 hours
	AND		
	A.2	Be in MODE 4.	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.	6 hours
	AND		
	C.2	Be in MODE 4.	12 hours

BASES

APPLICABILITY

The need for pressure control is most pertinent when core heat can cause the greatest effect on RCS temperature, resulting in the greatest effect on pressurizer level and RCS pressure control. Thus, applicability has been designated for MODES 1 and 2. The applicability is also provided for MODE 3. The purpose is to prevent solid water RCS operation during heatup and cooldown to avoid rapid pressure rises caused by normal operational perturbation, such as reactor coolant pump startup.

A Note has been added to indicate the limit on pressurizer level is not applicable during short term operational transients such as a THERMAL POWER ramp > 5% RTP per minute or a THERMAL POWER step > 10% RTP. These conditions represent short term perturbations.

In MODES 1, 2, and 3, there is need to maintain the availability of pressurizer heaters, capable of being powered from an emergency power supply. In the event of a loss of offsite power, the initial conditions of these MODES give the greatest demand for maintaining the RCS in a hot pressurized condition with loop subcooling for an extended period. For MODE 4, 5, or 6, it is not necessary to control pressure (by heaters) to ensure loop subcooling for heat transfer when the Residual Heat Removal (RHR) System is in service, and therefore, the LCO is not applicable.

ACTIONS

A.1 and A.2

Pressurizer water level control malfunctions or other plant evolutions may result in a pressurizer water level above the nominal upper limit, even with the plant at steady state conditions.

If the pressurizer water level is not within the limit, when the limit is applicable, action must be taken to bring the plant to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to MODE 3, with the reactor trip breakers open, within 6 hours and to MODE 4 within 12 hours. This takes the unit out of the applicable MODES.

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.

(continued)

In addition operator judgment may be used to identify the appropriate performance of an AOP in conjunction with an ERP in order to enhance equipment and personnel emergency response. Typically guidance included in the following AOPs may be of value during ERP performance as applicable to existing plant conditions:

FNP-1-AOP-5.1 CONTINGENCY ELECTRICAL ALIGNMENTS
FNP-1/2-AOP-6.0 LOSS OF INSTRUMENT AIR
FNP-1/2-AOP-7.0 LOSS OF TURBINE BUILDING SERVICE WATER
FNP-1/2-AOP-9.0 LOSS OF TRAIN A OR B COMPONENT COOLING WATER
FNP-1/2-AOP-10.0 LOSS OF TRAIN A OR B SERVICE WATER
FNP-1/2-AOP-36.0 LOSS OF SPENT FUEL POOL COOLING

There are some instances where actions directed by non-ERP procedures would be in conflict with the recovery strategy directed by the ERP's. In these cases, the operator should use the guidance contained in the ERP's as well as his knowledge of the overall recovery strategy to determine the correct course of action. For example, if RCP support conditions are lost, the guidance of AOP-9.0 would require the RCP's to be tripped. However, if this condition occurs in conjunction with an ATWT, it would not be appropriate to secure the RCP's until power is reduced to less than 5%.

3.15 Mode Applicability

The ERP network was developed to accommodate emergency transients occurring at a "hot" or "at power" condition. The guidance for operator action is based upon having the safety-related equipment required by Technical Specifications for MODE 1 or MODE 2 operation available for use. For transients initiated during other MODES of operation, the same complement of equipment may not be available, therefore some instructions within the ERPs may not be able to be accomplished. In addition, if the plant is already substantially cooled down and depressurized, some instructions may not be applicable.

Critical Safety Function monitoring using the Status Trees also assumes a MODE 1 or MODE 2 initial condition, followed by some reactor protection system actuation, to result in a subcritical reactor. Use of the trees can be extended beyond this original intent, but with an understanding of the intent of each tree.

To clarify the usability of the ERPs for transients originating during other than the assumed initial operating MODES, a detailed review was presented in the ERG Background Document. This review is presented in Table 1. In some cases, slight modification would be needed to extend the applicable range of a procedure beyond its original intent. Therefore, when other procedures do not exist to address the specific condition, the ERPs may be used as guidance during modes of operation when they may not be totally applicable.

90. G2.1.31 001/NEW/SRO/C/A 4.6/4.3/G2.1.31/N/2/HBF/

The following plant conditions exist:

- The Motor Driven Fire pump (MDFP) was started remotely per SOP-61.0, Fire Protection- Pump House and Yard Main, for annual valve cycle testing in the Unit 2 Auxiliary Building.
- MH3, FIRE PROT SYS TRBL, is in alarm due to the MDFP supply breaker tripping open.

Which one of the following states the status of the amber light on the MDFP, N1P43P003, MCB handswitch, AND the **minimum** Fire Pump requirements for operability of the Fire Suppression Water System?

The MDFP control switch amber light will be __(1)__

The Fire Suppression Water System is considered operable when a **minimum** of __(2)__ Fire Pumps are operable.

A.✓ 1) LIT.

2) Two

B. 1) LIT.

2) Three

C. 1) **NOT** Lit

2) Two

D. 1) **NOT** Lit.

2) Three

Plant conditions: MDFP started from MCB per SOP-61.0 which would also require the Jockey fire pump to be secured. Upon trip of the MDFP, the #2 DDFP is expected to start at 70 psig header pressure, and maintain ~120 psig header pressure-- inferred since Jockey not capable of running (turned off) and pressure being maintained.

Plausibility and Answer Analysis

A Correct. 1) indication correct: since the MDFP was started from the MCB the amber light is capable of indicating the breaker is opened by a method other than the MCB control switch (Remotely or automatically).
2) FSAR Section 9B.C.2.1(unit 1) and 9B.C.9.1.2.1 (unit 2) state that "[...] two high pressure pumps [...]" are required to maintain the suppression header operable.

B Incorrect 1) Correct see A.
2) Incorrect. TWO pumps are required per FSAR 9B.C.2.1.

Plausible: SOP-0.4 states "partial loss of fire main system that results **in at least one fire pump and one fire protection storage tank operable**, initiate a Fire Protection Administrative LCO and take action per FSAR Sections."

This statement mis-read would lead one to believe that all three pumps were required.

Additionally, because the Fire protection system is similar to the AFW system; such that there are 3 pumps, two with same prime mover and the third with a different type. The AFW system requires all 3 trains to be operable.

C Incorrect. 1) Wrong indication; because the MDFP was started from the MCB, the amber light will be lit if the pump is not running with switch in Auto until switch is repositioned to stop.
2) Correct See A

Plausible: This is the correct indication if the pump were started locally.

D Incorrect. 1) Incorrect indications and incorrect requirements.
2) Incorrect number-- See B

Plausible : See C --- indications & See B for # of pumps.

K/A statement - 2.1.31 **Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.**

Importance Rating:	4.6 4.3
Technical Reference:	SOP-61.0, ver 40.0 FSAR 9B.C.2.1 & 9B.C.9.1 SOP-0.4, ver 74.0
References to be provided:	None
Learning Objective:	OPS-62108K01; Recall and Apply the information from the [...] T.S.-Fire Protection Program: Renewed License No. NPF-2-Amendment No.175- Fire Protection Program as describe in FSAR which implements fire protection requirements of 10CFR50.48, 10CFR50, and Appendix R.
Question origin:	NEW
Comments:	K/A match or other comments: identifies indications **expected** following a remote manual start and subsequent trip; **Location (1st part of K/A) of switch is omitted** from stem due to the complication of 3 part questions--Switch operation chosen as the higher cognitive level portion of the question since the indication will vary depending on station from which the pump was started. Remotely= from MCB;
SRO justification:	Requires knowledge of limitations within the Facility License (FSAR 9B) required to analyze "OPERABILITY" of this particular system. Task of determining FP system operability is performed solely by an SRO. (SRO only objective)

Question # 90

K/A G2.1.31

REFERENCE Docs

NOTE:	**The following step will permit remote starting of the MDFP from the Main Control Board.**

4.1.7 At the local pushbutton control station for the MDFP, place the selector switch in REMOTE.

4.2 Normal System Operation

4.2.1 System will normally function in automatic, and will initiate the following actions dependent on discharge header pressure.

NOTE:	**The automatic start of the #1 and #2 diesel fire pumps are delayed by 5 and 10 seconds respectively.**

90 PSIG	Start MDFP
80 PSIG	Start No. 1 DDFP
70 PSIG	Start No. 2 DDFP

NOTE:	**Automatic start of a diesel driven or motor driven fire pump requires shutdown from local control panels.**

4.3 Startup of the MDFP from Main Control Board

4.3.1 Place MDFP handswitch to START.

NOTE:	**Failure to secure the jockey pump while running any fire pump when no flow demand exists on the system, may result in overheating or damage to the fire pump.**

4.3.2 To stop the jockey pump, place the handswitch controller in OFF.

4.4 Startup of the MDFP from Local Control Panel

4.4.1 Place local/remote switch to LOCAL.

4.4.2 Depress START pushbutton.

4.4.3 Return local/remote switch to REMOTE.

NOTE: Failure to secure the jockey pump while running any fire pump when no flow demand exists on the system, may result in overheating or damage to the fire pump.

4.4.4 To stop the jockey pump, place the handswitch controller in OFF.

4.5 Shutdown of the MDFP

4.5.1 Start the jockey pump by placing the handswitch controller in ON.

NOTE: The MDFP cannot be shutdown from Main Control Board.

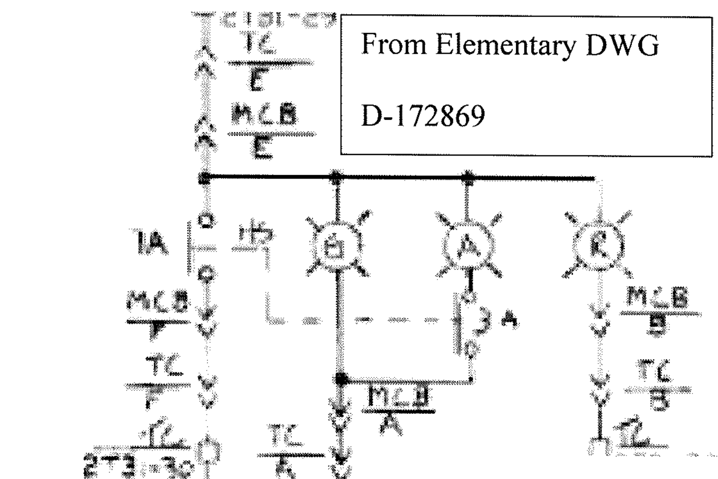
4.5.2 Place local/remote switch to LOCAL.

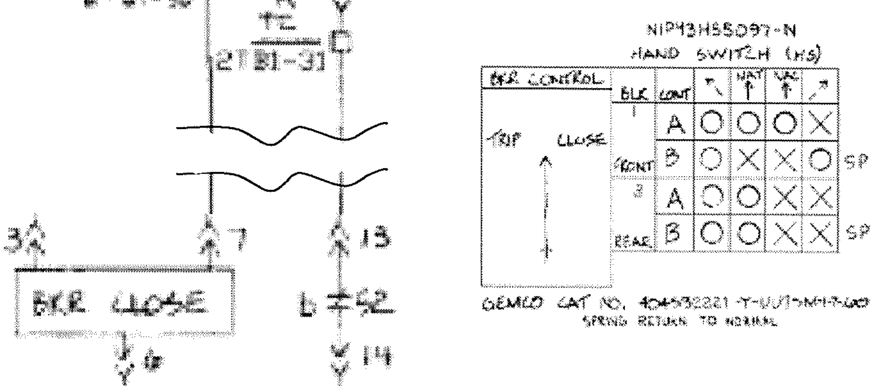
4.5.3 Depress STOP/RESET pushbutton.

4.5.4 IF started from Main Control Board, THEN place handswitch on MCB to STOP and verify handswitch spring returns to NEUTRAL. (This function is to de-energize trouble light only.)

4.5.5 Return to automatic standby by placing local/remote selector switch to REMOTE.

4.5.6 Verify the jockey pump running and maintaining approximately 125 psig.





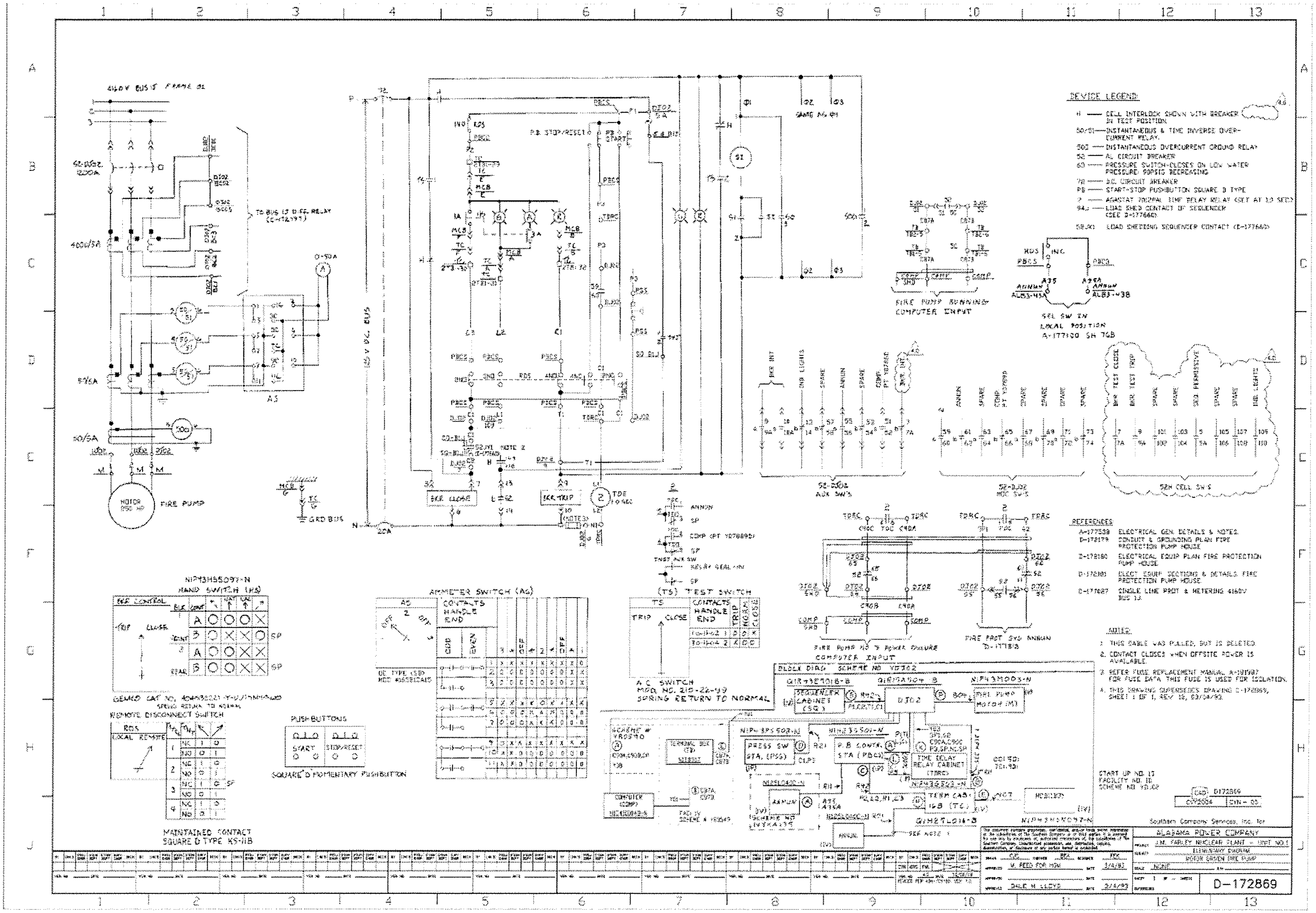
The amber light can not light unless HS is placed in the Closed position;

This is done only when started from the MCB.

therefore, when started from MCB with subsequent opening (52b contact closes) the Amber light will light with the Green light.

The amber will remain lit until the HS is placed in the Trip position.

The red and green lights are accurate indication of pump status regardless of where the pump was started.


4160V BUS 1J FRAME 01
FIRE PUMP
125 V DC BUS
DEVICE LEGEND:
FIRE PUMP RUNNING COMPUTER INPUT
52H CELL SW'S
REFERENCES
NOTES:
HAND SWITCH (HS)
AMMETER SWITCH (AS)
(TS) TEST SWITCH
PUSHBUTTONS
SQUARE D MOMENTARY PUSHBUTTON
REMOTE DISCONNECT SWITCH
MAINTAINED CONTACT
SQUARE D TYPE KS-11B
A.C. SWITCH
SPRING RETURN TO NORMAL
BLOCK DIAG. SCHEME NO YD302
Southern Company Services, Inc.
ALABAMA POWER COMPANY
J.M. FARLEY NUCLEAR PLANT - UNIT NO.1
D-172869

7.9 FSAR Sections 9B.C.2 and 9B.C.9 outline the operability requirements for fire pumps, fire protection storage tanks, and operable flow paths. IF all or part of the system is inoperable, THEN perform the following as applicable:

NOTE: IF the fire main system cannot be restored AND backup suppression cannot be established, THEN upon exceeding the restoration time specified in FSAR Sections 9B.C.2.1.2 and 9B.C.9.1.2, both units must be placed in hot standby within the next 6 hours and in cold shutdown within the following 30 hours. (SER U1/U2 Tech Spec Amendments 96/88)

7.9.1 For a partial loss of fire main system that results in at least one fire pump and one fire protection storage tank operable, initiate a Fire Protection Administrative LCO and take action per FSAR Sections 9B.C.2.1.2.A and 9B.C.9.1.2.1.

7.9.2 For a complete loss of all fire main capability, initiate a Fire Protection Administrative LCO and take action per FSAR Sections 9B.C.2.1.2.B and 9B.C.9.1.2.2.

8.0 Smoke/Fire Detection Systems

CAUTION:
- **Removing a smoke detector causes all detectors in the circuit downstream of the removed detector to be inoperable.**
- **When detector is reinstalled and the ZIU clears, the FIU must still be reset per section 3, Pyrotronics Alarm Panel, to clear flashing signal.**

8.1 IF a fire alarm exists on the Pyrotronics Panel due to a bad smoke detector, THEN the detector may be removed in order to reset and clear the Fire alarm. Removing the detector will cause a Trouble alarm.

8.2 Gloving of smoke detectors is permitted for areas in which repeated welding or grinding may cause the detectors to be in a continuous state of alarm. Gloving is permitted provided a Fire Protection Administrative LCO is initiated identifying the gloved detectors and the minimum operable smoke detectors requirement is satisfied. Otherwise the smoke detector system for that room must be declared inoperable. If the smoke detection system is inoperable, the associated sprinkler system is also inoperable unless the clapper valve is tripped.

8.3 IF a smoke detection system is alarming spuriously and is located in an inaccessible area which precludes maintenance until the plant is shutdown or corrective maintenance is unable to be performed within the 72 hours, THEN the alarming system may be disabled by installing an 91K ohm resistor in place of the detector wiring in the applicable section of the Pyro Panel per Table 1 and vendor manual U-359072.

9B.C.2 FIRE SUPPRESSION WATER SYSTEM - UNIT 1

9B.C.2.1 Operability Requirement

The fire suppression water system shall be operable with:

A. Two high pressure pumps, each with a capacity of 2500 gal/min, with their discharge aligned to the fire suppression header,

B. Separate water supplies, each with a minimum contained volume of 250,000 gal., and

C. An operable flow path capable of taking suction from each tank and transferring the water through distribution piping with operable sectionalizing control or isolation valves to the yard hydrant curb valves, the last valve ahead of the water flow alarm device on each sprinkler or hose standpipe, and the last valve ahead of the deluge valve on each deluge or spray system required to be operable per requirements 9B.C.3, 9B.C.5, and 9B.C.6.

9B.C.2.1.1 Applicability

At all times.

9B.C.2.1.2 Action

A. With one of the above required pumps and/or water supplies inoperable, restore the inoperable equipment to operable status within 7 days or provide an alternate backup pump or supply.

B. With the fire suppression water system otherwise inoperable, establish a backup fire suppression water system within 24 h.

9B.C.2.2 Surveillance Requirements

A. The fire suppression water system shall be demonstrated operable:

1. At least once per 7 days by verifying the contained water supply volume.

2. At least once per 60 days, automatically start and run the electric motor-driven pump, without flowing water, for a minimum of 10 minutes. At least once per 31 days, automatically start and run the diesel engine-driven pump, without flowing water, for a minimum of 30 minutes.

91. G2.2.36 001/BANK/SRO/MEM 3.1/4.2/G2.2.36/N/2/HBF/NRC 2008

At 0500, to complete draining a system on an outage tagout, an MOV that automatically opens during a safety injection has to be manually closed due to power being tagged out to the MOV.

At 1900, the work is complete and the following conditions exist:

- The system has been filled, vented, and tagged in.
- The MOV is closed per the System Checklist.
- The tagout has restored power to the MOV and the GREEN valve position light is LIT.

Which one of the following correctly states the OPERABILITY of the MOV, and the reason for the determination?

A. The MOV is OPERABLE since no internal valve work was performed.

B. The MOV is OPERABLE since power has been restored, and a safety injection signal will automatically open the valve.

C. The MOV is **NOT** OPERABLE since it has not been time stroked in the open direction.

D✓ The MOV is **NOT** OPERABLE since the valve was manually operated and has not been electrically stroked one full cycle.

A. Incorrect. The valve was manually operated to the closed position, will require electrically stroked to regain operability-- ensures that the MOV torque switches will not prevent operation; Plausible, because this would be true for any tagging order that de-energized the valve and later re-energized it IF no manual stroking was performed.

B. Incorrect. See A.

C. Incorrect. Time stroke of the MOV is not required. Furthermore, the valve must be stroked OPEN and Closed (one full cycle) to be restored to operable. plausible, because time stroking would be minimum required if the maintainance performed on this valve impacted its stroke time, such as packing adjustment, but NOT manually operate the valve.

D. Correct. The valve is inoperable until electrically cycling the valve one full cycle, and that will allow clearing the LCO per FNP-0-SOP-0.0, Step 15.5.4 and 15.5.6.

K/A statement - G2.2.36 **Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.**

Importance Rating: 3.1 4.2

Technical Reference: SOP-0.0 v 127

Technical Reference:	SOP-0.0 v 127
References to be provided:	None
Learning Objective:	OPS-52302A06; Assess plant conditions to determine the ability of plant equipment and structures to meet their intended, designated function.
Question origin:	FNP Bank PLT OPER-40502H12 005 (2008 NRC Exam)
Comments:	K/A match--This question presents a maintenance activity which affects the operability of an MOV. Proper evaluation of the operability of the MOV after it has power restored and proper indication is verified is required to answer this question. Also Knowledge of the post-maintenance testing required to return the valve to operable is required to answer this question. The words "**such as** [...]" are used in this k/a to allow other types of maintenance affecting LCOs to meet this k/a
SRO justification:	Information regarding T.S. operability is not contained "Above-the-Line" and although this information is contained in generic instructions to operations personnel, "**An operability declaration is a decision by a senior reactor operator (SRO)** on the operating shift crew that [...] that an SSC can perform its specified safety function." (NMP-AD-012, ver 6.0, 4.12)

Random selection process:

Bank matches: DC DIST 62103C01 003
DC DIST 62103C01 004
INTRO TS-52302A10 005
PLT OPER-40502H12 005
PLT OPER-40502H12 006
UOP4.0-40503A01 001

Selection: Spec sheet ran on 7/30/09. Applied the following selection procedure:
a) select top center
b) select left
c) select right
d) select down
e) move down 1 then restart selection at b.

<Spec 8>		
DC DIST-62103C01 3	INTRO TS-52302A10 5	PLT OPER-40502H12 6
DC DIST-62103C01 4	PLT OPER-40502H12 5	UOP4.0-40503A01 1

1) INTRO TS-52302A10 005 was first selected, but REJECTED since issuance of NMP-AD-012 guidance has significantly altered the process of declaring components OPERABLE or OPERABLE but Degraded.

a) Question would require significant overhaul to comply with current guidance.

b) Question not currently in Rev 9 standards.

2) Select 62103C01 003; REJECT since question also on 2008 NRC exam.

3) PLT OPER-40502H12 006; selected however this is a duplicate question to PLT OPER-40502H12 006 which was used 2008 NRC exam but not in Rev 9 standards (appears to be source of PLT OPER-40502H12 005).

4) PLT OPER-40502H12 005 see #3 above.
5) DC DIST 62103C01 004; REJECT (-- direct lookup? with references and questionable match to K/A -- T.S. evaluation performed on pre-existing failure not maintenance activity--- although used on HARRIS 2008 exam confidence in match and direct lookup question yielded a rejection.)
6) UOP-4.0-40503A01 001; RO level question with no apparent means to upgrade.

Question #	91
K/A	G2.2.36

REFERENCE Docs

15.5 Restrictions On Manual Operation of MOVs

CAUTION:	**IF MOV is powered up and capable of remote operation, THEN de-energize the power supply before manually operating MOV.**

15.5.1 If a MOV must be operated manually, and the valve can be opened electrically, the manual operator should be engaged with the valve in the open position.

15.5.2 SMB-00 MOV operators can potentially open on high D/P when declutched for manual operation. IF any of the following MOVs are required to be maintained closed after being declutched, THEN tie wrap or otherwise secure the MOVs handwheel in place.

- Q1(2)E21MOV8105
- Q1(2)E21MOV8106
- Q1(2)E21MOV8107
- Q1(2)E21MOV8108
- Q1(2)E21MOV8109A/B/C
- Q1(2)E21MOV8803A/B
- Q1(2)E21MOV8884
- Q1(2)E21MOV8885
- Q1(2)E21MOV8886
- Q1(2)E21MOV8000A/B

15.5.3 Prior to manually seating or back seating an MOV that performs a safety function; the Shift Supervisor should evaluate the effect on valve operability with respect to Technical Specifications, Inservice Test Plan, or other applicable requirements. (SOER 83-9):

15.5.4 IF an MOV that performs a safety function, is to be placed in a position other than the one required to fulfill its safety function, THEN the MOV should be considered inoperable after manual operation. (SOER 83-9):

15.5.5 IF an MOV that performs a safety function is to be placed in the position required to fulfill its safety function, THEN the MOV is still considered operable after manual operation. (SOER 83-9):

NOTE:	• **The following step applies to both conditions described in steps 15.5.4 and 15.5.5.** • **In the following step, a time stroke is not required for valve operability.**

15.5.6 After manual operation of any MOV that performs a safety function, an LCO (either Voluntary or Administrative) should be initiated. The

LCO should require the MOV to be stroked electrically (one full cycle) to demonstrate operability prior to return to service. IF electrical operability of the motor operator cannot be verified, THEN initiate a Condition Report. (SOER 83-9):

15.5.7 DO NOT at any time pull up on the declutch lever. This would damage the clutch internals.

15.5.8 DO NOT use the manual operator to force the valve any further against its seat than the motor operator will drive it. The motor may not be able to drive the valve off the seat without damaging the operator. IF the motor operator fails to close the valve against the seat, THEN the manual operator may be used to close the valve and a Condition Report shall be submitted to evaluate the MOV operator.

15.5.9 DO NOT hold the de-clutch lever in the depressed position while the motor is running. Inadvertent re-engagement of the motor operator could damage the clutch internals.

15.5.10 DO NOT use any type of additional mechanical advantage (such as a cheater bar) when operating an MOV manually. Such use will damage the valve operator.

15.5.11 Excessive force should not be applied to declutch lever as deformation of the de-clutch shaft will result.

1. PLT OPER-40502H12 005

At 0500, to complete draining a system on an outage tagout, an MOV that performs a safety function to automatically open during a safety injection has to be manually closed due to power being tagged out to the MOV.

At 1900, the work is complete and the following conditions exist:

- The system has been filled, vented, and tagged in.
- The MOV is closed per the System Checklist.
- The tagout has restored power to the MOV and the GREEN valve position light is lit.

Which one of the following correctly states the OPERABILITY of the MOV, and the reason for the determination?

A. The MOV is OPERABLE since no internal valve work was performed.

B. The MOV is OPERABLE since power has been restored, and a safety injection signal will automatically open the valve.

C. The MOV is **NOT** OPERABLE since it has not been time stroked in the open direction.

D✓ The MOV is **NOT** OPERABLE since the valve was manually operated and has not been electrically stroked one full cycle.

SOP-0.0 Version 124
2.2 Equipment Control
2.2.36 Ability to **analyze** the **effect of maintenance activities, *such as*** degraded power sources, **on the status of limiting conditions for operations.**
(CFR: 41.10 / 43.2 / 45.13) 3.1 4.2

A. Incorrect. The first part is incorrect, but plausible, because this would be true for any maintenance or preventive maintenance on the valve that required de-energizing the valve and later re-energizing it IF no manual stroking was performed.

B. Incorrect. The first part is correct. The second part is incorrect, but plausible, because this would be true for any maintenance or preventive maintenance that de-energized the valve and later re-energized it IF any work had been performed which could have affected the time stroke of the valve in the direction of it's safety function position. This could easily be mistaken for the requirement after manually stroking an MOV to: "cycle electrically for one full cycle". SOP-0, Note prior to step 15.5.6 states that a time stroke is NOT required for valve operability after a manual stroke of an MOV.

C. Incorrect. The first part is incorrect, but plausible, because this would be true for any tagging order that de-energized the valve and later re-energized it IF no manual stroking was performed.

D. Correct. The valve is inoperable until electrically cycling the valve one full cycle, and that will allow clearing the LCO per FNP-0-SOP-0.0, Step 15.5.4 and 15.5.6.

SRO level: 10 CFR 55.43(b) (2)
This question tests the SRO knowledge of TS beyond the RO required knowledge by requiring knowledge that manually stroking an MOV makes the MOV inoperable, and requires knowledge of the actions required to clear the LCO and return the MOV to OPERABLE. Both are SRO only functions, since they require OPERABILITY determinations.

Technical Reference: FNP-0-SOP-0.0 Version 118.0

Learning Objective: 6. Access plant conditions to determine the ability of plant equipment and structures to meet their intended, designated function (OPS52302A06).

Comments: k/a match: This question presents a maintenance activity which affects the operability of an MOV. Proper evaluation of the operability of the MOV after it has power restored and proper indication is verified is required to answer this question. Also Knowledge of the post-maintenance testing required to return the valve to operable is required to answer this question. There is no degraded power source in this question to preclude overlap with other questions on this exam. The words "**such as** [degraded power sources]" are used in this k/a to allow other types of maintenance affecting LCOs to meet this k/a, with degraded power sources used only as one example of a maintenance activity.

92. G2.2.37 008/BANK/SRO/C/A 3.6/4.6/G2.2.37/Y/3/HBF/VER 5 EDITIORIAL

Unit 1 is at 100% power, and the following conditions exist:

- Chemistry discovers and reports that Surveillance Requirement 3.5.1.4, the safety injection accumulator boron concentration verification, which is required at a frequency of 31 days, has been missed for the 1C SI ACCUM.
- The last 1C SI ACCUM boron sample result was 2260 ppm 45 days ago.
- The 1C Accumulator level has risen 3% since the last sample but no fill evolution has occurred.

Which one of the following states whether or not the 1C Accumulator is OPERABLE and the reason?

The 1C Accumulator is __(1)__ because __(2)__

	(1)	(2)
A.✓	OPERABLE	the delay period of SR 3.0.3 may be applied for up to 31 days.
B.	OPERABLE	the delay period of SR 3.0.3 may be applied for only the next 24 hours.
C.	INOPERABLE	the surveillance frequency has been missed.
D.	INOPERABLE	the boron concentration is unknown.

SR 3.0.3 "If it is discovered that a Surveillance was not performed within its specified Frequency, then compliance with the requirement to declare the LCO not met may be delayed, from the time of discovery, up to 24 hours or up to the limit of the specified Frequency, **whichever is greater**. [...]"

Plausibility and Answer Analysis

A Correct. Although the surveillance has not been completed, there is reasonable expectation that the Accumulator boron concentration remains above the minimum required value (NMP-AD-012), and the delay period allowance of SR 3.0.3 can be applied thereby allowing an additional 31 days to complete the surveillance. Reasonable expectation can be derived from the 12% rise requirement: A rise in level with no Fill evolution would ensure that <1 % of tank volume change due to potential leakage from the RCS (since no fill evolutions occurred); due to relatively small volume, it is unlikely that even with EOL boron concentrations that a 3% (indicated) volume change would result in Boron concentrations falling outside of the allowable limits.

B Incorrect. The accumulator remains operable but 3.0.3 allows the extension of up to 31 days.

Plausible if missed the "OR GREATER" aspect of 3.0.3, which is coincidently also counter-intuitive.

C Incorrect. Missing the surveillance alone does not render the accumulator inoperable. See A.

Plausible: Satisfying the requirements of the surveillances is required to be operable, and if extensions requirements of 3.0.2, or delay period of 3.0.3 is not satisfied or there is reasonable expectation that the safety function was lost then this would be a correct answer.

D Incorrect See C; a 3% rise without filling, may imply that a leak is occurring from the RCS into the accumulator. In the event of an RCS leak into the Accumulator, a 1% tank volume change is permitted (12% indicated) before this dilution would be a concern. With a known volume change, known RCS boron concentration, and previous sample results, the Accumulator concentration could be calculated very accurately further gaining "reasonable assurance" that the function was not lost.

Plausible: since a level rise has occurred since the last sample, then it can be assumed that a dilution of the Accumulator has occurred. Without knowledge of the basis of SR 3.5.1.4 or system knowledge that the indicated level of 12% is only 1% of volume of the accumulator, one might assume that there has been a significant dilution resulting in a loss of that reasonable assurance that the safety function has been maintained.

K/A statement - 2.2.37 **Ability to determine operability and/or availability of safety related equipment.**

Importance Rating:	3.6 4.6
Technical Reference:	SR 3.0.2 / Basis SR 3.0.3 / Basis
References to be provided:	none
Learning Objective:	INTRO TS-52302A05; Recall and describe the application of bases of LCO [...] section SR 3.0 of TS.
Question origin:	NEW
Comments:	Requires evaluation of T.S. equipment for operability with regard to missing a Surveillance frequency requirement. Although this is a system specific evaluation, *it exercises the generic principles* of SR 3.0.1 through 3.0.3 thereby satisfying the generic intent of the K/A.
SRO justification:	Application of generic LCO requirements (LCO SR 3.0.3)

Question #	92
K/A	G2.2.37

REFERENCE Docs

3.0 SURVEILLANCE REQUIREMENT (SR) APPLICABILITY

SR 3.0.1	SRs shall be met during the MODES or other specified conditions in the Applicability for individual LCOs, unless otherwise stated in the SR. Failure to meet a Surveillance, whether such failure is experienced during the performance of the Surveillance or between performances of the Surveillance, shall be failure to meet the LCO. Failure to perform a Surveillance within the specified Frequency shall be failure to meet the LCO except as provided in SR 3.0.3. Surveillances do not have to be performed on inoperable equipment or variables outside specified limits.
SR 3.0.2	The specified Frequency for each SR is met if the Surveillance is performed within 1.25 times the interval specified in the Frequency, as measured from the previous performance or as measured from the time a specified condition of the Frequency is met. For Frequencies specified as "once," the above interval extension does not apply. If a Completion Time requires periodic performance on a "once per . . ." basis, the above Frequency extension applies to each performance after the initial performance. Exceptions to this Specification are stated in the individual Specifications.
SR 3.0.3	If it is discovered that a Surveillance was not performed within its specified Frequency, then compliance with the requirement to declare the LCO not met may be delayed, from the time of discovery, up to 24 hours or up to the limit of the specified Frequency, whichever is greater. This delay period is permitted to allow performance of the Surveillance. A risk evaluation shall be performed for any Surveillance delayed greater than 24 hours and the risk impact shall be managed. If the Surveillance is not performed within the delay period, the LCO must immediately be declared not met, and the applicable Condition(s) must be entered. When the Surveillance is performed within the delay period and the Surveillance is not met, the LCO must immediately be declared not met, and the applicable Condition(s) must be entered.
SR 3.0.4	Entry into a MODE or other specified condition in the Applicability of an LCO shall only be made when the LCO's Surveillances have been met within their specified Frequency, except as provided by SR 3.0.3. When an LCO is not met due to Surveillances not having been met, entry into a MODE or other specified condition in the Applicability shall only be made in accordance with LCO 3.0.4.

(continued)

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.1.1	Verify each accumulator isolation valve is fully open.	12 hours
SR 3.5.1.2	Verify borated water volume in each accumulator is ≥ 7555 gallons (31.4%) and ≤ 7780 gallons (58.4%).	12 hours
SR 3.5.1.3	Verify nitrogen cover pressure in each accumulator is ≥ 601 psig and ≤ 649 psig.	12 hours
SR 3.5.1.4	Verify boron concentration in each accumulator is ≥ 2200 ppm and ≤ 2500 ppm.	31 days AND -------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.	31 days

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.1.2 and SR 3.5.1.3

Every 12 hours, borated water volume and nitrogen cover pressure are verified for each accumulator. This Frequency is sufficient to ensure adequate injection during a LOCA. Because of the static design of the accumulator, a 12 hour Frequency usually allows the operator to identify changes before limits are reached. Operating experience has shown this Frequency to be appropriate for early detection and correction of off normal trends.

SR 3.5.1.4

The boron concentration should be verified to be within required limits for each accumulator every 31 days since the static design of the accumulators limits the ways in which the concentration can be changed. The 31 day Frequency is adequate to identify changes that could occur from mechanisms such as stratification or inleakage. 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 every 31 days 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. Since power is removed under administrative control, the 31 day Frequency will provide adequate assurance that power is removed.

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)

93. G2.3.11 002/BANK/SRO/MEM 3.8/4.3/G2.3.11/N/2/HBF/VER 4 EDITORIAL

The following plant conditions exist on Unit 1:

- A gaseous waste release is in progress IAW a gas waste permit and SOP-51.1, Waste Gas System Gas Decay Tank Release.
- The power supply to R-14, Plant Vent Gas Monitor, fails.
- The following alarms have come in:
  - FH1, RMS HI-RAD.
  - FH2, RMS CH FAILURE.

Which one of the following is the required action, and is a complete list of personnel required to be notified per FH1, FH2, and SOP-51.1?

HCV-14, Waste Gas Release Valve, will be verified closed __(1)__

Notify the Shift Supervisor, __(2)__

A. 1) immediately from the MCB.

2) Chemistry, Health Physics, and I&C personnel.

B✓ 1) by the Radside SO at the Waste Gas Panel.

2) Chemistry, Health Physics, and I&C personnel.

C. 1) immediately from the MCB.

2) and the shift radiochemist **ONLY**.

D. 1) by the Radside SO at the Waste Gas Panel.

2) and the shift radiochemist **ONLY**.

A - Incorrect;
1- The discharge in progress is automatically secured by the auto shutting of HCV-14 and can not be closed nor checked from the MCB.

2- The second part is correct. See B.

B - Correct;
1- The discharge in progress should automatically secure by auto shutting HCV-14. The rad side SO must be sent to the verify the release is secured, per ARP-1.6, FH1, step 2 and 3.1 since this valve status is only available from the WG control panel. SOP-51.1 is referenced from FH1, in which the P&L 3.2 states that the release stopped and SS notified.
2 - Additionally, the action for FH2 includes:

2. Notify **chemistry and health physics** personnel.
3. Notify **Instrument Service Personnel**

C - Incorrect;
1- see A above
2-The notifications are incomplete and does not include health physics or IC personnel.

plausible: stated actions are that required per the ODCM to allow for a release without HCV-14 availability. The release being secured also satisfies the ODCM requirements.

D - Incorrect;
1- correct see B above

2- second part is not complete. See C.

K/A statement - Radiation Control--2.3.11 **Ability to control radiation releases.**

Importance Rating:	3.8 4.3
Technical Reference:	ARP-1.6, FH1 & FH2, Ver 64 SOP-51.1, ver 27 ODCM ver 23
References to be provided:	None
Learning Objective:	OPS-62106B02; Assess the facility conditions associated with the WG system components and select the appropriate procedure for normal or abnormal situations.
Question origin:	FNP Bank WAST GAS-62106B02 002 ; 2003 NRC SRO
Comments:	The radiation monitors fail to a "High Radiation" condition on loss of instrument and/or control power that will result in actuation of associated automatic functions.
SRO justification:	notifications of other organizations is the responsibility of the SRO.

Question # 93

K/A G2.3.11

REFERENCE Docs

OPERATOR ACTIONS

1. Check indications on radiation monitoring system console and determine which radiation monitor channel indicates high activity.
2. Insure that any automatic actions, associated with the alarmed channel, have occurred.
3. Perform the following general actions as appropriate.
   3.1. Determine the source or cause of the high activity and correct or isolate as required.
   3.2 Determine the validity of the high activity indication as follows:
      3.2.1 Verify that the instrument is aligned for normal operation and is functioning properly.
      3.2.2 IF a known problem exists such that the detector is saturated, THEN momentarily pull the affected detector's fuses (located on the front of the drawer) to clear the condition.
      3.2.3 If requested to disable a remote audible alarm, refer to FNP-1-SOP-45.0, P&L 3.6.
      3.2.4 Sample or survey the affected system or area as required. **{CMT 0008755}.**
   3.3 Do not allow personnel to enter the affected area without the approval of the Health Physics Department.
   3.4 IF high activity indication is due to instrument failure, THEN refer to Technical Specifications, section 3.3.3, 3.4.15 and TRM TR 13.3.4.
   3.5 IF high activity indication of RCS leakage is present AND accompanied by either decreasing pressurizer level, OR decreasing VCT level, THEN go to FNP-1-AOP-1.0, RCS LEAKAGE.
   3.6 IF high activity indication of Steam Generator Tube Leakage is present, THEN go to FNP-1-AOP-2.0, STEAM GENERATOR TUBE LEAKAGE.
   3.7. IF ARDA activated and not required, THEN have counting room stop the automated dose assessment per FNP-0-EIP-9.1, AUTOMATED DOSE ASSESSMENT METHOD.
   3.8 WHEN radiation levels have decreased below alarm setpoint, THEN reset the appropriate HI radiation alarm on the RAD monitor drawer.

RADIATION MONITOR REFERENCE TABLE (cont)

RE	LOCATION	TYPE	DETECTOR	FUNCTION	ACTIONS
R-12*	Containment Atmosphere (AB 121')	Gas	G-M (W)		Perform Step 4.12
R-13	Waste Gas Compressor Suction (AB 100' WGC Valve Room)	Gas	G-M (W)		Perform Step 4.13
R-14 ODCM	Plant Vent Stack (AB Roof)	Gas	G-M (W)	Closes HCV-14	Perform Step 4.14
R-15A ODCM	Condenser Air Ejector Discharge Header (TB 155')	Gas	G-M		Perform Step 4.15A
R-15B*	Condenser Air Ejector (Intermediate Range) (TB 189')	Gas	G-M (Eberline)		Perform Step 4.15B
R-15C*	Condenser Air Ejector (High Range) (TB 189')	Gas	Ion Chamber (Eberline)		Perform Step 4.15B
R-17A	Component Cooling Water (CCW Hx Room)	Liquid	Scint. (W)	Closes CCW surge tank vent (RCV-3028)	Perform Step 4.17
R-17B	Component Cooling Water (CCW Hx Room)	Liquid	Scint.	Closes CCW surge tank vent (RCV-3028)	Perform Step 4.17
R-18 ODCM	Waste Monitor Tank Pump Discharge (AB 121' at the Batching Funnel)	Liquid	Scint. (W)	Closes RCV-18	Perform Step 4.18
R-19	Steam Generator Blowdown/Sample (AB 139')	Liquid	Scint. (W)	Isolates sample lines 3328, 3329, 3330	Perform Step 4.19
R-20A	Service Water from Containment Coolers A and B (AB 121' BTRS Chiller Room)	Liquid	Scint. (W)		Perform Step 4.20
R-20B	Service Water from Containment Coolers C and D (AB 121')	Liquid	Scint. (W)		Perform Step 4.20

*Technical Specification related

OPERATOR ACTION (cont)

4.8 IF **R-8** in alarm THEN perform the following:
- 4.8.1 Announce the affected area on the public address system.
- 4.8.2 Have all personnel evacuate the affected area.

4.9 Step not used

4.10 IF **R-10** alarms and high activity in the penetrations rooms is possible, THEN consider placing penetration room filtration in service using FNP-1-SOP-60 PENETRATION ROOM FILTRATION SYSTEM.

4.11 IF **R-11** alarms, THEN perform the following:
- 4.11.1 IF personnel are in containment and unaware of the high activity, THEN announce the affected area on the public address system.
- 4.11.2 IF high activity in containment is possible, THEN consider securing containment purge / minipurge (refer to FNP-1-SOP-12.2 CONTAINMENT PURGE AND PREACCESS FILTRATION SYSTEM.
- 4.11.3 IF RCS leakage is possible then perform actions of FNP-1-AOP-1.0, RCS LEAKAGE

4.12 IF **R-12** alarms, THEN perform the following:
- 4.12.1 IF personnel are in containment and unaware of the high activity, THEN announce the affected area on the public address system.
- 4.12.2 IF high activity in containment is possible, THEN consider securing containment purge / minipurge (refer to FNP-1-SOP-12.2 CONTAINMENT PURGE AND PREACCESS FILTRATION SYSTEM.
- 4.12.3 IF RCS leakage is possible then perform actions of FNP-1-AOP-1.0, RCS LEAKAGE

4.13 IF **R-13** alarms, THEN refer to FNP-1-SOP-51, WASTE GAS SYSTEM for potential problems with the waste gas system.

4.14 IF **R-14** alarms, THEN perform the following:
- 4.14.1 IF dry storage operations are in progress, THEN perform the following, as appropriate:
  - 4.14.1.1 IF dry storage personnel have notified OPS that the R-14 alarm is possible due to dry storage operations, THEN regard as an expected alarm.
  - 4.14.1.2 Contact dry storage personnel AND determine if dry storage operations probably caused the R-14 alarm.

OPERATOR ACTION (cont)

4.14.2 IF high effluent activity is possible, THEN implement FNP-0-EIP-9.0, EMERGENCY CLASSIFICATION AND ACTIONS. **{CMTs 0008751, 0008755}.**

4.14.3 Refer to FNP-1-SOP-51, WASTE GAS SYSTEM for potential problems with the waste gas system.

4.15A IF **R-15** alarms AND remains above the alarm setpoint (not a momentary spike), THEN perform the following:

4.15A.1 IF high effluent activity is possible, THEN implement FNP-0-EIP-9.0, EMERGENCY CLASSIFICATION AND ACTIONS. **{CMTs 0008751, 0008755}.**

4.15A.2 Notify the Counting Room to immediately sample the SGs per FNP-0-CCP-31, LEAK RATE DETERMINATION, to determine the leak rate.

4.15A.3 Notify the Operations Shift Manager.

4.15B IF **R-15B** OR **R-15C**, alarms AND remains above the alarm setpoint (not a momentary spike), THEN notify the Counting Room to immediately sample the SGs per FNP-0-CCP-31, LEAK RATE DETERMINATION, to determine the leak rate.

4.16 This step not used.

NOTE: IF CCW surge tank vents are closed for reasons other than an actual high radiation alarm, THEN with Shift Supervisor concurrence, the CCW surge tank vents should be cycled once every shift (eight hours) and documented in AutoLog.

4.17 IF **R-17A** OR **R-17B** alarms, THEN perform the following:

4.17.1 IF alarm is due to CCW Suction rad monitor R-17A or R-17B being failed low (low alarm lit), THEN close CCW Surge Tank vent valve Q1P17HV3028, using handswitches for both Q1P17SV3028A and Q1P17SV3028B, with SS concurrence.

4.17.2 Monitor CCW pump operation while the CCW surge tank vents are closed.

4.17.3 WHEN desired to open the CCW surge tank vent valve Q1P17HV3028, THEN simultaneously place handswitches for both Q1P17SV3028A and Q1P17SV3028B to open until the red light is lit.

LOCATION FH2

SETPOINT: Not Applicable

H2
RMS CH FAILURE

ORIGIN: Any of the below listed Area, Process or Gaseous and Particulate Monitors: R01, R02, R03, R04, R05, R06, R07, R08, R10, R11, R12, R13, R14, R15, R17A R17B, R18, R19, R20A, R20B, R21, R22, R23A, R23B, R26A, or R26B.

PROBABLE CAUSE

1. Loss of input signal to any of the above listed Radiation Detection Channels.
2. Loss of Power to a Channel.
3. Radiation Monitoring System testing in progress.

AUTOMATIC ACTION

1. The radiation monitors fail to a "High Radiation" condition on loss of instrument and/or control power that will result in actuation of associated automatic functions. Refer to annunciator FH1 for automatic actions.

OPERATOR ACTION

NOTE: Low Alarm Light "on" indicates failure.

1. Check indications on radiation monitoring system console and determine which radiation monitor channel indicates a failure.
2. Notify chemistry and health physics personnel.
3. Notify Instrument Service Personnel to:
   A. Investigate the failure.
   B. Make repairs as necessary.
4. Return the Radiation Monitor System Channel to service, in accordance with FNP-1-SOP-45.0, RADIATION MONITORING SYSTEM, as soon as possible.
5. Refer to the Technical Requirements Manual section on Radiation Monitoring Instrumentation.

References: A-177100, Sh. 307; U-260841; D-181751; D-181752; D-181753; FSAR, Section 11.4

3.0 Precautions and Limitations

3.1 Radiation monitor R-14 must be frequently observed during the release of radioactive gas to assure that the count rate is not approaching R-14 setpoint as stated on the release permit.

3.2 IF R-14 becomes inoperable while discharging gaseous waste to the vent stack, THEN discharge shall be stopped immediately and the Shift Supervisor notified.

3.3 IF either R-14, R-14's alarm, or R-14's automatic termination of release function is inoperable, THEN with the Shift Supervisors permission the release may continue provided ODCM action requirements are met.

3.4 Once a gas decay tank has been isolated for sampling purposes, prior to discharging to the vent stack, the tank shall remain in an isolated condition to prevent the introduction of any gas which could alter the concentration of the tank's contained volume.

3.5 When a high alarm is initiated on channel R-14, ARDA may start (two consecutive polls one minute apart) and the Shift Radiochemist must be notified to stop the automated dose assessment per FNP-0-EIP-9.1, AUTOMATED DOSE ASSESSMENT METHOD, if ARDA is not required.

1. WAST GAS-62106B02 002

A gaseous waste release is in progress to the vent stack in accordance with a gas waste permit and SOP-51.1, Waste Gas System Gas Decay Tank Release.

- During the planned waste gas release, the power supply to R-14, Plant Vent Gas Monitor, fails.
- FH1, RMS HI-RAD, and FH2, RMS CH FAILURE, has come into alarm.

Which ONE of the following is a complete list and required actions IAW the applicable annunciator response procedures and SOP-51.1?

A. • Immediately close HCV-14, Waste Gas Release Valve, from the MCB.

  • Notify Chemistry, Health Physics, I&C personnel, and the Shift Supervisor only.

B.✓ • Send the Radside SO to verify closed HCV-14 at the Gas Waste panel.

  • Notify Chemistry, Health Physics, I&C personnel, and the Shift Supervisor only.

C. • Send the Radside SO to verify closed HCV-14 at the Gas Waste panel.

  • Notify the shift radiochemist to implement sampling procedures IAW the ODCM, then inform the Shift Supervisor only.

D. • Immediately close HCV-14, Waste Gas Release Valve, from the MCB.

  • Notify the shift radiochemist to implement sampling procedures IAW the ODCM, then inform the Shift Supervisor only.

The radiation monitors fail to a "High Radiation" condition on loss of instrument and/or control power that will result in actuation of associated automatic functions.

A - Incorrect; The discharge in progress is automatically secured by the auto shutting of HV-14. Also HCV-14 can not be closed from the MCB.
second part is correct.

B - Correct; The discharge in progress is automatically secured by auto shutting of HV-14. The rad side SO is secnt to verify the release is secured.

Operator actions of Annunciator FH2, RMS CH FAILURE, IS SHOWN:
OPERATOR ACTION

NOTE: Low Alarm Light "on" indicates failure.

1. Check indications on radiation monitoring system console and determine which radiation monitor channel indicates a failure.
2. Notify **chemistry and health physics** personnel.
3. Notify **Instrument Service Personnel** to:
A. Investigate the failure.
B. Make repairs as necessary.
4. Return the Radiation Monitor System Channel to service, in accordance with FNP-1-SOP-45.0, RADIATION MONITORING SYSTEM, as soon as possible.
5. Refer to the Technical Requirements Manual section on Radiation Monitoring Instrumentation.

Action from precaution in SOP-51.1 is **to secure the discharge and notify Shift Supervisor.**
3.2 IF R-14 becomes inoperable while discharging gaseous waste to the vent stack, THEN discharge shall be stopped immediately and the Shift Supervisor notified

C - Incorrect; this list is correct but is only a partila list. HP and I&C are also notified.
second part is correct.

D - Incorrect; The discharge in progress is automatically secured by the auto shutting of HV-14. Also HCV-14 can not be closed from the MCB.
second part is not complete.

2003 NRC exam

G2.3.11
ability to control radiation releases.

94. G2.3.12 002/MODIFIED BANK/SRO/MEM 3.2/3.7/G2.3.12/N/3/HBF/

Unit 1 is at 25% power. A Unit 1 containment entry is planned for maintenance on the Moveable Incore Detector System (MIDS). Containment entry will be through the Emergency Air Lock.

IAW AP-42, Access Control, which one of the following states the positions that must **approve**:

(1) removal of the locking device from the MIDS power switch,

AND

(2) entry using the emergency personnel airlock?

	(1)	(2)
A.	Shift Supervisor	Shift Manager
B.	Shift Supervisor	Operations Manager
C✓	Health Physics Supervisor	Shift Manager
D.	Health Physics Supervisor	Operations Manager

AP-42, version 44.0 states:

10.2 Normal entry when the reactor is at power shall be through the personnel air lock. **The emergency personnel air lock is for emergency use only, and any other use of the emergency personnel air lock must be approved by the Shift Manager**. Also, management may allow personnel/groups to enter containment via the equipment hatch when the plant is shutdown and it is deemed prudent to allow access via this point.

10.3 Before any Containment entry, Incore Detectors will be placed in a safe condition [...] Removal of the locking device or safety tag will require approval by Health Physics Supervision. [...] The [MIDS] will be controlled per Health Physics procedure(s) [RCP-12].

RCP-12, ver 17.0, provides more definitive clarification that "supervision" = Supervisor

6.0 Contact an HP Supervisor for their approval and to authorize the Incore Drive Panel to be energized.

Plausibility and Answer Analysis

A. Incorrect. 1) incorrect per AP-42 para 10.3; but plausible since the Shift Supervisor would be normally direct the Plant Operators to perform this action or would be informed "of each change in configuration control" per RCP-12 step 3.6.1.
2) per AP-42 para 10.2 this is correct.

B. Incorrect. 1) See A#1
2) incorrect per AP-42 step 10.2; but plausible since "management" may allow personnel/groups to enter containment via the equipment hatch when shutdown.

C. Correct. 1) HP Supervisor is correct per AP-42 para 10.3 & RCP-12.
2) Shift Manager is correct per AP-42 para 10.2

D. Incorrect. 1) See C#1
2) See B#2

K/A statement - G2.3.12 **Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.**

Importance Rating: 3.2 3.7

Technical Reference: AP-42 ver 44.0
RCP-12 ver 17.0
RCP-11 ver 24.0,

References to be provided: None

Learning Objective: AP-42-40502M04; Describe the requirements that must be met for containment entry[...].

Question origin:	modified BANK-- combined 2; AP-42-40502M04 001 AP-42-40502M04 002 (NRC 2000;2003;2006)
Comments:	K/A Match: 1-- **radiological safety principles:** safety principle is control of the MIDS to prevent overexposure 2-- **pertaining to licensed operator duties:** authorization for containment "NON-emergency" entry via the Emergency Personnel Air lock while at power. **combined two bank questions** to better match KA since the SRO duty (decision) is not for "radiological safety" and since this aspect of Radiological safety is not directly a "licensed operator duty"; although knowledge of the limitations of the SS/SM's authority is as important as knowledge of the position's authority itself.
SRO justification:	This question requires recalling what strategy or action is written into a plant procedure, including when the strategy or action is required. It also requires the SRO to know his unique responsibilities for radiological safety principles pertaining to his duties while at power.

Bank Selection (different than randomly chosen):
AOP-30.0-62521H02 001--- first randomly selected K/A (used 2008 NRC)--- used on Audit exam
CCW-40204A11 014--- REJECTED due to RO knowledge level no feasible method to upgrade

<Spec 10>	
AOP-30.0-62521H02 1	CCW-40204A11 3

Question #	94
K/A	G2.3.12

REFERENCE Docs

Gamma-isotopic (iodine and particulates)

Tritium

Containment entries will be controlled per Health Physics procedures FNP-1-RCP-11 or FNP-2-RCP-11.

10.2 Normal entry when the reactor is at power shall be through the personnel air lock. The emergency personnel air lock is for emergency use only, and any other use of the emergency personnel air lock must be approved by the Shift Manager. Also, management may allow personnel/groups to enter containment via the equipment hatch when the plant is shutdown and it is deemed prudent to allow access via this point.

10.3 Before any Containment entry, Incore Detectors will be placed in a safe condition (e.g. in the core or in storage) and a Health Physics controlled locking device or safety tag placed on the switches to prevent operation. Removal of the locking device or safety tag will require approval by Health Physics Supervision. If it is necessary to move the detectors or to perform maintenance on the detectors while personnel are in Containment, or if detectors are stuck out of their storage position this requirement may be replaced by direct Health Physics surveillance to protect against inadvertent exposure. The Moveable Incore Detector System will be controlled per Health Physics procedure(s) FNP-1-RCP-12 or FNP-2-RCP-12.

10.4 Personnel will evacuate Containment under any of the following conditions:

10.4.1 Sounding of the Plant Emergency Alarm.

10.4.2 Sounding of the Containment Evacuation Alarm.

10.4.3 Announcement of Containment evacuation over the public address system.

11.0 <u>Lost or Damaged Security Badges</u>

Lost or damaged security badges will be reported immediately to Security. If a security badge is lost, search activities will be performed as specified by FNP-0-SP-11.

12.0 <u>Lost or Damaged Dosimetry Devices</u>

Lost or damaged dosimetry devices will be reported immediately to the Dosimetry Lab.

[ ] MIDs **HAVE** been driven into the core at power within 72 hours of the planned containment entry.

Record method that was used to make determination:____________________
____
____

Date: ____________ Time: __________

HP Supervision or HP Technician: _________________________

5.0 Evaluate if the job is Radiologically Risk Significant.

[ ] YES [ ] NO

If it is determined the job is Radiologically Risk Significant, ensure the requirements of FNP-0-RCP-0 are met.

HP Supervision or HP Technician: ________________________

NOTE:	**The Incore Control Panel (located in the U-1 Control Room) must be energized to drive a unit from the local control in the drive box (e.g. this is utilized for drive wheel check outs during drive system maintenance).**

6.0 Contact an HP Supervisor for their approval and to authorize the Incore Drive Panel to be energized.

Name of HP Supervisor contacted: ____________________

[ ] Inform the HP Supervisor whether the incore(s) will be worked while energized or if they will be worked manually.

[ ] Inform the HP Supervisor when the incores were last run. If the incores were driven into the core at power and all MIDs are not in storage, access to containment may need to be restricted for 72 hours from the time the MIDs were last run.

[ ] Inform the HP Supervisor if more than one incore will be energized at a time. The HP Technician providing coverage will ensure all associated incore drive unit disconnects that are **not** required to be energized are positioned in the **OPEN** position.

[ ] If R-7 is operable note the reading __________ mRem/hr. Inform the HP Supervisor of the results. Historically, R-7 has averaged 10 to 15 mRem/hr during power operation and ~ 1 - 5 mRem/hr when the reactor is shut down.

1. AP-42-40502M04 001

Before any containment entry, the incore detectors must be placed in a safe condition and either a Health Physics controlled locking device or safety tag placed on the power switch to prevent operation.

Removal of either device requires the approval of which one of the following?

A. Shift Manager

B✓ Health Physics Supervision

C. On-Call Emergency Director

D. Shift Supervisor

10.3 Before any Containment entry, Incore Detectors will be placed in a safe condition (e.g. in the core or in storage) and a Health Physics controlled locking device or safety tag placed on the switches to prevent operation. **Removal of the locking device or safety tag will require approval by Health Physics Supervision**. If it is necessary to move the detectors or to perform maintenance on the detectors while personnel are in Containment, or if detectors are stuck out of their storage position this requirement may be replaced by direct Health Physics surveillance to protect against inadvertent exposure. The Moveable Incore Detector System will be controlled per Health Physics procedure(s) FNP-1-RCP-12 or FNP-2-RCP-12.

editorial only - specified the power switch instead of switches.

2. AP-42-40502M04 002

Unit 1 is at 100% power.

Which one of the following positions must approve use of the emergency personel airlock for a non-emergency entry?

Use of the emergency personel airlock must be approved by the ________________, at a minimum.

A. Shift Manager

B. On-Call Emergency Director

C. Health Physics Supervision

D✓ Shift Supervisor

AP-42 version 42.0

10.2 Normal entry when the reactor is at power shall be through the personnel air lock. The emergency personnel air lock is for emergency use only, and any other use of the emergency personnel air lock must be approved by the Shift Supervisor-Nuclear. Also, management may allow personnel/groups to enter containment via the equipment hatch when the plant is shutdown and it is deemed prudent to allow access via this point.

95. G2.4.2 002/MODIFIED BANK/SRO/C/A 4.5/4.6/G2.4.2/N/3/HBF/VER 5 EDITORIAL

Given the following conditions:

- Both Units are operating at 100% power.
- The 1C Diesel Fuel Oil Storage Tank Auto Transfer Oil Pump is in the OFF position.
- The 1C Diesel Fuel Oil Storage Tank Manual Transfer Oil pump is tagged out.
- The Diesel Building SO has been briefed to stay in the Diesel Building to be available to fill the Fuel Oil Day Tank Manually if needed.

Which one of the following states the current operability status of the 1C DG, AND the accident combination which will result in 4160V Bus 2H remaining de-energized until it is manually energized?

The 1C DG is __(1)__.

__(2)__ will result in 4160V Bus 2H remaining de-energized until manually energized.

A. 1) inoperable

2) A Dual Unit LOSP with an SI on Unit 1

B. 1) inoperable

2) An LOSP on Unit 2 with an SI on Unit 2

C. 1) operable

2) A Dual Unit LOSP with an SI on Unit 1

D✓ 1) operable

2) An LOSP on Unit 2 with an SI on Unit 2

Plausibility and Answer Analysis

A. Incorrect - 1) INCORRECT The 1C EDG is operable and available. Plausible: IF Automatic operation of the Auto-fuel oil transfer pump was required for operability--SR 3.8.1.5 requires the operation of the FO transfer system, and is a support system that is in an abnormal configuration.

2) Inorrect -- 2H bus will be energized by the 1C EDG.

B. Incorrect - 1) Incorrect See A #1
2) correct -- see D#2.

C. Incorrect - 1) correct- See D#1
2) Incorrect-- See A#2.

D. Incorrect - 1) 1C DG is operable-- only 1 pump which allows for MANUAL OR AUTO day tank level maintenance is required.
2) Unit 2A Train busses F&K will be energized by the 1-2A DG, but DF13, feeder bkr to the H bus will remain open due to SI signal on U-2.

SOP-42.0 P&L 3.6 requires reference to Figure 1. It states: "Tagging out of an EDG Auto Fuel Oil Transfer Pump does not, by itself, make a given EDG inoperable."

TS B3.8.1 states: "The diversity of the defense in depth of the fuel oil transfer system ensures that even with one DG fuel oil transfer pump out of service on a single DG fuel oil storage tank, the capability still exists to maintain the DG Day Tank using multiple fuel transfer pumps. Therefore, one fuel transfer pump can be out of service on any given DG and the DG is still capable of meeting its design function." (T.S. B3.8.1-3)

TS B3.8.3 states: "Fuel oil is transferred from a storage tank be either of two transfer pumps associated with the storage tank. [...] Operator actions are required to transfer fuel between storage tanks and day tank using the manually operated fuel transfer pumps." (T.S. B3.8.3-1)

STP-81.3 P&L 4.1 states: "The 1C DG Auto Fuel Oil Transfer Pump will be placed in OFF per SOP-42.0 [... and the 1C...] DG will remain operable and [functional/available] provided a designated individual is briefed to [1) remain in the DG bldg and 2) place the Auto pump in Auto when instructed.]

K/A statement - 2.4.2 **Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.**

Importance Rating:	4.5 4.6
Technical Reference:	FSD A-181005 App A. TS B3.8.1 & TS B 3.8.3
References to be provided:	None
Learning Objective:	40102D07; Define and evaluate the operational implications of normal/abnormal plant or equipment conditions associated with the safe operation of the DG Seq System components and equipment.
Question origin:	Modified Bank: DG SEQ-40102D07 028
Comments:	K/A match or other comments-- Knowledge of the interlocks and automatic response of DF13 and the 1C EDG in various LOSP/SI/Unit combinations. An LOSP is entry conditions to either the ERG network or AOP network.
SRO justification:	Requires knowledge of the Surveillance Requirement and T.S. Basis to make the Operability determination.

Question #	95
K/A	G2.4.2

REFERENCE Docs

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.3 Diesel Fuel Oil, Lube Oil, and Starting Air

BASES

BACKGROUND

Each diesel generator (DG) is connected to a shared fuel oil storage and transfer system. The shared fuel oil storage system consists of 5 underground storage tanks interconnected with piping, valves and redundant capacity fuel transfer pumps. This configuration allows for pumping diesel fuel to the DG day tanks or from any storage tank to any other storage tank. The deliverable capacity of 4 tanks is sufficient to operate the required DGs for a period of 7 days while the DGs are supplying maximum post loss of coolant accident load demand discussed in the FSAR, Section 8.3.1.1.7 (Ref. 1). The maximum load demand is calculated using the assumption that a minimum of any two DGs are available. This onsite fuel oil capacity is sufficient to operate the DGs for longer than the time to replenish the onsite supply from outside sources.

Fuel oil is transferred from a storage tank by either of two transfer pumps associated with each storage tank. The automatically controlled transfer pump, normally aligned to its DG day tank, is powered from a MCC supplied by the associated diesel, while the manually operated pump is powered from a MCC associated with another diesel. With the exception of transfer pumps for the tank associated with the station blackout diesel (2C), the pumps are powered from opposite trains. The opposite train power supplies ensure fuel in the associated storage tank can be transferred considering a design basis single failure. The transfer pumps for the station blackout diesel storage tank are supplied by train B power only. The automatic transfer pump can be fed from buses supplied by either DG 1B or 2B (in addition to DG 2C) and the manual transfer pump is fed from buses supplied by DG 2B. Therefore, the 2C fuel oil storage tank and associated transfer pumps may be available during design basis events to be used and credited as a manual supply to either B train design basis diesel (1B or 2B) when all applicable Technical Specification requirements are met. Operator actions are required to transfer fuel between storage tanks and day tank using the manually operated fuel transfer pumps.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

Since diesel fuel oil, lube oil, and the air start subsystem support the operation of the standby AC power sources, they satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Stored diesel fuel oil is required to have sufficient useable supply for 7 days operation of the required DGs supplying the required loads. It is also required to meet specific standards for quality. Additionally, sufficient lubricating oil supply must be available to ensure the capability to operate at full load for 7 days. This requirement, in conjunction with an ability to obtain replacement supplies within 7 days, supports the availability of DGs required to shut down the reactor and to maintain it in a safe condition for an anticipated operational occurrence (AOO) or a postulated DBA with loss of offsite power. DG day tank fuel requirements, as well as transfer capability from the storage tank to the day tank, are addressed in LCO 3.8.1, "AC Sources - Operating," and LCO 3.8.2, "AC Sources - Shutdown."

The starting air system is required to have a minimum capacity for five successive DG start attempts without recharging the air start receivers. A single air receiver on each DG is sufficient to meet this operability requirement.

APPLICABILITY

The AC sources (LCO 3.8.1 and LCO 3.8.2) are required to ensure the availability of the required power to shut down the reactor and maintain it in a safe shutdown condition after an AOO or a postulated DBA. Since stored diesel fuel oil, lube oil, and the starting air subsystem support LCO 3.8.1 and LCO 3.8.2, stored diesel fuel oil, lube oil, and starting air are required to be within limits when the associated DG is required to be OPERABLE.

BASES

LCO (continued)

connecting the 500 and 230 kV switchyards are available. Any combination of 500 and 230 kV circuit breakers required to complete the independent circuits is permissible.

Each DG must be capable of starting, accelerating to rated speed and voltage, and connecting to its respective ESF bus on detection of bus undervoltage. This will be accomplished within 12 seconds. Each DG must also be capable of accepting required loads within the assumed loading sequence intervals, and continue to operate until offsite power can be restored to the ESF buses. For DG 1C this capability requires the support of the 4160 V H bus to enable DG 1C to supply the 4160 V buses F and K. These capabilities are required to be met from a variety of initial conditions such as DG in standby with the engine hot and DG in standby with the engine at ambient conditions. Additional DG capabilities must be demonstrated to meet required Surveillance, e.g., capability of the DG to revert to standby status on an ECCS signal while operating in parallel test mode.

Proper sequencing of loads, including tripping of nonessential loads, is a required function for DG OPERABILITY.

The AC sources in one train must be separate and independent (to the extent possible) of the AC sources in the other train. For the DGs, separation and independence are complete.

For the offsite AC sources, separation and independence are to the extent practical. All ESF buses, with two power sources available, have their supply breakers interlocked such that the buses can receive power from only one source at a time.

APPLICABILITY

The AC sources and sequencers 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.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.3 (continued)

The 31 day Frequency for this Surveillance is consistent with Regulatory Guide 1.108 (Ref. 9).

This SR is modified by four Notes. Note 1 indicates that diesel engine runs for this Surveillance may include gradual loading, as recommended by the manufacturer, so that mechanical stress and wear on the diesel engine are minimized. Note 2 states that momentary transients, because of changing bus loads, do not invalidate this test. Note 3 indicates that this Surveillance should be conducted on only one DG per unit at a time in order to avoid common cause failures that might result from offsite circuit or grid perturbations. Note 3 is intended to be applied on a per unit basis and is not intended to preclude testing DGs on different units at the same time. Note 4 stipulates a prerequisite requirement for performance of this SR. A successful DG start must precede this test to credit satisfactory performance.

SR 3.8.1.4

This SR provides verification that the level of fuel oil in the day tank is at or above a level which ensures sufficient time for manual transfer of fuel oil from the DG storage tank if the automatic transfer fails. The level is expressed as an equivalent volume in gallons, and ensures adequate fuel oil for a minimum of 3 hours of DG operation at the continuous rating.

The 31 day Frequency is adequate to assure that a sufficient supply of fuel oil is available, since low level alarms are provided and facility operators would be aware of any large uses of fuel oil during this period.

SR 3.8.1.5

This Surveillance demonstrates that each required fuel oil transfer pump operates and transfers fuel oil from its associated storage tank to its associated day tank. This is required to support continuous operation of standby power sources. This Surveillance provides assurance that the fuel oil transfer pump is OPERABLE, the fuel oil piping system is intact, the fuel delivery piping is not obstructed, and the controls and control systems for fuel transfer systems are OPERABLE.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.5 (continued)

The design of fuel transfer systems is such that pumps operate automatically or must be started manually in order to maintain an adequate volume of fuel oil in the day tanks during or following DG testing. In such a case, a 31 day Frequency is appropriate.

SR 3.8.1.6

See SR 3.8.1.2.

SR 3.8.1.7

Transfer of the unit power supply from the normal offsite circuit to the alternate offsite circuit demonstrates the OPERABILITY of the alternate circuit distribution network to power the shutdown loads. The 18 month Frequency of the Surveillance is based on engineering judgment, taking into consideration the unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

This SR is modified by a Note. The reason for the Note is that, during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems.

SR 3.8.1.8

Each DG is provided with an engine overspeed trip to prevent damage to the engine. Recovery from the transient caused by the loss of a large load could cause diesel engine overspeed, which, if excessive, might result in a trip of the engine. This Surveillance demonstrates the DG load response characteristics and capability to reject the largest single load without exceeding predetermined voltage and while maintaining a specified margin to the overspeed trip. The single load for each DG is approximately 1000 kW. This Surveillance may be accomplished by:

(continued)

Diesel generator 1-2A must be used in this scenario because diesel generator 1C is not capable of energizing a full train of LOCA loads. As in sections A.3.1.4 and A.3.1.5, diesel generator 1C will start and idle but it will not connect to any bus.

A.3.1.7 LOSP and LOCA on Unit 2

For LOSP and LOCA on Unit 2 only, the diesel generator alignment will be as follows:

1-2A	Unit 2	Buses 2F and 2K
2B	Unit 2	Buses 2G, 2L and 2J

(Reference 6.7.080)

As in section A.3.1.6, diesel generator 1-2A must be used in this event. Diesel generator 1C will start and idle but it will not connect to any bus.

A.3.2 UNIT 1 IN OPERATION ONLY

A.3.2.1 LOSP

For Unit 1 in operation and LOSP in that unit, the diesel generator alignment will be as follows:

1-2A	Unit 1	Buses 1F and 1K
1C	Unit 1	Bus 1H
1B	Unit 1	Buses 1G, 1L and 1J

(Reference 6.7.080)

Diesel generator 1C is lightly loaded in this as well as in all single-unit operation events. See Remarks section A.4.1.3 for further discussion (Reference 6.7.080).

If diesel generator 1C fails to load bus 1H, diesel generator 1-2A will provide automatic back-up and energize bus 1H.

A.3.2.2 LOSP and LOCA

For Unit 1 in operation with LOSP and LOCA simultaneously on that unit, the diesel generator alignment will be as follows:

1-2A	Unit 1	Buses 1F and 1K
1C	Unit 1	Bus 1H
1B	Unit 1	Buses 1G, 1L and 1J

(Reference 6.7.080)

_____ 3.10 Reference values for ΔP_r & Q_r (acceptance criteria) in Data Sheet 2 and Data Sheet 3 to be used for this test are current per the Surveillance Test Data Book.

_____ 3.11 Calibrated stopwatch is available for measuring time required for level change.

Serial No. ____________________ Cal Due Date __________________

_____ 3.12 An I&C Technician is available with 0-30 psig calibrated test gauge(s) for each pump being tested. The gauge(s) will be used to measure fuel oil transfer pump discharge pressure(s). Poly flow tubing and appropriate fittings will be necessary for connecting to pump discharge sample valves (¾" NPT) when directed.

Gauge #1 Serial No. __________Cal Due Date________________

Gauge #2 Serial No. __________Cal Due Date ________________ (If required)

_____ 3.13 If required, the entry supervisor has been notified that a Confined Space Entry Checklist is required for entry into the 1C Diesel Generator Pump Compartment.

4.0 Precautions and Limitations

4.1 The 1C DG Auto Fuel Oil Transfer Pump will be placed in OFF per FNP-0-SOP-42.0, DIESEL GENERATOR FUEL OIL STORAGE AND TRANSFER SYSTEM, in order to drain the day tank to the required level. The DG will remain operable and NRC performance indicators are NOT affected provided a designate individual is briefed to perform the following:

- The individual has been instructed to remain in the DG building while the auto fuel oil transfer pump is in OFF
- The individual has been instructed to restore the pump to AUTO upon notification of a DG auto start.

4.2 Tech Spec SR 3.8.1.4 requires a minimum of 700 gallons in the day tank.

- 65% in the 1C DG day tank is 48 inches above the floor on the tank sightglass.
- During the performance of this test the EPB level indication will be taken below the log specification of 74%. This specification was determined by adding 9% for instrument inaccuracies to the Tech Spec minimum level 65%. Level will be maintained above Tech Spec minimum by direct observation of the sightglass.

3.0 Precautions and Limitations

3.1 Do not smoke or allow flames in the vicinity of the fuel oil storage tanks, day tanks or diesel generator rooms.

3.2 Ensure all fire doors in these areas are closed and operable.

3.3 DO NOT run the Auto and Manual Fuel Oil Transfer Pumps simultaneously.

3.4 The preferred method of transferring diesel fuel oil from the auxiliary boiler fuel oil storage tank to a DG fuel oil storage tank (to prevent NRC PI planned unavailable hours from being accrued) is as follows:

3.4.1 Transfer diesel fuel oil from the auxiliary fuel oil storage tank to the 2C DG fuel oil storage tank (Refer to Appendix 6).

3.4.2 Transfer diesel fuel oil from the 2C DG fuel oil storage tank to the appropriate DG fuel oil storage tank (Refer to Appendix 7).

3.5 IF diesel fuel oil must be transferred from the auxiliary boiler fuel oil storage tank directly to DG 1-2A, 1C, 1B, or 2B fuel oil storage tanks, THEN ensure the approval requirements provided in FNP-0-ACP-52.1 Section 21.0, Required Approvals for Removing NRC Performance Indicator (PI) Equipment from Service, are received prior to the starting the diesel fuel oil transfer process.

3.6 Diesel fuel oil transfer pumps are considered attendant equipment. IF a FOTP is out of service, THEN refer to Figure 1 to determine power supplies and pumps required to maintain operability of all FOSTs.

3.7 Based on conservative fuel oil transfer pump and fuel oil storage tank capacities approximately 36 hours should be allotted for pumping the accessible contents of the fuel oil storage tank using the fuel oil transfer system. Also provision for pumping approximately 3500 gallons of fuel oil below the fuel oil transfer pump suction should be anticipated for completely draining a fuel oil storage tank.

3.8 The Diesel Fuel Oil Storage Tanks are continuously vented to the atmosphere. An overflow will result in a spill to the environment.

3.9 Only the 1-2A FOST has a high level alarm. The level indication on the EPB for the affected FOST's must be closely monitored during filling and transfer operations.

3.10 When preparing for filling and transfer of fuel oil, the yard drain located in the extreme southeastern corner of the protected area by the Defensive Position should be covered. This precaution can be omitted if weather conditions are such that covering the drain will cause standing water.

FIGURE 1

ELECTRICAL ALIGNMENT FOR DIESEL FUEL OIL TRANSFER PUMPS				
DG SET	4KV BUS	600V LC	MCC	XFER PUMPS
1-2A DG	4160V 1F 4160V 2F	LC 1D/2D	MCC 1S	1-2A Auto Pump 2B Manual Pump
1C DG	4160V 1H 4160V 2H	LC 1R/2R	MCC 1N	1C Auto Pump 1B Manual Pump
1B DG	4160V 1G	LC 1E	MCC 1T	1B Auto Pump 1-2A Manual Pump
2B DG	4160V 2G	LC 2E	MCC 2T	2B Auto Pump 2C Manual Pump
2C DG	4160V 1J 4160V 2J	LC 1S/2S	MCC 1P	2C Auto Pump 1C Manual Pump

Assuming dual unit LOSP:

- Unit 1, G bus failure affects the following pumps: 1B Auto, 1-2A Manual
- Unit 2, G bus failure affects the following pumps: 2B Auto, 2C Manual

For a tank of fuel to be unavailable for transfer, there has to be a failed pump in combination with a G bus failure.

For Example:

- 1B Manual Pump failure in conjunction with a Unit 1 G bus failure makes 1B storage tank unavailable for transfer.
- 1-2A Auto Pump failure in conjunction with a Unit 1 G bus failure makes 1-2A storage tank unavailable for transfer.
- 2B Manual Pump failure in conjunction with a Unit 2 G bus failure makes 2B storage tank unavailable for transfer.
- 2C Auto Pump failure in conjunction with a Unit 2 G bus failure makes 2C storage tank unavailable for transfer.

In order to strand more than one storage tank, the following combination of two pump failures must occur:

- IF Unit 1 G bus fails AND 1B Manual pump fails AND 1-2A Auto pump fails, THEN two tanks will be stranded.
- IF Unit 2 G bus fails AND 2B Manual pump fails AND 2C Auto pump fails, THEN two tanks will be stranded.
- IF two pumps on two tanks fail simultaneously, THEN two tanks will be stranded.

Otherwise, any single pump failure leaves at least 4 tanks available for transfer even with a G bus failure on either unit. Two pumps failing simultaneously other than the above 3 combinations still leaves 4 tanks available for transfer.

Tagging out of an EDG Auto Fuel Oil Transfer Pump does not, by itself, make a given EDG inoperable. The diversity and defense in depth of the fuel oil transfer system ensures that the capability exists to maintain the EDG Day Tanks using multiple FOST pumps. (CR 2009100948)

1. DG SEQ-40102D07 028

Given the following conditions:

- All diesel generator Mode Selector Switches are in Mode 1.
- All diesel generators will start and load as required, if demanded.
- The Unit Selector Switch for the swing diesels is in the 1-2 position.
- Both Units are operating near 100% power.

Which one of the following casualty combinations will result in 4160V Bus 2H remaining de-energized until it is manually energized?

A. Dual Unit LOSP.

B. LOSP Unit 2, SI Unit 1.

C. Dual Unit LOSP, SI Unit 1.

D✓ LOSP Unit 2, SI Unit 2.

Excerpt from DG FSD A-181005 App. A
A.3.1.7 LOSP and LOCA on Unit 2
For LOSP and LOCA on Unit 2 only, the diesel generator alignment will be as follows:
1-2A Unit 2 Buses 2F and 2K
2B Unit 2 Buses 2G, 2L and 2J

A. Incorrect - 2H bus will be energized by the 1C DG
B. Incorrect - 2H bus will be energized by the 1-2A DGvia DF13 (no SI on Unit 2)
C. Incorrect - 2H bus will be energized by the 1C DG
D. Correct - Unit 2 A-train busses F & K will be energized by the 1-2A DG, but DF13, feeder bkr to the H bus will remain open due to SI signal on U-2.

96. G2.4.20 001/NEW/SRO/C/A 3.8/4.3/G2.4.20/N/4/HBF/VER 4 EDITORIAL

The following conditions exist on Unit 1:

- A Main Steam header rupture occurred in the Turbine Building 35 minutes ago while at 100% power.
- The MSIVs could not be closed from the MCB.
- SI termination using ECP-2.1, Uncontrolled Depressurization of All Steam Generators, is in progress.

Concurrently with securing the first charging pump, air is bled from 1A MSIV accumulator using SOP-17, Main and Reheat Steam, and the 1A SG pressure begins to rise.

- Pressurizer Level is 15%.
- RCS Pressure is 1880 psig.
- Subcooling Margin Monitor indicates 186°F and increasing.
- T_{COLD} are 418°F and decreasing.
- T_{HOT} is 423°F and decreasing.
- SG water levels, pressures and, AFW flows are as follows:

	WR LEVEL	PRESS	AFW FLOW (throttled)
- 1A SG	23%↑	305 psig ↑	20 gpm
- 1B SG	11%↓	295 psig ↓	20 gpm
- 1C SG	12%↓	290 psig ↓	20 gpm

Which one of the following describes the required procedure transition from ECP-2.1?

A. Immediately transition to EEP-2, Faulted Steam Generator Isolation.

B. Immediately transition to FRP-H.1, Response to Loss of Secondary Heat Sink.

C✓ Remain in ECP-2.1 until SI is terminated, then transition to EEP-2, Faulted Steam Generator Isolation.

D. Remain in ECP-2.1 until SI is terminated, then transition to FRP-H.1, Response to Loss of Secondary Heat Sink.

Plausibility and Answer Analysis

A Incorrect. Step 1 NOTE-2 denotes that the transition to EEP-2 is not made during the SI termination steps of ECP-2.1.

Plausible: The transition to EEP-2 is correct per step 1 [CA] of ECP-2.1, except for during the SI termination steps.

B Incorrect. Although CSFST are applicable, and FRP-H.1 (RED) is indicated, ECP-2.1 NOTE-5 and FRP-H.1 NOTE-1 both state that FRP-H.1 is expected and should not be implemented.

Plausible : FRP-H.1 is RED and 2 SG WR levels are <31% NR, without knowledge of notes of ECP-2.1 or H.1 step 1 note: entry into FRP-H.1 is not appropriate if flow is less then 395 gpm due to intentional operator action.

C Correct. Due to step 1 NOTE- 2, The transition to EEP-2 is delayed until SI termination is complete (step 26).

The transition to EEP-2 is correct per step 1 [CA] of ECP-2.1.

and based on ECP-2.1 NOTE-5 and FRP-H.1 NOTE-1 both state that **FRP-H.1** is expected and **should not be implemented**.

D Incorrect. ECP-2.1 NOTE-5 and FRP-H.1 NOTE-1 both state that **FRP-H.1** is expected and **should not be implemented**.

Plausible:
FRP-H.1 is RED and 2 SG WR levels are <12%. this would require initiation of Bleed and Feed without delay, should FRP-H.1 be implemented-- without knowledge of notes of ECP-2.1 or H.1 step 1 note.

K/A statement - Emergency Procedures/plans 2.4.20 **Knowledge of the operational implications of EOP warnings, cautions, and notes.**

Importance Rating:	3.8 4.3
Technical Reference:	ECB-2.1, ver 1.0 EEP-2, ver 14 ECP-2.1, ver 23 FRP-H.1, ver 26
References to be provided:	None
	Learning Objective: OPS-62532F01; Assess the facility conditions associated with ECP-2.1, [...], and based on that assessment: • **Select** the appropriate procedures during normal, abnormal and emergency situations, • **Determine** if transition to another section fo the procedure or to another procedure is required and • **Determine** if the CSF are satisfied.
Question origin:	NEW
Comments:	K/A match or other comments: Requires understanding and application of ECP-2.1 Step 1 NOTE 2 regarding the transition applicability while performing SI termination. Also, tests knowledge of ECP-2.1 NOTE-5 and FRP-H.1 NOTE-1 for the impact on FRP-H.1 implementation.
SRO justification:	Requires in depth understanding of procedural strategy/transitions/decision points out of Emergency Contingency Procedures; Particularly exceptions to the entry conditions for various procedures/Continuing actions/Foldout page criteria.

Question #	96
K/A	G2.4.20

REFERENCE Docs

Step	Action/Expected Response	Response NOT Obtained

NOTE:
- FOLDOUT PAGE should be monitored continuously.
- Step 1 is a continuing action step, except while performing SI termination steps 16 through 26.

Targeted NOTE to satisfy K/A match

___ 1 **[CA] IF any SG pressure rises during performance of this procedure, THEN go to FNP-1-EEP-2, FAULTED STEAM GENERATOR ISOLATION.**

NOTE: Local isolations directed in the RNO column should be performed on one loop at a time.

___ 2 **Check secondary pressure boundary isolated.**

2.1 Verify all main steam isolation and bypass valves - CLOSED.

1A(1B,1C) SG
MSIV - TRIP
- [] Q1N11HV3369A
- [] Q1N11HV3369B
- [] Q1N11HV3369C
- [] Q1N11HV3370A
- [] Q1N11HV3370B
- [] Q1N11HV3370C

1A(1B,1C) SG
MSIV - BYPASS
- [] Q1N11HV3368A
- [] Q1N11HV3368B
- [] Q1N11HV3368C
- [] Q1N11HV3976A
- [] Q1N11HV3976B
- [] Q1N11HV3976C

RNO: 2.1 Place the associated test switch in the TEST position.

SG	1A	1B	1C
1A(1B,1C) SG MSIV - TEST Q1N11HV	[]3369A/ 70A	[]3369B/ 70B	[]3369C/ 70C

Step 2 continued on next page.

___Page Completed

Step	Action/Expected Response	Response NOT Obtained
3.2	Verify AFW flow control valve handswitches - IN THE MODULATE POSITION. MDAFWP TO 1A/1B/1C SG B TRN [] FCV 3227 in MOD MDAFWP TO 1A(1B,1C) SG [] Q1N23HV3227A in MOD [] Q1N23HV3227B in MOD [] Q1N23HV3227C in MOD TDAFWP TO 1A(1B,1C) SG [] Q1N23HV3228A in MOD [] Q1N23HV3228B in MOD [] Q1N23HV3228C in MOD	
___ 4	**[CA] Maintain at least 20 gpm AFW flow to SGs with narrow** [redacted]%}. AFW FLOW TO 1A(1B,1C) SG [] FI 3229A [] FI 3229B [] FI 3229C	

___Page Completed

Step	Action/Expected Response	Response NOT Obtained

NOTE: Throttling AFW flow in the following RNO step may result in a Red Path. However, transition to FNP-1-FRP-H.1, RESPONSE TO LOSS OF SECONDARY HEAT SINK should only be made when AFW flow of 395 gpm is unavailable, and NOT due to deliberate operator action.

Step	Action/Expected Response	Response NOT Obtained
___ 5	**[CA] Control AFW flow to minimize RCS cooldown.**	AFW flow limited to 20 gpm
5.1	[CA] Check cooldown rate in RCS cold legs - LESS THAN 100°F IN ANY 60 MINUTE PERIOD. RCS COLD LEG TEMP [] TR 410 Tavg at 100% = 573 (Tc = 543; Th=604) Therefore Cooldown exceeds 100F in last 60 mins if RCS temp is ~ 423 in last 35 mins.	5.1 Reduce AFW flow to 20 gpm to each SG and proceed to step 5.3. MDAFWP TO 1A(1B,1C) SG FLOW CONT [] HIC 3227AA adjusted [] HIC 3227BA adjusted [] HIC 3227CA adjusted TDAFWP TO 1A(1B,1C) SG FLOW CONT [] HIC 3228AA adjusted [] HIC 3228BA adjusted [] HIC 3228CA adjusted
5.2	[CA] Check narrow range level in all SGs - LESS THAN 65%.	5.2 Control AFW flow to maintain narrow range level in all SGs less than 65%. MDAFWP TO 1A(1B,1C) SG FLOW CONT [] HIC 3227AA adjusted [] HIC 3227BA adjusted [] HIC 3227CA adjusted TDAFWP TO 1A(1B,1C) SG FLOW CONT [] HIC 3228AA adjusted [] HIC 3228BA adjusted [] HIC 3228CA adjusted

Step 5 continued on next page.

___Page Completed

Step	Action/Expected Response	Response NOT Obtained
___18	**Check PHASE B CTMT ISO - RESET.** [] MLB-3 1-1 not lit [] MLB-3 6-1 not lit	18 Perform the following. 18.1 Reset PHASE B CTMT ISO. 18.2 Verify proper PRF system operation using FNP-1-SOP-60.0, PENETRATION ROOM FILTRATION SYSTEM.
___19	**Establish instrument air to containment.**	
	19.1 Verify at least one air compressor started. AIR COMPRESSOR [] 1A [] 1B [] 1C	
	19.2 Verify INST AIR PRESS PI 4004B greater than 85 psig.	
	19.3 Check the following: IA TO CTMT [] MLB-3 1-2 NOT lit IA TO PENE RM PRESS LO [] Annunciator KD1 clear	19.3 Verify instrument air aligned to containment. (BOP) IA TO PENE RM [] N1P19HV3825 open [] N1P19HV3885 open IA TO CTMT [] Q1P19HV3611 open

condition of STEM.

___20	**Stop all but one CHG PUMP.**	
___21	**Check RCS pressure - STABLE OR RISING.** 1C(1A) LOOP RCS NR PRESS [] PI 402A [] PI 403A	21 Return to step 4.

___Page Completed

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: This procedure should not be performed if total AFW flow is less than 395 gpm due to operator action.

****

****

CAUTION: To minimize thermal stress, feed flow should not be reestablished to any faulted steam generator if a nonfaulted steam generator is available.

****

Step	Action/Expected Response	Response NOT Obtained
1	**Check secondary heat sink - REQUIRED.**	
1.1	Check RCS pressure - GREATER THAN ANY NON-FAULTED SG PRESSURE. 1C(1A) LOOP RCS WR PRESS [] PI 402A [] PI 403A	1.1 Go to procedure and step in effect.
1.2	Check RCS hot leg temperatures - GREATER THAN 350°F{350°F}. RCS HOT LEG TEMP [] TR 413	1.2 Perform the following. 1.2.1 Place RHR system in service using FNP-1-SOP-7.0, RESIDUAL HEAT REMOVAL SYSTEM while continuing with this procedure. 1.2.2 WHEN adequate cooling established with RHR system, THEN go to procedure and step in effect.

___Page Completed

97. WE03EG2 4.6 001/NEW/SRO/C/A 3.7/4.7/WE03EG2.4.6/Y/2/HBF/FEEDBACK

Unit 1 is at 18,000 MWD/MTU and has experienced a small break LOCA.

At 11:00, the following conditions exist:

- ESP-1.2, Post LOCA Cooldown and Depressurization, is in progress.
- A cooldown using the SG Atmospheric Relief Valves has been started.
- The RCS temperature has been as follows:

TIME	10:00	10:30	11:00
TEMP (°F)	535	485	440

- Containment pressure has risen to 2 psig.
- Normal Charging has been established.
- Only 1B RCP is running.
- Pressurizer Level is 37%.
- Subcooling is 35°F.
- RCS boron concentration is 500 ppm.

Which one of the following describes the status of the cooldown rate AND whether or not **ALL** the requirements are met to continue the cooldown IAW ESP-1.2?

REFERENCE PROVIDED

The allowable cooldown rate __(1)__ been exceeded.

ALL requirements __(2)__ met to continue the cooldown.

	(1)	(2)
A.	has	are
B.	has	are NOT
C.	has NOT	are
D.✓	has NOT	are NOT

Plausibility and Answer Analysis

PZR level will not require termination of cooldown -- this is depressurization criteria 73% [66%] and charging flow control parameter >25% [50%].

Cooldown RATE:

The maximum cooldown rate of 100°F in any 60 min period will preclude violation of the Integrity Status Tree Thermal shock limits. (ESB-0.1 pg 20)

NOTE: RCS cooldown can proceed prior to establishing final cold shutdown boron concentration if adequate shutdown margin is maintained for existing RCS temperature.

REQUIRED SDM is required for given temp to continue cooldown, and from curve 61:

$1.77\%\ \mathrm{SDM\ at\ } 500°\mathrm{F} = 466\ \mathrm{ppm}$

$1.77\%\ \mathrm{SDM\ at\ } 400°\mathrm{F} = 653\ \mathrm{ppm}$

$$\mathrm{PPM} = \left(\frac{\mathrm{ppm}_{400°F} - \mathrm{ppm}_{500°F}}{(400-500)°F} \right)(Temp_0 - 400) + 653ppm$$

$$\mathrm{PPM} = \left(\frac{653_{400°F} - 466_{500°F}}{(400-500)°F} \right)(440_0 - 400) + 653ppm$$

$$\mathrm{PPM} = 578.2\ \mathrm{ppm\ required}$$

A Incorrect. (1) The limit of <100F for any 60 min period has NOT been exceeded. However, the excessive momentary rate could result in a challenge maintaining the <100F for the <u>next 60 min</u> and cooldown rate would need to be closely monitored to prevent violating this limit.

(2) Per curve 61 the current required SDM concentration is 578 ppm (see above calculation). RCS concentration is not adequate to continue cooldown.

Plausible: 1) Cooldown RATE between 10:00 and 10:30 is =100°F/hr therefore not <100F/hr. Also, many other FRP, ESPs for similar conditions limit cooldown to 50°F per 60 min period (FRP-P.1 post soak is one such example).

2) Cooldown in ESP-1.2 is the primary strategy and once initiated is NORMALLY not stopped (UNLESS SDM is not established for current temp). This circumstance is dependent upon core life, duration of SI flow, and size of the break. Late in core life (Boron concentration significantly low), short duration SI flow and small break size (small volume injected) could result in challenging the ability to maintain SDM during the implementation of ESP-1.2.

B Incorrect. (1) See A #1 for discussion and plausibility.

(2) This is correct due to the boron concentration. See discussion/calculation above.

C Incorrect. (1) This is correct. Cooldown is <100F in past 60 mins.

(2) See A #2 for discussion and plausibility.

D Correct. (1) This is correct. Cooldown is <100F in past 60 mins. See A#1 for discussion.

(2) This is correct due to the boron concentration NOT adequate. See discussion/calculation above.

K/A statement - WE03 LOCA Cooldown and Depressurization
G2.4.6 Knowledge of EOP mitigation strategies.

Importance Rating: 3.7 4.7

Technical Reference: ESP-1.2 ver 23
ESB-1.2 ver 1.0
PCB-VOL1-CRV1
PCB-VOL1-CRV61

References to be provided: PCB-VOL1-CRV61

Learning Objective: OPS-52531F03: State and explain the basis for all Cautions, Notes and Actions associated with ESP-1.2.

OPS-52531F06: Evaluate plant conditions and Determine if any system components need to be operated while performing ESP-1.2.

Question origin: NEW

Comments: K/A match or other comments:
RO knowledge= Major actions: Cooldown establish subcooling; 100 F in 60 min period is generic cooldown required by many of the ERPs.

KA match: ESP-1.2 mitigation strategy includes a cooldown to long term cooling (RHR) while preventing further challenge to the RCS integrity (cooldown rate) and Preventing cold restart accident (SDM)

SRO justification: **Recalling what action/strategy** is written into a plant procedure, **including when the strategy** or action is required (which are not HIGH level actions) SRO knowledge= Major actions of ESP-1.2 strategy when conflict with other accident mitigating strategies (loss of SDM) and the knowledge of proceduralized strategy of priority.

Question #	97
K/A	WE03EG2.4.6

REFERENCE Docs

student reference

UNIT 1 CYCLE 22 CURVE 61
Minimum Boron Concentration to Assure 1.00% and 1.77% ΔK/K
Shutdown Margin at Various Moderator Temperatures and Core Burnups
(Assumes All Rods In with the Most Reactive Rod Stuck Out and Xenon-Free Conditions)

REV. 34

APPROVED: [signature] 10/17/07
ENGINEERING SUPPORT MANAGER DATE

Vessel Average Moderator Temperature (°F)

Burnup (MWD/MTU)	**(1.00% SDM)**		**(1.77% SDM)**				
	68	**200**	**200**	**300**	**400**	**500**	**547**
0	1301	1285	1360	1340	1304	1226	1130
150	1296	1280	1355	1338	1306	1230	1136
1000	1300	1285	1359	1343	1310	1235	1141
2000	1339	1320	1396	1372	1335	1260	1168
3000	1373	1354	1429	1406	1360	1274	1179
4000	1390	1372	1447	1423	1375	1278	1177
6000	1387	1366	1440	1413	1359	1251	1135
8000	1344	1319	1392	1361	1299	1179	1056
10000	1274	1245	1316	1279	1210	1074	946
12000	1184	1150	1219	1176	1098	950	810
14000	1069	1031	1098	1051	965	802	658
16000	940	897	962	909	814	639	487
18000	798	750	813	754	653	466	307
20250	626	571	632	569	458	257	100

Note: All cases were run with ARI and the most reactive rod withdrawn, no Xenon. BOL has peak Sm, then Sm depleted through end of life. All concentrations are in ppm (100 ppm allowance included). Additional boron may be required to satisfy boron dilution concerns at hot and cold shutdown (See Curve 61A). Information includes B^{10} depletion considerations.

ARO Critical Boron Concentration = 1659 ppm (BOL, HZP, Xenon-free conditions for Cycle 22)

Step	Action/Expected Response	Response NOT Obtained

8.2.2 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: 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.

___ 9 **Begin RCS cooldown to cold shutdown.**

9.1 <u>WHEN</u> P-12 light lit (543°F), <u>THEN</u> perform the following.

9.1.1 Block low steam line pressure SI.

STM LINE PRESS SI
BLOCK - RESET
[] A TRN to BLOCK
[] B TRN to BLOCK

question TARGET:

STRATEGY regarding cooldown

RATE and SDM requirements.

BANK:
525831F03 001

Step 9 continued on next page.

___Page Completed

Step	Action/Expected Response	Response NOT Obtained
9.1.2	Verify blocked indication. BYP & PERMISSIVE STM LINE ISOL. SAFETY INJ. [] TRAIN A BLOCKED light lit [] TRAIN B BLOCKED light lit	
9.1.3	Bypass the steam dump interlock. STM DUMP INTERLOCK [] A TRN to BYP INTLK [] B TRN to BYP INTLK	
9.1.4	Adjust steam header pressure controller to control cooldown rate. STM HDR PRESS [] PK 464 adjusted	
9.2	[CA] Maintain RCS cold legs cooldown rate - LESS THAN 100°F IN ANY 60 MINUTE PERIOD. RCS COLD LEG TEMP [] TR 410	Cooldown rate limit

Step 9 continued on next page.

___Page Completed

Step	Action/Expected Response	Response NOT Obtained

NOTE: RCS cooldown can proceed prior to establishing final cold shutdown boron concentration if adequate shutdown margin is maintained for existing RCS temperature.

___23 **[CA] Establish adequate shutdown margin.**

23.1 Direct Chemistry to sample RCS for boron concentration using FNP-0-CCP-1300, CHEMISTRY AND ENVIRONMENTAL ACTIVITIES DURING A RADIOLOGICAL ACCIDENT.

23.2 Determine cold shutdown boron concentration from the following.

[] Core Power History
[] Core Physics Curve 61
[] Core Physics Curve 61A

Step 23 continued on next page.

___Page Completed

***Section:* Procedure**

Unit 1 ERP Step: 9 NOTE-1 **Unit 2 ERP Step:** 9 NOTE-1 ***ERG Step No:*** *8 NOTE-1*

ERP StepText: 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.

ERG StepText: *Shutdown margin should be monitored during RCS cooldown.*

Purpose: To determine if shutdown margin is adequate for RCS cooldown

Basis: This note advises the operator to monitor RCS boron concentration to verify adequate shutdown margin during the cooldown to cold shutdown. Note that since SI was in service, RCS boron concentration is expected to be sufficient.

Knowledge: Periodic samples should be taken to monitor shutdown margin, however, the operator should not wait for the sample results.

References:

Justification of Differences:

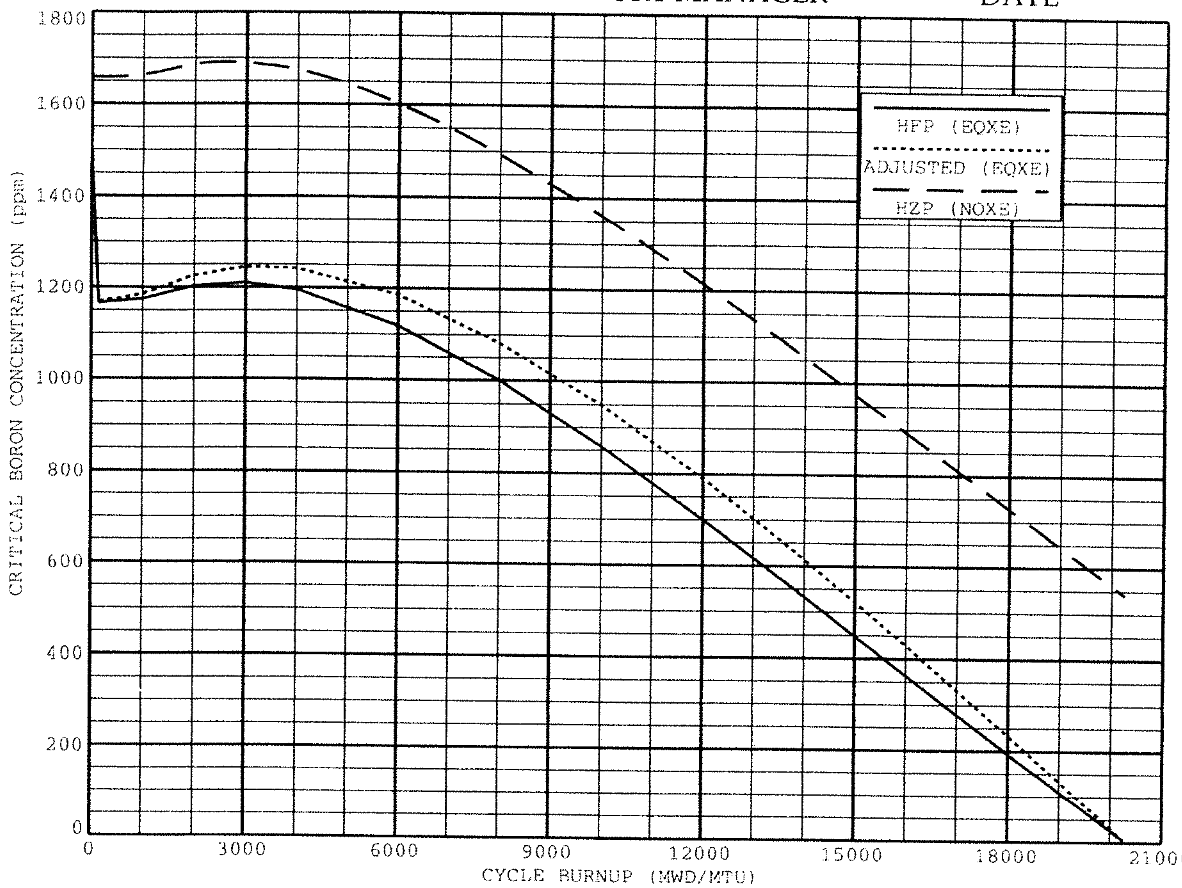
1 Changed to make plant specific.

UNIT 1 CYCLE 22 CURVE 1
Critical Boron Concentration versus Burnup at HFP, ARO, Equilibrium Xenon Conditions and HZP, ARO, No Xenon Conditions

REV. 23

APPROVED: 10/17/07

ENGINEERING SUPPORT MANAGER DATE



Burnup (MWD/MTU)	Boron Concentration (ppm)		
	HFP Nominal	Adjusted**	HZP Nominal*
0	1507*	1507*	1659
150	1166	1168	1659
1000	1174	1185	1664
2000	1203	1226	1687
3000	1210	1245	1690
4000	1195	1242	1675
6000	1118	1185	1602
8000	1000	1082	1492
10000	858	948	1361
12000	700	790	1214
14000	533	615	1056
16000	364	429	892
18000	193	233	727
20250	5	6	541

* No Xenon

** Soluble boron concentration, adjusted for the effects of B-10 depletion, assuming no boron added during the cycle.

UNIT 1 VOLUME 1 CURVE 70
BORATION, DILUTION CURVES
Revision 1

10

CRBusey 10-21-94
Technical Manager Date

INSTRUCTIONS FOR USE OF BORATION AND DILUTION CURVE

For Boration
Calculate the RCS average boron concentration during the boration. Use this average to determine which line to use on the boration curve. Read the ppm boration from the horizontal axis and the number of gallons boration required from the vertical axis. These values are drawn for 547°F and a pressurizer level of 21.4%. Use correction factors as indicated below.

For Dilution
Calculate the ratio of the initial boron concentration (C_i) to the final boron concentration (C_f). Find this ratio (C_i/C_f) on the horizontal axis. Then read the gallons dilution required from the vertical axis. Use correction factors as indicated below.

Correction Factors for Dilution and Boration
For values other than 547°F and 21.4% pressurizer level, corrections should be made as follows:

ACTUAL GALLONS REQUIRED = GALLONS REQUIRED x C_L x C_T

T_{AVG}°F	C_T	T_{AVG}°F	C_T	T_{AVG}°F	C_T	T_{AVG}°F	C_T	T_{AVG}°F	C_T
70	1.3332	180	1.2947	290	1.2347	400	1.1543	510	1.0456
80	1.3309	190	1.2908	300	1.2289	410	1.1446	520	1.0335
90	1.3287	200	1.2868	310	1.2214	420	1.1272	530	1.0214
100	1.3264	210	1.2810	320	1.2140	430	1.1253	540	1.0093
110	1.3224	220	1.2752	330	1.2065	440	1.1156	547	1.0000
120	1.3185	230	1.2694	340	1.1991	450	1.1060	550	0.9959
130	1.3145	240	1.2636	350	1.1916	460	1.0963	560	0.9890
140	1.3106	250	1.2579	360	1.1841	470	10.866	570	0.9672
150	1.3066	260	1.2521	370	1.1767	480	1.0769	575	0.9595
160	1.3026	270	1.2463	380	1.1692	490	1.0673	580	0.9454
170	1.2987	280	1.2405	390	1.1618	500	1.0576		

PZR LEVEL%	C_L	PZR LEVEL%	C_L	PZR LEVEL%	C_L	PZR LEVEL%	C_L
10	0.9837	35	1.0195	55	1.0482	80	1.0840
15	0.9908	40	1.0260	60	1.0553	85	1.0912
20	0.9980	45	1.0338	65	1.0625	90	1.0984
21.4	1.0000	50	1.0410	70	1.0697	95	1.1055
25	1.0052	52.4	1.0444	75	1.0768	100	1.1127
30	1.0123	54.9	1.0480				

Examples:

DILUTION: Where T_{AVG} = 490°F, C_i= 700ppm, pressurizer level = 40%, required dilution = 200ppm. From this, C_i/C_f = 700/500 = 1.4. From the curve, the gallons of dilution = 16,655 gal. For 490°F, C_T =1.0673; for 40%, C_L=1.0260. The gallons dilution is equal to 16,655 * 1.0673 * 1.0260, which is equal to 18,238.

BORATION: Where desired boration = 50ppm, pressurizer level = 30%, T_{AVG} = 340°F, C_i=516ppm. The average boron concentration for boration evolution is equal to (516 + 566)/2 = 541. Interpolating between the 500ppm line and the 1000ppm line for a 50ppm boration, the boric acid required=361gal. For 340°F, C_T =1.1991; for 30%, C_L=1.0123. Therefore the actual boration required is equal to 361 * 1.1991 * 1.0123, which is equal to 438.2 gal.

Equations Used to Derive Boration and Dilution Curves

$$\text{Gallons Dilution} = 49{,}500 * \ln\left[\frac{C_i}{C_f}\right] * C_T * C_L$$

$$\text{Gallons Boration} = 49{,}500 * \ln\left[\frac{C_B - C_i}{C_B - C_f}\right] * C_T * C_L$$

Ci = Initial RCS boron concentration (ppm)
C_f = Final RCS boron concentration (ppm)
C_B = Boric Acid Tank boron concentration (ppm) [Nominal 7350 ppm]

UNIT 1 VOLUME 1 CURVE 70
BORATION, DILUTION CURVES
Revision 1

10

Technical Manager 10-21-99
Date

INSTRUCTIONS FOR USE OF BORATION AND DILUTION CURVE

For Boration
Calculate the RCS average boron concentration during the boration. Use this average to determine which line to use on the boration curve. Read the ppm boration from the horizontal axis and the number of gallons boration required from the vertical axis. These values are drawn for 547°F and a pressurizer level of 21.4%. Use correction factors as indicated below

Tavg°F	C_T
400	1.1543
410	1.1446
420	1.1272
430	1.1253
440	1.1156
450	1.1063

	PZR LEVEL %	C_L	F
7	35	1.0195	
8	40	1.0260	
0	45	1.0338	
0	50	1.0410	
2	52.4	1.0444	
3	54.9	1.0480	

$$\text{Gallons Boration} = 49{,}500 * \ln\left[\frac{C_B - C_i}{C_B - C_f}\right] * C_T * C_L$$

- Using PCB-1-VOL1-CRV70, plausibility of timeline and boron concentration estimated using the following assumptions:
- RCS leakrate > makeup capability resulted in Rx Trip SI → 125 gpm is the assumed injection flow throughout the entire time from initiation to endpoint
- Ci = 233 ppm from PCB-1-VOL1-CRV1 at 18000 MWD/MTU.
- Cf = 500 ppm was selected for the given temp which would require terminating the cooldown in ESP-1.2 due to inadequate shutdown margin.
- RWST concentration = 2300 ppm.
- PZR level 35%
- RCS temp 440°F

$$\text{Gallons Boration} = 49{,}500 \times \ln\left[\frac{c_B - C_i}{c_B - C_f}\right] \times C_T \times C_L$$

$$49{,}500 \times \ln\left[\frac{2300 - 233}{2300 - 500}\right] \times 1.0195 \times 1.1156$$

$$\text{Gallons Boration} = 7787\,\textit{gallons}$$

$$\text{Time from injection} = \left[\frac{\textit{gallons}}{}\right] \cdot \left[\frac{\min}{\text{leak rate } \textit{gallons}}\right] \cdot \left[\frac{\textit{hours}}{60\min}\right]$$

$$\text{Time from injection} = \left[\frac{7787}{}\right] \cdot \left[\frac{}{125}\right] \cdot \left[\frac{\textit{hours}}{60}\right] \approx 1.03\text{ hours}$$

1.77% SDM at 500°F = 466 ppm

1.77% SDM at 400°F = 653 ppm

$$\text{PPM} = \left(\frac{\text{ppm}_{400°F} - \text{ppm}_{500°F}}{(400 - 500)°F} \right)(Temp_0 - 400) + 653\,ppm$$

$$\text{PPM} = \left(\frac{653_{400°F} - 466_{500°F}}{(400 - 500)°F} \right)(440_0 - 400) + 653\,ppm$$

PPM = 578.2 ppm required

Table for question:

TIME	10:00	10:30	11:00
TEMP (°F)	535	485	440

1. ESP-1.2-52531F07 006

Unit 1 has experienced an RCS leak of approximately 150 gpm.
A cooldown to Mode 5 is in progress with the following conditions:

- RCS temperature is 440°F.
- The RCS temperature 30 minutes ago was 480°F.
- The RCS temperature 60 minutes ago was 535°F.

Which one of the following is correct concerning the cooldown rate of the RCS and the ability to control that rate, according to ESP-1.2, Post LOCA Cooldown and Depressurization, for the conditions given?

The cooldown rate is___(1)___, and the cooldown rate___(2)___.

A. (1) excessive
(2) can **NOT** be controlled due to HHSI/break cooling

B. (1) excessive
(2) can be controlled by adjusting Steam Dumps

C. (1) acceptable
(2) can **NOT** be controlled due to HHSI/break cooling

D✓ (1) acceptable
(2) can be controlled by adjusting Steam Dumps

009EK2.03 009 Small Break LOCA
EK2. Knowledge of the interrelations between the loss of Small Break LOCA and the following:
EK2.03 S/Gs 3.0 3.3*

ESP-1.2

A. Incorrect. The cooldown rate is 95°F per 60 minutes, which is less than the 100°F per 60 minute limit. IF the first half hour cooldown rate had been continued (55°F in 30 minutes) the cooldown rate would have been excessive at 110°F per 60 minutes. Also, cooldown may be excessive due to HHSI flow, requiring a wait prior to commencing cooldown due to >100°F in the past 60 minutes prior to the operator induced cooldown. However, this would apply only to larger breaks.
B. Incorrect. The cooldown rate is 95°F per hour, which is less than the 100°F per 60 minute limit. Second part correct.
C. Incorrect. First part is correct, and second part is plausible since cooldown may be excessive due to HHSI flow, requiring a wait prior to commencing cooldown when RCS temp has dropped >100°F in the past 60 minutes with no operator induced cooldown. However, this would apply only to larger breaks.
D. Correct. Both parts are correct. The cooldown rate is less than the 100°F per 60 minute limit. With a LOCA of 150 gpm, some HHSI/break cooling would occur, but SG heat removal would still be required at this break size.

HLT-32 audit exam

CR 2007 NRC exam: Edited to make FNP specific

ESP-1.2

2. ESP-1.2-52531F03 001

Prior to experiencing a small break LOCA, Unit 1 was operating at EOL, 20,000 MWD/MTU, with a boron concentration of 85 ppm.

The crew is performing an RCS cooldown IAW ESP-1.2, Post LOCA Cooldown and Depressurization, to Cold Shutdown (CSD). The crew has reached the step to Establish Adequate Shutdown Margin. RCS temperature is 500°F and a Safety Injection was in progress for approximately 20 minutes. Chemistry reports that the current boron concentration is 380 ppm.

Based on these conditions, which one of the following is the proper response IAW ESP-1.2?

A. Stop the cooldown and emergency borate until the CSD boron concentration is satisfied, then recommence the cooldown.

B. Continue the cooldown and continue the safety injection until the CSD boron concentration is satisfied.

C✓ Continue the cooldown and emergency borate to maintain the required SDM while borating the RCS to establish the CSD boron concentration.

D. Heat up the RCS to greater than 500°F and soak for 1 hour while establishing the cold shutdown boron concentration.

A. Incorrect. stopping the cooldown is not an option while emergency boration is required.

B. Incorrect. the SI has been secured at this point in the procedure and that is the reason for the SI. Since the boron concentration is 380 ppm you meet the requirement to continue the cooldown but do not have enough SDM to go to CSD. Emergency boration will allow the continued cooldown to CSD. 380 ppm is also consistent with simulator scenarios that will increase Boron Concentration by this amount.

C. Correct. per the note and the proceding steps of ESP-1.2.

ESP-1.2 rev 23

NOTE: RCS cooldown can proceed prior to establishing final cold shutdown boron concentration if adequate shutdown margin is maintained for existing RCS temperature.

23 Establish adequate shutdown margin.

23.1 Direct Chemistry to sample RCS for boron concentration using FNP-0-CCP-1300, CHEMISTRY AND ENVIRONMENTAL ACTIVITIES DURING A RADIOLOGICAL ACCIDENT.

D. Incorrect. heating up is not an option but could be done if a person thought the current SDM was not met. this is reasonable if the person used the wrong curves to determine the SDM.

98. WE10EA2.2 001/NEW/SRO/MEM 3.4/3.9/WE10EA2.2/N/3/HBF/

The following conditions exist on Unit 1, following a sustained Loss of Off-site Power:

- ESP-0.4, Natural Circulation Cooldown with Allowance for Reactor Vessel Head Steam Voiding (Without RVLIS), has been entered.

Which one of the following describes the basic strategy of ESP-0.4, AND the actions required if PZR level rises to >90% while implementing that strategy?

A.✓ • Step-wise cooldown and depressurization.

• Repetitively raise and lower RCS pressure 100 psig.

B. • Concurrent cooldown and depressurization.

• Repetitively raise and lower RCS pressure 100 psig.

C. • Step-wise cooldown and depressurization.

• Dump steam to obtain >40°F subcooling.

D. • Concurrent cooldown and depressurization.

• Dump steam to obtain >40°F subcooling.

Plausibility and Answer Analysis

A. Correct- ESP-0.4 performs a step-wise cooldown & depressurization, thereby allowing the PRZR level to be an indicator of the void's size and growth. The strategy of repetitively raising pressure 100 psig to collapse the void, and then allowing it to re-form improves the cooling of the vessel head; this strategy is annotated in notes preceding steps 10,15, and 20.

B. Incorrect- Plausible: The stated strategy is that of ESP-0.3; which provides a faster cooldown/depressurization than that outlined in ESP-0.2, where RVLIS is available for monitoring Core coverage.

C. Incorrect- The strategy is correct, but the actions for High PZR level are incorrect

Plausible: (1) since this is the actions directed if PZR level is >67% AND subcooling is <40F while trying to restore forced flow (step 1) which is a continuous action step. It is possible that if a void were to grow, then the candidate might assume the SCMM would indicate less than the required subcooling and take the actions of the [CA] step; (Subcooling margin monitor would likely NOT indicate <40F for the condition stated since the CETC would still be covered and at the temp of Th).

D. Incorrect plausibility: See Choice B for strategy, and Choice C for actions .
(2) Further plausibility provided by step 5.2 RNO of ESP-0.3 should the strategy of ESP-0.3 be selected, these actions are those required by ESP-0.3.

K/A statement - **E10** *Natural Circulation with Steam Void in Vessel with/without RVLIS*
EA2.2 *Adherence to appropriate procedures and operation within the limitations in the facility*s license and amendments.*

IMPORTANCE	3.4	3.9

Technical Reference: ESP-0.4, version 20
ESB-0.4, version 1.

References to be provided: None

Learning Objective: OPS-62531C01;
Assess the facility conditions associated with (1) ESP-0.2 [...] (2) ESP-0.3 [...], and (3) ESP-0.4 [...] and based on that assessment:
- Select the appropriate procedures during normal, abnormal and emergency situations.
- Determine if transition to another section of the procedure or to another procedure is required.
- Determine if the CSF are satisfied.

Question origin: NEW

Comments:

K/A match or other comments:
1) ESP-0.4 and the mitigation strategy is chosen to address E10 portion of the K/A; this procedure is only applicable in Natural Circ cooldown without RVLIS.
2) Procedural adherence: is satisfied by challenging the knowledge of actions for a High PZR level.
3) Operation within Facility License limitations is satisfied via the strategy and of maintaining PZR level thereby ensuring the core remains covered and cooled and maintaining pressure control for the Loss of forced flow event.

SRO justification:

Meets 10 CFR 55.43 (b) 5.
Requires knowledge of **third level** Emergency Stabilization strategy. (ESP-0.1(et al), ESP-0.2, then ESP-0.4)
Additionally, includes detailed knowledge of a **decision point** within the procedure which **implements a contingency strategy contained within the** stabilization procedure.

(1) **SRO**/*RO* consideration: The first part of this question is regarding the HIGH level strategy/actions of ESP-0.4 vs that of ESP-0.3; however, ESP-0.4/ESP-0.3 are similar and are "NON-major" EOP procedures, that this differentiation is at the SRO level.

(2) ***SRO***/RO considerations: the second part of the answer choice is a **recollection** of strategy/actions written into plant procedure which are not HIGH LEVEL Actions.

Question #	98
K/A	WE10EA2.2

REFERENCE Docs

Section: Procedure

Unit 1 ERP Step: 3 **Unit 2 ERP Step:** 3 ***ERG Step No:*** *3*

ERP StepText: Reduce RCS hot leg temperature to 500`F.

ERG StepText: *Decrease RCS Hot Leg Temperatures To 500°F*

Purpose: To initiate the cooldown sequence with a temperature decrease to 500°F

Basis: The entire guideline is accomplished in a step-wise fashion to decrease temperature and pressure. This is the first temperature decrease and 500°F is chosen in order that the initial depressurization (to 1600 psig) does not cause a void to form (or increase further) in the upper head and does not violate the Technical Specification cooldown curve (see Figure 1). Since it is not intended to draw a void at this time in the guideline, the pressure is maintained constant and the cooldown rate is maintained at a maximum of 50°F/hr which was the maximum rate used in the natural circulation cooldown analysis where no void was formed (see Reference 1). In addition, the PRZR level is maintained constant using charging to make up for system volumetric shrink. Deviation from the required cooldown rate could lead to excessive heat removal rates during the RCS cooldown. Since the intent of this guideline is to perform a controlled RCS cooldown and stay within Technical Specification limits, the requirement to maintain RCS temperature and pressure within these limits is explicitly emphasized in this step and subsequent steps (Steps 5, 11 and 15). Though this is not a pressurized thermal shock concern, emphasis is needed on maintaining RCS temperature and pressure within certain limits.

Knowledge: N/A

References:

Justification of Differences:

1 Changed to make plant specific.

Step	Action/Expected Response	Response NOT Obtained
	NOTE: Reactor vessel steam voiding may occur during RCS pressure reduction. This will cause a rapid rise in pressurizer level.	
___ 9	**Reduce RCS pressure.**	
	9.1 IF normal letdown in service, THEN control auxiliary spray to reduce RCS pressure.	9.1 Open only one PRZR PORV to reduce RCS pressure.
	9.2 WHEN RCS pressure less than 800 psig OR pressurizer level greater than 90%, THEN stop RCS pressure reduction.	
	NOTE: To continue RCS pressure reduction, it may be necessary to cycle pressurizer level several times by raising and then lowering RCS pressure (in accordance with steps 9 and 10). This will enhance reactor vessel upper head cooling.	
___10	**Check pressurizer level - LESS THAN 90%.**	10 Raise RCS pressure by 100 psig. 10.1 Turn on additional pressurizer heaters. PRZR HTR GROUP VARIABLE [] 1C PRZR HTR GROUP BACKUP [] 1A [] 1B [] 1D [] 1E 10.2 Return to step 9. OBSERVE CAUTION PRIOR TO STEP 9.

___Page Completed

Step	Action/Expected Response	Response NOT Obtained

NOTE: To continue RCS pressure reduction, it may be necessary to cycle pressurizer level several times by raising and then lowering RCS pressure (in accordance with steps 14 and 15). This will enhance reactor vessel upper head cooling.

Step	Action/Expected Response	Response NOT Obtained
___15	**Check pressurizer level - LESS THAN 90%.**	15 Raise RCS pressure by 100 psig. 15.1 Turn on additional pressurizer heaters. PRZR HTR GROUP VARIABLE [] 1C PRZR HTR GROUP BACKUP [] 1A [] 1B [] 1D [] 1E 15.2 Return to step 14. OBSERVE CAUTION PRIOR TO STEP 14.

___Page Completed

Step	Action/Expected Response	Response NOT Obtained

NOTE: To continue RCS pressure reduction, it may be necessary to cycle pressurizer level several times by raising and then lowering RCS pressure (in accordance with steps 19 and 20). This will enhance reactor vessel upper head cooling.

Step	Action/Expected Response	Response NOT Obtained
___20	**Check pressurizer level - LESS THAN 90%.**	20 Raise RCS pressure by 100 psig.
		20.1 Turn on additional pressurizer heaters. PRZR HTR GROUP VARIABLE [] 1C PRZR HTR GROUP BACKUP [] 1A [] 1B [] 1D [] 1E
		20.2 Return to step 19. OBSERVE CAUTION PRIOR TO STEP 19.
___21	**Check if RHR system can be placed in service.**	
	21.1 Check RCS hot leg temperatures - LESS THAN 350°F. RCS HOT LEG TEMP [] TR 413	21.1 Return to step 16.
	21.2 Check RCS narrow range pressure - LESS THAN 350 psig. 1C(1A) LOOP RCS NR PRESS [] PI 402B [] PI 403B	21.2 Return to step 19.
	21.3 Place RHR system in service using FNP-1-SOP-7.0, RESIDUAL HEAT REMOVAL SYSTEM.	

___Page Completed

Step	Action/Expected Response	Response NOT Obtained
5.2	Check pressurizer level - LESS THAN 90%.	5.2 Perform the following.

NOTE: The intent of step 5.2.1 is to maintain the pressurizer liquid at saturation temperature.

Plausible distractor;

combines the mitigation strategy of ESP-0.3 with the PZR level recovery actions of ESP-0.3.

5.2.1 Turn on additional pressurizer heaters.

PRZR HTR GROUP VARIABLE
[] 1C

PRZR HTR GROUP BACKUP
[] 1A
[] 1B
[] 1D
[] 1E

5.2.2 Reduce pressurizer level to less than 90% by one of the following.

- Control charging and letdown flow as necessary.

  Reduce charging flow
  CHG FLOW
  [] FK 122 manually adjusted

  Raise letdown flow.

  OR

- Continue RCS cooldown to shrink inventory.

___Page Completed

99. WE11EG2.1.28 005/NEW/SRO/C/A 4.1/4.1/WE11EG2.1.28/N/2/HBF/

The following sequence of events occur on Unit 1:

At 10:00:

- EEP-1.0, Loss of Reactor or Secondary Coolant, is in progress.
- MOV-8706B, 1B RHR HX to CHG Pump Suct, is discovered with no indicating lights lit.
- SI RESET pushbuttons for both A and B trains were depressed with the following results:
  - MLB-1 1-1 is LIT.
  - MLB-1 11-1 is NOT LIT.

At 10:15:

- 1F 4160V Bus is de-energized and the 1-2A DG starts but fails to load.
- RWST level is 13 ft.

AT 10:45:

- The crew has begun cooldown using ECP-1.1, Loss of Emergency Coolant Recirculation.
- The TSC has restored power to MOV-8706B.
- RWST level is 4.5 ft.

Which one of the following describes:

1) the actions required to RESET SI at 10:00

AND

2) the actions required for the RWST level at 10:45?

A. 1) S821 RESET switch must be placed in the RESET position.

2) Align for normal charging from the RWST, using ECP-1.1, Loss of Emergency Coolant Recirculation.

B✓ 1) S821 RESET switch must be placed in the RESET position.

2) Align for cold leg recirculation using ESP-1.3, Transfer to Cold Leg Recirculation.

C. 1) ESS STOP RESET pushbutton on the Sequencer panel must be depressed.

2) Align for normal charging from the RWST, using ECP-1.1, Loss of Emergency Coolant Recirculation.

D. 1) ESS STOP RESET pushbutton on the Sequencer panel must be depressed.

2) Align for cold leg recirculation using ESP-1.3, Transfer to Cold Leg Recirculation.

Plausibility and Answer Analysis

A Incorrect 1) Operating the S821 RESET will reset all the latched slave relays in the SSPS AND is the directed action per step 4 RNO of ECP-1.1, as well as in EEP-1 step 9.4, if encountered prior to transition (step 14 or foldout criteria).

2) ***Step 2*** of ECP-1.1 is a continuing action step that requires return to procedure step in effect upon restoration or recirculation capability.

-This would require transition back to EEP-1, and immediate (foldout) transition to ESP-1.3. which would then align for Recirculation.

Step 9 of ECP-1.1 is **ALSO a continuing action** step that requires advancement within ECP-1.1 to align for normal charging to maintain core cooling with the minimum flow required.

- The actions of step 34 and the remainder of ECP-1.1 are **ONLY applicable if BOTH** RWST level <4.5 ft **AND** cold leg recirc is NOT available. (step 34-CAUTION-1).

Plausible: 2) ECP-1.1 is the procedure currently in use and step 9, also a continuing action directs advancement to step 34. IF power was not restored to MOV8706B, then this would be a correct response.

B Correct. 1) SEE A #1.

2) Because power is restored to MOV8706B Recirc capability has been restored, and return to procedure step in effect (EEP-1) would result in foldout criteria mandating transition to ESP-1.3 (<12.5 ft RWST) this is the correct action. IF step 9 [CA] were implemented, the Caution preceding step 34 would remind the operator not to proceed with ECP-1.1. SEE A #1 for further discussion.

C Incorrect 1) Depressing the ESS Emerg Stop Reset pushbutton on the B1F sequencer will not Reset the SI signal; nor will it reset the sequencer since the SI signal is still present.

plausible: the ESS Emerg Stop Reset Pushbutton is often reset following reset of the SI signal, and would be encountered in EEP-1 attachment 4 step 1.11 RNO, and again in AOP-5.0 after the loss of A train power. This action is required to reset the sequencer's memory retentive circuit.

2) See A#1 for discussion and plausibility.

D Incorrect 1) See C #1 for discussion and plausibility
2) See B#2.

K/A statement - Loss of Emergency Coolant Recirc-
2.1.28 **Knowledge of the purpose and function of major system components and controls.**

Importance Rating:	4.1 4.1
Technical Reference:	ECP-1.1, rev 27
References to be provided:	None
Learning Objective:	OPS-62532D01; Assess the facility conditions associated with ECP-1.1 [...] and based on that assessment: • Select the appropriate procedures [...] • Determine if transition to another section fo the procedure or to another procedure is required. • Determine if the CSFs are satisfied.
Question origin:	NEW
Comments:	Requires knowledge of purpose/function of the S821 switch;
SRO justification:	Requires detailed knowledge of strategy within procedure that is not a high level action/ERP, also a decision point within the procedure.

Question #	99
K/A	WE11EG2.1.28

REFERENCE Docs

Step	Action/Expected Response		Response NOT Obtained

****

CAUTION: SI or spray pump damage will occur if suction is lost and the pump is not secured.

****

NOTE:
- IF both trains of RHR have lost emergency coolant recirculation capability AND ECCS sump level is approximately 4.6 ft or less, THEN the loss may be due to insufficient NPSH or air entrainment (vortexing) due to the low ECCS sump level.
- Erratic pump parameters (flow, discharge pressure, amps, etc.) are indications of pump cavitation.
- Step 1 is a continuing action.

Step	Action/Expected Response		Response NOT Obtained
___ 1	**Verify ECCS pumps not affected by sump blockage.**	1	IF both trains are affected such that at least one train of SI recirculation flow cannot be maintained, THEN go to FNP-1-ECP-1.3, LOSS OF EMERGENCY COOLANT RECIRCULATION CAUSED BY SUMP BLOCKAGE.
1.1	[CA] Monitor ECCS pump suction conditions - NO INDICATION OF CAVITATION. CHG PUMP [] 1A [] 1B [] 1C RHR PUMP [] 1A [] 1B CS PUMP [] 1A [] 1B		
___ 2	**[CA] WHEN emergency coolant recirculation capability is restored, THEN go to procedure and step in effect.**		

___Page Completed

Step	Action/Expected Response	Response NOT Obtained
___ 3	**Check cold leg recirculation equipment - AVAILABLE.** 3.1 Train A equipment available: • 1A RHR Pump • CTMT SUMP TO 1A RHR PUMP Q1E11MOV8811A • CTMT SUMP TO 1A RHR PUMP Q1E11MOV8812A • 1A RHR HX TO CHG PUMP SUCT Q1E11MOV8706A • CCW TO 1A RHR HX Q1P17MOV3185A <u>OR</u> 3.2 Train B equipment available: • 1B RHR Pump • CTMT SUMP TO 1B RHR PUMP Q1E11MOV8811B • CTMT SUMP TO 1B RHR PUMP Q1E11MOV8812B • 1B RHR HX TO CHG PUMP SUCT Q1E11MOV8706B • CCW TO 1B RHR HX Q1P17MOV3185B	3 Perform the following. a) [CA] Continue attempts to restore at least one train of recirculation equipment. b) Proceed to Step 4.
___ 4	**Verify SI - RESET.** [] MLB-1 1-1 off (A TRN) [] MLB-1 11-1 off (B TRN)	4 <u>IF</u> any train will <u>NOT</u> reset using the MCB SI RESET pushbuttons, <u>THEN</u> place the affected train S821 RESET switch to RESET. (SSPS TEST CAB.)
___ 5	**Check PHASE B CTMT ISO - RESET.** [] MLB-3 1-1 not lit [] MLB-3 6-1 not lit	5 Reset PHASE B CTMT ISO.
___ 6	**Verify containment spray signals - RESET.** CS RESET [] A TRN [] B TRN	

___Page Completed

Step	Action/Expected Response	Response NOT Obtained
___ 7	**Reset containment sump to RHR valve switches.** CTMT SUMP TO RHR PUMP RESET [] A TRN [] B TRN	
___ 8	**Verify containment fan cooler alignment.** 8.1 Verify all available containment fan coolers - STARTED IN SLOW SPEED. CTMT CLR FAN SLOW SPEED [] 1A [] 1B [] 1C [] 1D 8.2 Verify associated emergency service water outlet valve - OPEN. EMERG SW FROM 1A(1B,1C,1D) CTMT CLR [] Q1P16MOV3024A [] Q1P16MOV3024B [] Q1P16MOV3024C [] Q1P16MOV3024D	

NOTE: The following step is a continuing action step during performance of steps 9 through 34.

Step	Action/Expected Response	Response NOT Obtained
___ 9	**[CA] Check RWST level - GREATER THAN 4.5 ft.**	9 Proceed to Step 34.

___Page Completed

Step | Action/Expected Response | Response NOT Obtained

****

CAUTION: The remainder of this procedure should only be performed if RWST level is less than 4.5 ft and cold leg recirculation is not available.

****

___34 **Stop all safeguards pumps. taking suction from the RWST.**

CHG PUMP
[] 1A
[] 1B
[] 1C

RHR PUMP
[] 1A
[] 1B

CS PUMP
[] 1A
[] 1B

___35 **[CA] Establish makeup to RCS from any available source.**

35.1 Consult TSC staff for alternate method of RCS makeup such as normal makeup.

OR

Step 35 continued on next page.

___Page Completed

Step	Action/Expected Response	Response NOT Obtained
1	**Monitor RCP criteria.**	
1.1	Greater than 16°F{45°F} subcooled in CETC mode.	1.1 IF HHSI flow greater than 0 gpm, THEN stop all RCPs.
2	**Monitor SI reinitiation criteria.**	
2.1	Greater than 16°F{45°F} subcooled in CETC mode and PRZR level above 13%{43%}.	2.1 Establish HHSI flow, and start additional CHG PUMPs as required using ATTACHMENT 6, RE-ESTABLISHING HHSI FLOW.
3	**Monitor FNP-1-EEP-2, FNP-1-EEP-3 & FNP-1-ECP-1.1 branch criteria.**	
3.1	No SG pressure falling in an uncontrolled manner or less than 50 psig.	3.1 IF affected SG NOT previously isolated, THEN go to FNP-1-EEP-2.
3.2	No high secondary radiation or SG level rising uncontrolled.	3.2 Establish HHSI flow, and start additional CHG PUMPs as required using ATTACHMENT 6, RE-ESTABLISHING HHSI FLOW. THEN go to FNP-1-EEP-3.
3.3	At least one train ECCS recirculation capability exists.	3.3 Go to FNP-1-ECP-1.1.
4	**Monitor switchover criteria.**	
4.1	RWST level greater than 12.5 ft.	4.1 Go to FNP-1-ESP-1.3.
4.2	CST level greater than 5.3 ft.	4.2 Align AFW pumps suction to SW using FNP-1-SOP-22.0.
5	**Monitor charging miniflow criteria (during SI).**	
5.1	RCS pressure less than 1900 psig.	5.1 Verify miniflow valves open.
5.2	RCS pressure greater than 1300 psig.	5.2 Verify miniflow valves closed.
6	**Monitor adverse containment criteria.**	
6.1	CTMT pressure less than 4 psig and radiation less than 10^5 R/hr.	6.1 Utilize bracketed adverse CTMT condition numbers.

1. E-0/ESP-0.0-52530A05 006

Given the following:

- A small break LOCA has occurred on Unit 1.
- Containment pressure has reached 6 psig.

The crew is in ESP-1.2, Post LOCA Cooldown and Depressurization.

- The operator has depressed the SI reset pushbuttons on the MCB.
- MLB 1, 1-1 is **NOT LIT**.
- MLB 1, 11-1 is **LIT**.

Which one of the following describes the operation of the slave relays when the SI signal is received and the method, by procedure, to restore operation of B Train Safety Injection Equipment IAW ESP-1.2?

The slave relays will ___(1)___ when the SI signal is received.

The operator will reset Train B relays ___(2)___.

A.✓ (1) energize

(2) by turning the S821 reset handswitch inside SSPS Test Cabinet for Train B

B. (1) energize

(2) by cycling the reactor trip breakers, then pushing the SI reset pushbutton for Train B again

C. (1) de-energize

(2) by turning the S821 reset handswitch inside SSPS Test Cabinet for Train B

D. (1) de-energize

(2) by cycling the reactor trip breakers, then pushing the SI reset pushbutton for Train B again

013A2.01
013 Engineered Safety Features Actuation System (ESFAS)
A2 Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; 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 LOCA. 4.6 4.8

A. Correct- energize is correct. The second part is correct per ESP-1.2 STEP 1 RNO: 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.)

B. Incorrect- energize is correct, second part is not correct. This may fix the problem but not likely and is not procedurally correct. Plausible, since cycling Reactor Trip breakers is required to reset P-4 permissive, which allows resetting some actuation signals, but it is not necessary to reset SI.

C. Incorrect- de-energize is incorrect. Plausible, since de-energizing to actuate is fail safe in Reactor protection in many applications, but the slave relays must energize to actuate. Second part is correct (see A).

D. Incorrect- de-energize is incorrect (see C) and second part is incorrect (see B).

SI Reset Using Switch S821

Westinghouse IG96004 documents an industry issue related to the potential failure of SSPS to reset safety injection when the SI reset push buttons are depressed on the MCB. This problem has occurred at more than one nuclear utility but not at Farley Nuclear Plant. Farley Nuclear Plant is potentially susceptible to the same failure mechanism. The problem is attributed to a relay race associated with the slave relays and the auto SI block/reset circuit. Basically, some of the slave relays might not reset after the SI reset push button has been operated. One of the slave relays for the SI is used to enable the reset feature, and, if it resets before the other slave relays (there are a total of eight slave relays that operate on an SI), some of the other slave relays might not reset. The reason the slave relays do not reset is the result of a time race in the blocking of the SI signal and energizing the reset coil on the relays.

While indication of failure of SI reset is typically considered to be Monitor Light Boxes (MLB) 1-1 or 11-1 not extinguishing when the SI reset push buttons are depressed, the nature of this failure mechanism is such that from one to several relays may fail to unlatch, even though MLBs 1-1 and 11-1 have extinguished. The bypass and permissive panel is another indicator used to verify reset of an SI signal. The lights on this panel could change state, indicating that the SI has reset, but some of the slave relays might not have reset. This would typically be realized when a valve does not stroke in response to a demand to a position other than the SI position. The impact is that the operator would not be able to regain control of some plant equipment associated with the affected slave relay. If this problem were to occur, operating the SI reset push buttons again would not correct the problem. To diagnose which relay or relays are affected, a walkdown of the SSPS output cabinet would have to be performed.

In lieu of requiring a walkdown and diagnosis of any affected relay during an event, FNP will rely on operator action to mitigate this event as follows: IF during any testing OR during actual operation, actuation of the MCB SI reset push buttons fails to reset any portion of the safety injection, THEN the operator will take the S821 RESET handswitch located in the SSPS test cabinet for the affected train(s) to the clockwise position to reset the slave relays.

For example, slave relay K603 lights MLB 1-1 and 11-1 from the respective train and slave relay K602 from each train lights bypass and permissive panel light 1-4. These lights could be showing an SI reset condition, but one of the other slave relays could still be latched. If slave relay K604 for A train was still latched, then the following components would not stroke in response to a demand to a position other than the SI position: 1C accumulator isolation valve V8808C, HHSI isolation valve V8803A, RCP SW INLET V3135, SW TO BLOWDOWN HX LETDOWN CHILLER INLET V3149, and SW FROM BLOWDOWN HX LETDOWN CHILLER OUTLET V3150.

2008 NRC exam

Technical Reference: ESP-0.1 Rev. 28

Learning Objective:
Describe the sequence of major actions and when and how continuous actions will be implemented associated with ESP- 1.3/1.4 (OPS52531G04).
Evaluate plant conditions to determine if any system components need to be operated while performing EEP-0/ESP-0.0. (OPS52530A06)
Evaluate plant conditions and determine if transition to another section of EEP-0/ESP-0.0 or to another procedure is required. (OPS52530A08)

Comments:
The questions asks for the impacts of a LOCA on the ESF system and then a subsequent failure of some ESF components.

100. WE15EA2.2 001/NEW/SRO/C/A 2.9/3.3/WE15EA2.2/N/2/HBF/

The following plant conditions exist on Unit 1 following a Large Break LOCA:

- All automatic functions operated per design.
- Containment pressure peaked at 33 psig and is now 18 psig.
- RWST level indicates 12 feet 5 inches.
- ESP-1.3, Transfer to Cold Leg Recirculation, has been implemented; the crew has **NOT** yet begun to align ECCS for Cold Leg Recirculation.

- The indications for containment sump level are as follows:
  - LI-3594A, CTMT SUMP LVL, is reading 8.2 feet.
  - LR-3594B, POST ACCIDENT CTMT WTR LVL, is reading 8.2 feet.

Which one of the following is the correct procedural flow path for the event in progress AND the concern with this containment sump level?

A. • Stop ESP-1.3 actions, implement FRP-Z.2, Response to CTMT Flooding, and then continue in ESP-1.3.

• Damage to vital systems or components due to submersion.

B✓ • Continue in ESP-1.3 until step 7 is complete, then implement FRP-Z.2, Response to Containment Flooding.

• Damage to vital systems or components due to submersion.

C. • Continue in ESP-1.3 until step 7 is complete, then implement FRP-Z.2, Response to Containment Flooding.

• Damage to containment structure due to lateral forces on walls.

D. • Stop ESP-1.3 actions, implement FRP-Z.2, Response to CTMT Flooding, and then continue in ESP-1.3.

• Damage to containment structure due to lateral forces on walls.

Plausibility and Answer Analysis

A Incorrect. 1- Since the RWST level is <12.5 ft, the realignment of the SI system to cold leg recirculation must be done as quickly as possible, and as stated in step 1 Caution-2, "NO FRP should be implemented until step 7 is completed". Step 7 is the step which aligns for recirculation.

Plausible: Per SOP-0.8 (version 16.0, step 4.4) since E-0 has been exited, FRPs have a higher priority over the ERPs and shall be implemented immediately upon satisfying a RED or ORANGE CSF condition, <u>except when specifically stated otherwise</u>.

2 - correct - see B

B Correct. 1- Due to RWST water level <12.5 ft, and the time required to swap to Recirculation lineup, protecting the ESF components is a higher priority than any other CSF, as stated in the step 1-Caution-2 of ESP-1.3.

2- Containment flooding is a concern since critical plant components necessary for plant recovery may be damaged and rendered inoperable. A water level greater than the design basis flood level (7.6 ft) provides an indication that water volumes other than those represented by the emergency stored water sources.

C Incorrect. 1- Continuing in ESP-1.3 is the correct response. see B

2 - Incorrect - The concern for filling Containment >7.6 ft is that of threatening the availability of equipment required for long term cooling of the core and/or containment.

Plausible: This is a concern for external flooding water level of 144.2 ft. (which is >38 ft from bottom of containment). The lateral stress imposed on the containment structure from a high interior water level is a concern in the design loading of containment. However, this loading is much greater than the 7.6 ft identified in the CSF for loss of vital equipment.

D Incorrect. See A & C

K/A statement -
WE15 Containment Flooding-
EA2.2 Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.

IMPORTANCE	2.9	3.3

Technical Reference: ESP-1.3, rev 19
ESB-1.3, ver 2.0
FRB-Z.2, ver 1.0
SOP-0.8, ver 18.0
PES Evaluations HP/LP Rev 2
FSAR 3.8.1.3.j.

References to be provided: None

Learning Objective: OPS-62531G01;
Assess the facility conditions associate with ESP-1.3 [...], and based on that assessment:
•Select the appropriate procedures [...].
•Determine if transitions to another section of the procedure or to another procedure is required.
•Determine if the CSFs are satisfied.

Question origin: Modified Bank; FRP-Z-52533M01 002 (improved plausibility of distractors) & ESP-1.3/.4-62531G01 (modified second part to match K/A more closely).

Comments: K/A match or other comments. This question requires candidate to evaluate conditions and comply with ESP-1.3 guidance as well as understanding of the intention of FRP-Z.2 in maintaining the operability/functionality of components vital to preventing Core damage.

SRO justification: Generic procedure transition is not appropriate in the situation presented above due to higher priority strategy implementation. This decision is an SRO level decision, also covered within the body of a recovery strategy that is NOT a high level step.

Question #	100
K/A	WE15EA2.2

REFERENCE Docs

A. Purpose

This procedure provides the necessary instructions for transferring the safety injection system and containment spray system to the recirculation mode.

B. Symptoms or Entry Conditions

I. This procedure is entered when RWST level is less than 12.5 ft; from the following:

a. FNP-1-EEP-1, LOSS OF REACTOR OR SECONDARY COOLANT, step 16

b. FNP-1-ESP-1.2, POST LOCA COOLDOWN AND DEPRESSURIZATION, step 1

c. FNP-1-ECP-2.1, UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS, step 13

d. FNP-1-FRP-C.2, RESPONSE TO DEGRADED CORE COOLING, step 1

e. FNP-1-FRP-C.3, RESPONSE TO SATURATED CORE COOLING, step 1

f. FNP-1-FRP-H.1, RESPONSE TO LOSS OF SECONDARY HEAT SINK, step 20

g. A Foldout Page

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: To ensure that SI recirculation flow is maintained at all times, the following steps should be performed without delay.

****

****

CAUTION: No Function Restoration Procedure should be implemented until step 7 has been completed.

****

****

CAUTION: Switchover to recirculation may cause high radiation levels in the auxiliary building.

****

___ 1 **[CA] IF RWST level less than 4.5 ft AND alignment for recirculation NOT imminent, THEN stop any pump taking suction from the RWST.**

___Page Completed

Step	Action/Expected Response	Response NOT Obtained

****

<u>CAUTION</u>: Pump damage will occur if a charging pump or RHR pump is started in a train in which a flow path from the containment sump to the RCS cannot be established or maintained.

****

___ 7 **Align ECCS for cold leg recirculation.**

Action/Expected Response	Response NOT Obtained
7.1 Check containment sump level - GREATER THAN 2.4 ft{3.0 ft}. CTMT SUMP LVL [] LI 3594A POST ACCIDENT CTMT WTR LVL [] LR 3594B	7.1 <u>IF</u> both containment sump level indications less than 2.4 ft{3.0 ft}, <u>THEN</u> go to FNP-1-ECP-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION.
7.2 Verify recirculation valve disconnects - CLOSED USING ATTACHMENT 1.	
7.3 Stop both RHR PUMPs.	
7.4 Close RWST TO 1A RHR PUMP Q1E11MOV8809A.	7.4 Perform the following. 7.4.1 Stop the running A train CHG PUMP. 7.4.2 Proceed to step 7.9.
7.5 Align CTMT sump to 1A RHR PUMP. CTMT SUMP TO 1A RHR PUMP [] Q1E11MOV8811A open [] Q1E11MOV8812A open	7.5 Perform the following. 7.5.1 Stop the running A train CHG PUMP. 7.5.2 Proceed to step 7.9.
7.6 Close RHR to RCS HOT LEGS XCON Q1E11MOV8887A.	

Step 7 continued on next page.

___Page Completed

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: Any charging pump with suction aligned to an RHR pump should be stopped prior to stopping the RHR pump.

****

****

CAUTION: Charging pump or spray pump damage will occur if suction is lost and the pump is not secured.

****

NOTE:
- Erratic pump parameters (flow, discharge pressure, amps, etc.) are indications of pump cavitation.
- Step 8 is a continuous action step which applies any time ECCS pumps are aligned to the sump.

Step	Action/Expected Response	Response NOT Obtained
___ 8	**Verify ECCS pumps not affected by sump blockage.**	8 IF both trains are affected such that at least one train of SI recirculation flow cannot be maintained, THEN go to FNP-1-ECP-1.3, LOSS OF EMERGENCY COOLANT RECIRCULATION CAUSED BY SUMP BLOCKAGE.
8.1	[CA] Monitor ECCS pump suction conditions - NO INDICATION OF CAVITATION. CHG PUMP [] 1A [] 1B [] 1C RHR PUMP [] 1A [] 1B CS PUMP [] 1A [] 1B	

___Page Completed

Section: Procedure

Unit 1 ERP Step: 1 CAUTION-2 **Unit 2 ERP Step:** 1 CAUTION-2 ***ERG Step No:*** *1 NOTE-1*

ERP StepText: No Function Restoration Procedure should be implemented until step 7 has been completed.

ERG StepText: *Steps 1 through 4 should be performed without delay. FRGs should not be implemented prior to completion of these steps.*

Purpose: To call attention to the fact that the operator actions to realign the SI System must be done in a rapid manner

Basis: Since the amount of water in the RWST between the switchover setpoint and the empty point is limited, the realignment of the SI System to cold leg recirculation must be done as quickly as possible.

Knowledge: A suction source of water for the SI pumps must be maintained to provide for core cooling. The actions of these first four steps must be completed even if challenges to a Critical Safety Function occur at this time, since these steps relate to the maintenance of core cooling.

References:

Justification of Differences:

1 ERG NOTE was split into two separate CAUTIONS due to their importance for core protection. The non-implementation of FRGs is a separate criteria from the admonition for prompt performance of this procedure.

4.4 Priority

The CSFSTs shall be continuously monitored in the following order of priority:

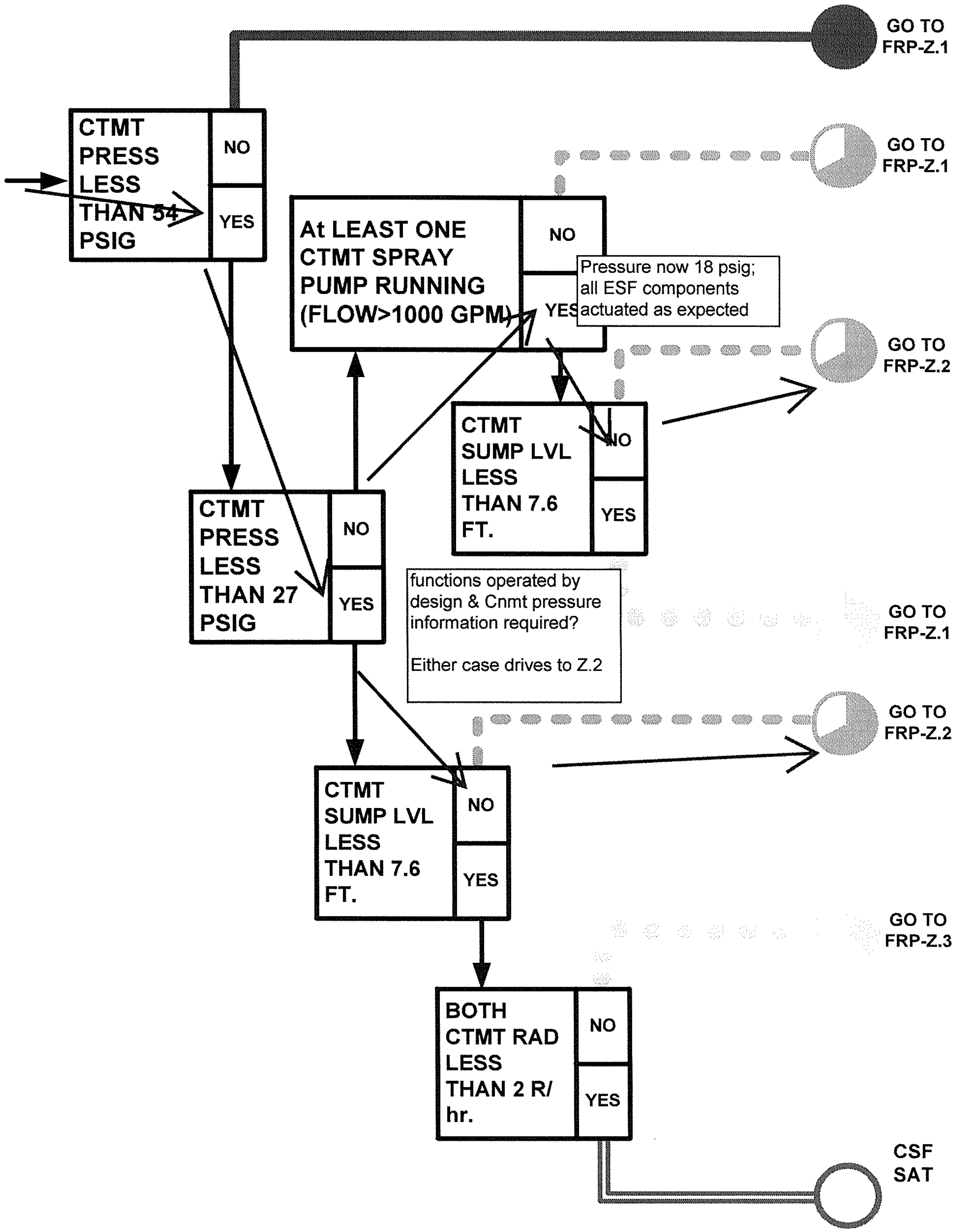
S - Subcriticality
C - Core Cooling
H - Heat Sink
P - Integrity
Z - Containment
I - Inventory

If a red path is identified, the user will, unless specifically directed otherwise, immediately suspend the procedure in effect and transition to the specified FRP. CSFST monitoring will continue so that if a higher priority red path occurs, it will be identified. If plant conditions degrade during recovery from reactor trip without safety injection, EEP-0.0 should be reentered and immediate actions performed prior to transition from ESP-0.1 to any FRP. The STA should validate the need for the FRP entry while immediate actions are being performed.

If an orange path is identified, the user will monitor the remaining CSFSTs to ensure that no red path exists. Unless specifically directed otherwise, he will then suspend the procedure in effect and transition to the specified FRP. CSFST monitoring will continue so that if a higher priority orange path or any red path occurs, it will be identified.

If a yellow path is identified, the user is not required to transition to the specified FRP. This indicates an off normal condition that the user should be aware of, but which does not yet challenge a CSF. Implementation of a yellow path FRP is based upon operator judgement when it is determined that adequate time exists to implement it. Optimal recovery procedures (EEPs, ESPs, and ECPs) have priority over yellow path FRPs. While performing a yellow path FRP, continuous actions or foldout page items of the optimal recovery procedure in effect are still applicable and should be monitored. Concurrent procedure usage should not cause difficulties since yellow path FRPs are only performed when adequate time exists.

Once an FRP has been entered due to a red or orange path, the FRP must be performed to completion unless it is preempted by a higher priority FRP. It is expected that the FRP will correct the red or orange condition before all of the operator actions are performed but the user must continue until the FRP directs a transition. In general, the performance of the critical safety functions is based on the current plant parameters. IF a red or orange path condition comes in and clears, THEN the associated FRP does not need to be performed. IF conditions degrade, THEN the status of the safety function will become a continuous red or orange condition at which time the operator would be directed to the appropriate critical safety function.


GO TO FRP-Z.1
CTMT PRESS LESS THAN 54 PSIG
NO
YES
GO TO FRP-Z.1
At LEAST ONE CTMT SPRAY PUMP RUNNING (FLOW>1000 GPM)
NO
YES
Pressure now 18 psig; all ESF components actuated as expected
GO TO FRP-Z.2
CTMT SUMP LVL LESS THAN 7.6 FT.
NO
YES
CTMT PRESS LESS THAN 27 PSIG
NO
YES
functions operated by design & Cnmt pressure information required?
Either case drives to Z.2
GO TO FRP-Z.1
GO TO FRP-Z.2
CTMT SUMP LVL LESS THAN 7.6 FT.
NO
YES
GO TO FRP-Z.3
BOTH CTMT RAD LESS THAN 2 R/ hr.
NO
YES
CSF SAT

Section: Containment Block Decision

Unit 1 ERP Step: 3b **Unit 2 ERP Step:** 3b ***ERG Step No:***

ERP StepText: CTMT SUMP LVL LESS THAN 7.6 FT.

ERG StepText: *Containment Sump Level Less Than (T.06)*

Purpose: To determine if containment is flooded.

Basis: High energy line breaks could result in a large volume of water being pumped into containment. As the water level rises, it might threaten the availability of equipment required for long term cooling of the core and/or containment. Such a high water level is considered a severe challenge to the containment barrier and an ORANGE priority is warranted. The appropriate guideline for function restoration is FR Z.2, RESPONSE TO CONTAINMENT FLOODING.

Knowledge: It should be noted that once all the actions of guideline FR Z.2 are completed and the operator is returned to the guideline and step in effect, this particular Containment function may not be restored and the Containment Status Tree may continue to display an ORANGE priority. If this is the case, guideline FR Z.2 does not need to be implemented again since all necessary actions have already been performed.

References:

Justification of Differences:

1 Changed to make plant specific.

e. Floor drain tanks

f. Laundry water storage tank

g. Laundry & hot shower tank

h. RWST

i. Other tanks, on plant-specific basis

When determining available storage capacity, the number, usable volume, and current liquid level of candidate tanks must be considered.

5. The following considerations apply to selection of candidate storage tank(s) to receive contaminated water transferred from the containment recirculation sump:

   a. Location, size, and shielding of outside-containment storage tanks

   b. Pump and line routing from the containment sump to various storage tanks

   c. Potential for uncontrolled off-gassing through the tank vent

6. It might be possible to increase the capacity available for storing contaminated sump water by transferring the current contents of candidate tanks to non-candidate tanks.

- **Review of Background Documentation**

From FR-Z.2, Section 2 Description[4]

Guideline FR-Z.2, RESPONSE TO CONTAINMENT FLOODING, provides actions to respond when the containment level is greater than design flood level. This level is significant since the critical systems and components, which are necessary to ensure an orderly safe plant shutdown and provide feedback to the operator regarding plant conditions, are normally located above the design flood level. Therefore, the guideline FR-Z.2 is entered from the Containment Status Tree on an ORANGE priority when this design flood level is exceeded.

The primary purpose of the containment sump area is to collect the water injected into the containment or spilled from the reactor coolant system following an accident. The water collected in the containment sump is then available for long term core and/or containment cooling via the emergency core cooling or containment spray recirculation systems. In addition, the containment sump collects the injected or spilled water into areas such that vital systems or components will not be flooded and thus rendered inoperable.

The maximum level of water in the containment following a major accident generally is based upon the entire water contents of the reactor coolant system, refueling water storage tank, condensate storage tank, and SI accumulators. This water volume approximates the maximum water volume introduced into the containment following a LOCA plus a steamline or feedline break inside containment.

An indicated water level in the containment greater than the maximum expected volume (design basis flood level) is an indication that water volumes other than those represented by the above noted volumes have been introduced into the containment. Also, the high water level provides an indication that potential flooding of critical systems and components needed for plant recovery may occur.

d. American Concrete Institute and American Society of Mechanical Engineers, "Proposed Standard Code for Concrete Reactor Vessels and Containments." (ACI-359)

The joint-ACI-ASME (ACI-359) document, Proposed Standard Code for Concrete Reactor Vessels and Containments, has not been used in the design of the containment.

3.8.1.2.2 Structural Specifications

Structural specifications are prepared to cover the areas related to design and construction of the containment. These specifications emphasize important points of the industry standards for the design and construction of the containment, and reduce options that otherwise would be permitted by the industry standards. Unless specifically noted otherwise, these specifications do not deviate from the applicable industry standards. They cover the following areas:

a. Concrete material properties.

b. Placing and curing of concrete.

c. Reinforcing steel and splices.

d. Post-tensioning system.

e. Liner plate and penetration assemblies.

3.8.1.3 Loads and Loading Combinations

The containment is designed for all credible conditions of loadings, including normal loads, loads resulting from a loss-of-coolant accident, test loads, and loads due to adverse environmental conditions.

Critical loading combinations are those caused by a postulated loss of reactor coolant, by a postulated earthquake, or by a pipe rupture in the containment.

Wind and tornado loads, flood design bases, and seismic loads are given in sections 3.3, 3.4 and 3.7, respectively. Missile effects and the postulated pipe rupture effects are discussed in sections 3.5 and 3.6. Chapter 15.0, "Accident Analyses", provides information on the design pressure load.

1. Loads

   The following loads are considered: dead loads; live loads; prestressing loads; earthquake loads; pipe rupture loads; loss-of-coolant accident loads; operating thermal loads; wind and tornado loads; external pressure loads; hydrostatic loads; and test loads.

a. Dead Loads:

Structural dead loads consist of the weight of the containment wall, dome, base slab, interior framing and slabs, all internal structures, equipment, and major piping and electrical conductors.

b. Live Loads:

Live loads consist of design floor loads, equipment live loads, and all live loads transmitted by the internal structures.

The operating floor slab is designed for either of these live loads:

Floor gratings	450 psf
Concrete slabs	1000 psf

Equipment live loads are those specified on drawings supplied by the manufacturer of the equipment.

c. Prestressing Loads:

The compressive forces due to the prestressing tendons are taken into consideration.

d. Earthquake Loads:

Earthquake loads are predicated on a basis of the 1/2 safe shutdown earthquake (1/2 SSE), having a horizontal ground acceleration of 0.05 g and a vertical ground surface acceleration of 0.033 g.

In addition, a safe shutdown earthquake (SSE), having a horizontal ground acceleration of 0.10 g and a vertical ground surface acceleration of 0.067 g, is used to check the design to ensure that loss of structural functions will not occur.

Seismic response spectrum curves are given in section 3.7 for both horizontal and vertical ground motions. A dynamic analysis is used to compute the seismic loads for the design of structural elements.

e. Pipe Rupture Loads:

Pipe rupture loads represent the forces or pressure on the structure due to the rupture of any one pipe.

f. Loss-of-Coolant Accident Loads:

The design pressure and temperature of the containment are greater than the peak pressure and temperature that would result from a postulated complete blowdown of the reactor coolant. This might occur through the

j. Hydrostatic Loads:

Lateral hydrostatic pressure resulting from ground or flood water, as well as buoyant forces resulting from the displacement of ground or flood water by the structure, are accounted for in the design.

The water levels considered are:

Ground water, elevation 125 ft.
Flood water, elevation 144.2 ft.

k. Test Loads:

Upon completion of construction, the containment and its penetrations are tested at 115 percent of the design pressure. This pressure is considered in the design.

2. Loading Combinations

In general, two types of loading cases are considered in the design of the containment.

a. The design loading case for which the working stress method is used.

b. The factored loading case for which the ultimate stress method is used.

The following terms are used in the loading combination equations:

C = Required capacity of the containment to resist factored loads.

ϕ = Capacity reduction factor (defined in subsection 3.8.1.3.1)

D = Dead loads of containment, interior structures, and equipment, plus any other permanent contributing loads.

E = 1/2 Safe-shutdown earthquake load.

E'= Safe Shutdown Earthquake load.

F = Prestress load.

H = Force on structure due to thermal expansion of pipes under operating conditions.

L = Appropriate live load.

P = Design accident pressure load.

R = Force or pressure on structure due to rupture of any one pipe.

1. ESP-1.3/.4-62531G01 002

source question Part 1:

Given the following:

- A large break LOCA has occurred on Unit 1.
- All automatic functions operated per design.
- Containment pressure peaked at 33 psig and is now 18 psig.
- RWST level indicates 12 feet 5 inches.

The control room team has entered ESP-1.3, Transfer to Cold Leg Recirculation, and are at step 7, Align ECCS for Cold Leg Recirculation, and are checking containment sump level. The indications for containment sump level are as follows:

- LI-3594A, CTMT SUMP LVL, is reading 8.2 feet.
- LR-3594B, POST ACCIDENT CTMT WTR LVL, is reading 8.2 feet.

Which one of the following is the correct procedural flow path for the event in progress and the source of the extra water in containment?

A. • Stop ESP-1.3 actions, implement FRP-Z.2, Response to CTMT Flooding, and then continue in ESP-1.3.

• Reactor Makeup water system.

B. • Continue in ESP-1.3 until step 7 is complete, then implement FRP-Z.2, Response to Containment Flooding.

• Reactor Makeup water system.

C✓ • Continue in ESP-1.3 until step 7 is complete, then implement FRP-Z.2, Response to Containment Flooding.

• Service Water system.

D. • Stop ESP-1.3 actions, implement FRP-Z.2, Response to CTMT Flooding, and then continue in ESP-1.3.

• Service Water system.

W/E15EA2.1
E15 Containment Flooding
EA2. Ability to determine and interpret the following as they apply to the (Containment Flooding)
(CFR: 43.5 / 45.13)
EA2.1 Facility conditions and selection of appropriate procedures during abnormal and emergency operations.
IMPORTANCE RO 2.7 SRO 3.2

A. Incorrect- The first part is incorrect since RWST level is at the entry level to go to ESP-1.3. Since the team is at step 7, they are required to finish the alignment even with an FRP in an ORANGE condition. There is no guidance that allows suspension of ESP-1.3 once entry conditions are met. Plausible since in emergency procedures it is normally procedurally correct to transition to any orange or red path that shows up. Second part is incorrect since this system is isolated on a phase A. RMW is normally aligned during normal ops and isolates. DW is normally isolated during normal ops and is less credible. This is plausible since there are four systems FRP-Z.1 has the operator check to see if the flooding is from one those areas. They are SW, CCW, RMW and DW. CCW is a small system with limited water, DW and RMW are 200,000 gal tanks.

B. Incorrect- first part is correct (see C). second part is incorrect (see A).

C. Correct- The first is correct since RWST level is at the entry level to go to ESP-1.3. Since the team is at step 7, they are required to finish the alignment even with an FRP in an ORANGE condition. This is per the caution above step 1.
The second part is correct since SW will still be aligned to containment through the ctmt coolers in emergency mode. RMW, CCW and DW are all isolated from ctmt with a T-signal or a phase B isolation.

D. Incorrect- first part is incorrect, and the second part is correct.
2008 NRC exam

Technical Reference: FRP-Z.2 Rev. 6 Response to Containment Flooding, ESP-1.3 Rev. 19 Transfer to Cold Leg Recirculation and EEP-0 Rev. 36 and OPS-52108, RMW lesson plan

Learning Objective:
Evaluate plant conditions to determine if entry into FRPZ. 1/Z.2/Z.3 is required. (OPS52533M02)
State the basis for all cautions, notes, and actions associated with ESP-1.3/1.4. (OPS52531G03).
Evaluate plant conditions and determine if transition to another section of ESP-1.3/1.4 or to another procedure is required (OPS52531G08)

Comments: This question meets the KA since there are entry conditions to the containment flooding FRP and another procedure is involved. This makes the candidate select the appropriate procedure during the emergency conditions. To make plausible distracters and a level of difficulty >1, I had to add the location or system involved in the leak. Otherwise the selection of the procedure with four different choices would not be plausible or discriminatory.

2. FRP-Z-52533M01 002

Which ONE of the following is a potential source of the flooding that is checked for in FRP-Z.2; and the concern if the maximum expected post-accident containment water level (design basis containment flood level) is exceeded?

A. • Condensate Storage Tank.

• Thermal shock to the reactor vessel lower head due to quenching.

B. • Condensate Storage Tank.

• Damage to vital system or components rendering them inoperable.

C✓ • Service Water system.

• Damage to vital system or components rendering them inoperable.

D. • Service Water system.

• Thermal shock to the reactor vessel lower head due to quenching.

Source question part 2--- modified to improve plausibility

A. Incorrect. CST is not one of the potential sources of water FRP-Z.2 addresses and the background does not mention. However, since AFW goes into ctmt and is in use, it is plausible that this large source of water would be checked for and is a concern. The maintenence sump is isolated from the bottom of the reactor vessel by a wall with an elevation higher than the vital equipment of concern. Plausible, because a high enough containment level would allow water to potentially thermally shock the hot post accident reactor vessel.

B. Incorrect. CST is not one of the potential sources of water FRP-Z.2 addresses and the background does not mention. The reason is correct.

C. Correct. Service water is the most likely source since it does not isolate to the ctmt on a phase A or B signal and is the largest source of water available to ctmt.

The purpose of the sump is to collect and divert water in areas that will not affect vital plant equipment. Flooding may jeopardize that function. RWST, CST, & RCS are expected to provide their full volumes to the CTMT sump in accident analysis.

D. Incorrect. SW is correct.
The reason is incorrect. Plausible, because a high enough containment level would allow water to potentially thermal shock the hot post accident reactor vessel.

FNP-0-FRB-Z.2 specific background document for FRP-Z.2 for step 1
Basis: This step instructs the operator to try to identify the unexpected source of the water in the containment sump. Containment flooding is a concern since critical plant components necessary for plant recovery may be damaged and rendered inoperable. A water level greater than the design basis flood level provides an indication that water volumes other than those represented by the emergency stored water sources (e.g., RWST, accumulators, etc.) have been introduced into the containment sump. Typical sources which penetrate containment are service water, component cooling water, primary makeup water and demineralized water. All possible plant specific sources which penetrate containment should be included in this step. These systems provide large water flow rates to components inside the containment and a major leak or break in one of these lines could introduce large quantities of water into the sump. Identification and isolation of any broken or leaking water line inside containment is essential to maintaining the water level below the design basis flood level.

2007 NRC exam

E15 EK3.4 Containment Flooding - EPE
Knowledge of the reasons for the following responses as they apply to the (Containment Flooding)
RO or SRO function as a within the control room team as appropriate to the assigned position, in such a way that procedures are adhered to and the limitations in the facilities license and amendments are not violated.

Technical Reference: FRP-Z.2 and FNP-0-FRB-Z.2 specific background document for FRP-Z.2

Learning Objective: OPS 52533M01

Comments:
This meets the KA in that it tests the knowledge of the operator on where the most likely source of water would come from and then the limitations that the bkgrd documents speak of.