1. 001AA1.03 001/NEW/RO/MEM 3.4/3.2/001AA1.03/N///B

Unit 2 is at 55% power with the following conditions:

- 2A BAT is on service, 2B BAT is on standby.

At 10:00:
- Control Rods are stepping out in AUTO and cannot be stopped.
- The Reactor cannot be tripped and FRP-S.1, Response to Nuclear Power Generation/ ATWT, has been entered.
- An emergency boration is in progress per FRP-S.1, with the 2A BAT pump running.

At 10:05:
- The 2A BAT pump trips.

Which one of the following correctly completes the statements below?

Verify 2B BAT pump (1) .

Per FRP-S.1, **minimum** boration flow is required to be greater than (2) gpm.

	(1)	(2)
A.	autostarts	30
B.✓	is manually started	30
C.	autostarts	40
D.	is manually started	40

2A BAT pump is manually started for the Emergency Boration in FRP-S.1. If the running BAT pump trips, candidate has to determine if the standby pump will autostart. The BAT pumps do not autostart upon trip of a running BAT pump, but plausibility is established because some other safety related equipment autostarts if the on service piece of equipment trips (i.e. Charging and CCW pumps). In addition, the on service BAT pump does autostart on a low VCT level.

Minimum boration flow, per FRP-S.1, is 30 gpm.

A. Incorrect - 1) incorrect, plausible because many other safety related components have autostarts of the standby pump if the on service pump trips.
2) correct, greater than 30 gpm boration flow is required.

B. Correct - 1) 2A BAT pump must be manually started
2) greater than 30 gpm boration flow is required.

C. Incorrect - 1) incorrect, see A.1.
2) incorrect, plausible because in FRP-S.1, required boration flow is 30 gpm, but required Charging flow is 40 gpm.

D. Incorrect - 1) correct.
2) incorrect, see C.2.

001AA1.03

APE: 001 Continuous Rod Withdrawal

AA1. Ability to operate and / or monitor the following as they apply to the Continuous Rod Withdrawal :

(CFR 41.7 / 45.5 / 45.6)

AA1.03 Boric acid pump control switch 3.4 3.2

Importance Rating:	3.4 / 3.2
Technical Reference:	FNP-2-FRP-S.1 v22
References provided:	None
Learning Objective:	EVALUATE plant conditions and DETERMINE if any system components need to be operated while performing (1) FRP-S.1, Response to Nuclear Power Generation/ATWT; (2) FRP-S.2, Response to Loss of Core Shutdown. (OPS-52533A06)
Question origin:	NEW
Basis for meeting K/A:	K/A is met by placing candidate in a situation where there is a continuous Rod Withdrawal event and the Reactor will not trip. This requires entry into FRP-S.1 and the initiation of an Emergency Boration. Student has to monitor the effects of a trip of the on service BAT pump, and determine if actions are required to start the standby BAT pump.
SRO justification:	N/A

Step	Action/Expected Response	Response NOT Obtained
4.7	Verify emergency boration flow adequate.	
4.7.1	IF normal emergency boration flow path aligned, THEN check emergency boration flow greater than 30 GPM. BORIC ACID EMERG BORATE [] FI 110	
4.7.2	IF manual emergency boration flow path aligned, THEN check boric acid flow greater than 30 GPM. MAKEUP FLOW TO CHG/VCT [] BA FI 113	
4.7.3	IF boration is from the RWST, THEN verify charging flow - GREATER THAN 92 GPM.	

____Page Completed

2. 001K6.02 002/BANK/RO/C/A 2.8/3.3/001K6.02/N///A

Given the following conditions on Unit 2:

- Reactor power is 90%.
- Rod Control is in AUTO.
- Control Bank D rods are at 200 steps.

Which one of the following describes how control rods will respond when N-44, PR NI, fails **LOW** quickly with no operator actions or automatic reactor trips?

A.✓ Rods step **out** until Tavg/Tref mismatch causes them to step **back in**.

B. Rods step **in** until Tavg/Tref mismatch causes them to step **back out**.

C. Rods step **out** and stay **out**.

D. Rods step **in** and stay **in**.

Failure of nuclear power channel N-44

Failure of N-44 channel would affect the turbine power-reactor power mismatch rate of change input to the reactor control unit. Since this is a rate of change input, a very slow failure of N-44 would have little affect. The **dominant** temperature mismatch channel would keep the rods at program Tavg. An immediate failure of N-44 low would cause the rate of change circuit to respond by moving the control rods out (if below D at 220 steps). Rod speed could be as high as 72 steps per minute initially. RCS Tavg could quickly rise above program as the rods moved out. The temperature-mismatch channel of the reactor control unit would respond when the temperature mismatch with program Tavg reached 1.5 degrees. The temperature error signal would call for rods to step back in to restore Tavg to program. RCS temperature would likely rise several degrees before the rod control response to the temperature error would begin to bring the rods back in. Because there is a one degree deadband in the reactor control unit, rods would step in to restore Tavg to approximately one degree above program. Thus, without operator intervention, the rods would end up close to their original position.

A. Correct - see above.

B. Incorrect - rods move out first since power is failed low and the Reactor Control Unit is trying to match Reactor power to Turbine power.

C. Incorrect - Rods do step out, but the dominant Temperature Mismatch portion of the Reactor Control Unit will step rods in to return temperature to normal.

D. Incorrect - Rods first step out due to the Power mismatch portion of the Reactor Control Unit.

001K6.02

001 Control Rod Drive System

Knowledge of the effect of a loss or malfunction on the following CRDS components:
(CFR: 41.7/45.7)
K6.02 Purpose and operation of sensors feeding into the CRDS 2.8 3.3

Importance Rating:	2.8 / 3.3
Technical Reference:	
References provided:	None
Learning Objective:	SELECT AND ASSESS the following instrument/equipment response expected when performing Rod Control System evolutions including the fail condition, alarms, and trip setpoints (OPS-52201E06). Nuclear Power Range Channel N-44 Turbine Impulse Pressure Channels, PT-446 & 447 Tavg Channels
Question origin:	FNP BANK ROD CONT-52201E06 06
Basis for meeting K/A:	K/A is met by testing candidates knowledge of the effects of a malfunction of a sensor feeding into the Automatic Rod Control system. One Nuclear Instrument fails low and candidate has to determine the operational response of the CRDS.
SRO justification:	N/A

220 steps control interlock C-11 will be active. See the T_{avg}, ΔT, and P_{imp} lesson for further information on RIL.

A control panel for the P to A converter is located in the rear of the DC hold cabinet. This cabinet allows the operator to display the rod height for any one of the control banks. The selected bank position indication can be changed for the selected display by selecting manual and using the up or down push button.

Failures Affecting Operation of the Rod Control System

Instrument failures that could affect the operation of the rod control system include failure of nuclear power channel N-44, selected turbine impulse pressure input PT-446 or PT-447, or T_{avg} input. The following discussions assume the BSS in auto. The proper response to any unexpected rod motion would be to enter AOP-19, *Malfunction of Rod Control System.* This procedure will tell the operator to attempt to stop unexpected rod motion by placing the BSS in manual.

Failure of nuclear power channel N-44

Failure of N-44 channel would affect the turbine power-reactor power mismatch rate of change input to the reactor control unit. Since this is a rate of change input, a very slow failure of N-44 would have little affect. The dominant temperature mismatch channel would keep the rods at program T_{avg}. An immediate failure of N-44 low would cause the rate of change circuit to respond by moving the control rods out (if below D at 220 steps). Rod speed could be as high as 72 steps per minute initially. RCS T_{avg} could quickly rise above program as the rods moved out. The temperature-mismatch channel of the reactor control unit would respond when the temperature mismatch with program T_{avg} reached 1.5 degrees. The temperature error signal would call for rods to step back in to restore T_{avg} to program. RCS temperature would likely rise several degrees before the rod control response to the temperature error would begin to bring the rods back in. Because there is a one degree deadband in the reactor control unit, rods would step in to restore T_{avg} to approximately one degree above program. Thus, without operator intervention, the rods would end up close to their original position.

Failure of T_{avg} Input

The temperature-mismatch channel of the reactor control unit gets its input from the median T_{avg} signal from the three RCS loop T_{avg} inputs. Failure of one of the T_{avg} inputs to the

ROD CONTROL SYSTEM

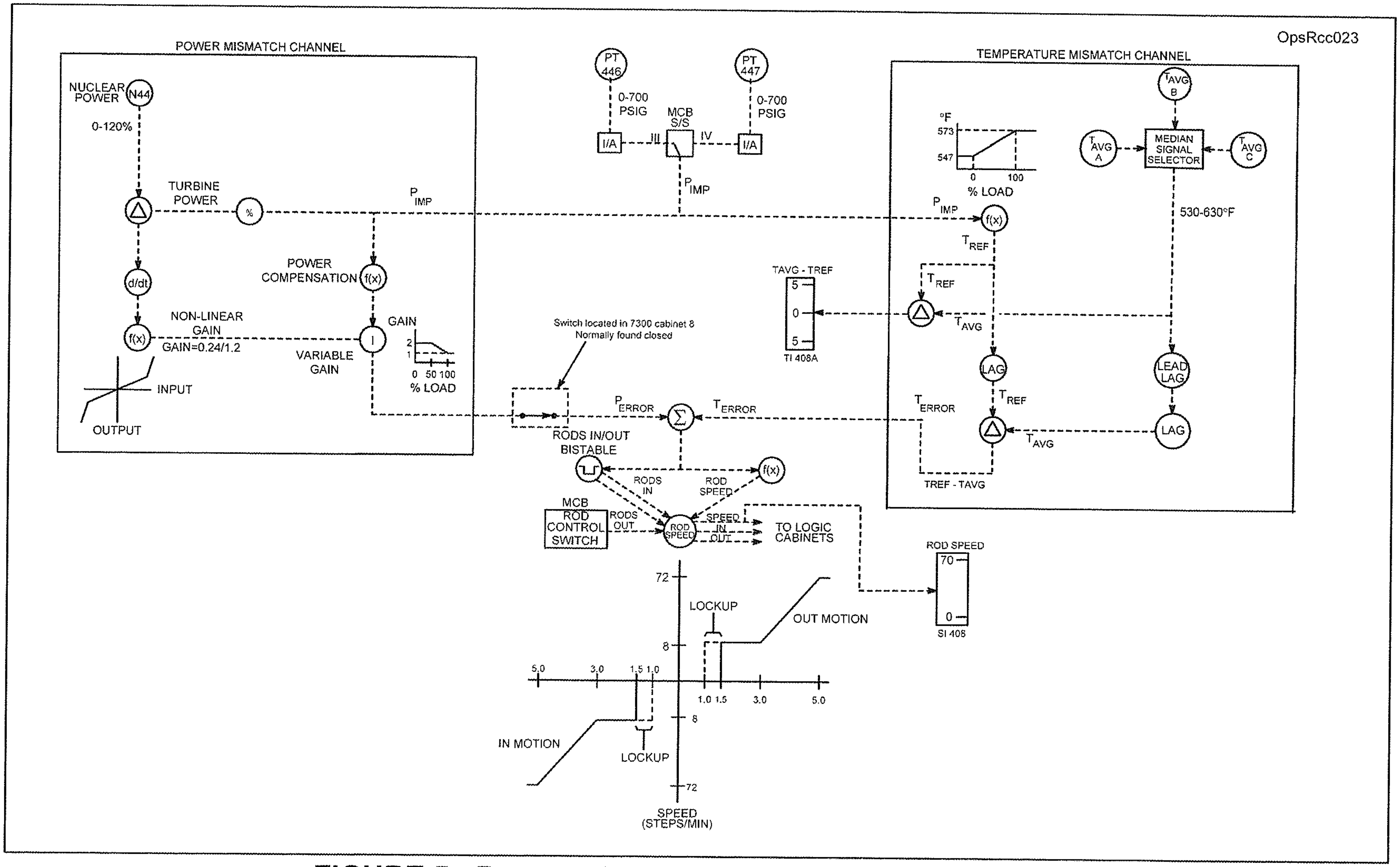

FIGURE 5 - Reactor Control Unit (Temp/Speed Control)

3. 003K6.14 003/NEW/RO/MEM 2.6/2.9/003K6.14/N///B

Unit 2 is in Mode 4 with the following conditions:

At 10:00:

- 2C RCP was started, but tripped due to over-current during the start attempt.

At 10:45:

- The Shift Manager directs 4160V Bus Voltage raised and the 2C RCP restarted.

The following MCB parameters are observed:

- 2C RCP #1 SEAL PRESSURE is 240 psid.
- 2C RCP SHAFT SEAL FLOW is 6.5 gpm.
- VCT PRESS is 16.5 psig.

Per SOP-1.1, Reactor Coolant System, which one of the following parameters will prevent the operator from starting the 2C Reactor Coolant Pump?

A. #1 Seal DP

B.✓ VCT pressure

C. Seal injection flow

D. Insufficient idle time between start attempts

This is related to OE from our plant for starting an RCP coming up out of an outage. We were starting an RCP with a Circulating Water Pump already running (on the same 4160V bus) and grid voltage low due to requirements to meet the Generation Voltage schedule. When the RCP was started, prior to the RCP coming up to speed (because of the inertia of the flywheel), it would trip on overcurrent due to the low voltage conditions and load on the bus. After several start attempts, we had to get permission from the Alabama Voltage Control Center to raise grid voltage higher than normally allowed to be able to start the RCP and maintain it running. This validates the plausibility of the stem of the question.

Per SOP-1.1, required conditions for RCP start are:
RCP #1 Seal dp >200 psid
VCT pressure $\geq$ 18 psig
Seal Injection flow 6-13 gpm
Minimum 30 minutes idle period between start attempts

A. Incorrect - #1 Seal dp is > required 200 psid.

B. Correct - Minimum required VCT pressure is 18 psig. Current VCT pressure is unacceptable.

C. Incorrect -Seal injection flow is > than required 6 gpm.

D. Incorrect - > 30 minutes has elapsed. Starting limitations are met.

003K6.14

003 Reactor Coolant Pump System (RCPS)

Knowledge of the effect of a loss or malfunction on the following will have on the RCPS:

(CFR: 41.7 / 45/5)

K6.14 Starting requirements 2.6 2.9

Importance Rating:	2.6 / 2.9
Technical Reference:	FNP-2-SOP-1.1 v39
References provided:	None
Learning Objective:	RECALL AND DISCUSS the Precautions and Limitations (P&L), Notes and Cautions (applicable to the "Reactor Operator") found in the following Procedures (OPS-52101D09): SOP-1.1, Reactor Coolant System SOP-1.7, Draining RCP Bearing Oil Reservoirs SOP-1.8, Filling RCP Bearing Oil Reservoirs AOP-4.0, Loss of Reactor Coolant Flow
Question origin:	NEW.
Basis for meeting K/A:	K/A is met by giving candidate a set of conditions for start of an RCP with a previous malfunction (loss of VCT pressure). Candidate must assess the conditions and determine if starting requirements are met to allow the re-start of an RCP.
SRO justification:	N/A

3.5 RCS pressure and temperature are limited to maximum of 375 psig and 350°F respectively when the RHR system is valved into the RCS.

3.6 RCPs shall not be operated continuously until the RCS has been filled and vented in accordance with FNP-2-SOP-1.3, REACTOR COOLANT SYSTEM FILLING AND VENTING - VACUUM METHOD, or FNP-2-SOP-1.11, REACTOR COOLANT SYSTEM FILLING AND VENTING-DYNAMIC METHOD.

3.7 Do not attempt to start a RCP unless its oil lift pump has been delivering oil to the upper thrust shoes for at least two minutes. Observe the oil lift pumps indicating lights to verify correct oil pump motor operation and oil pressure. The oil lift pumps should run at least 1 minute after the RCPs are started. An interlock will prevent starting a RCP until 600 psig oil pressure is established.

3.8 Shift Supervisor's approval must be obtained prior to removing any seal wires or changing the position of any throttle valves.

3.9 RCP seal water injection flow of 6 gpm or CCW to the RCP thermal barrier must be continuously supplied when RCS temperature exceeds 150°F.

3.10 Maintain RCP CCW and seal injection water supply temperature less than 105°F and 130°F respectively.

3.11 IF CCW flow to the RCP motor bearing oil coolers is lost, THEN pump operation may be continued until the motor upper or lower bearing temperature reaches 195°F (approximately 2 minutes after cooling water flow stops).

3.12 For RCP operations, a minimum pressure differential of 200 psid must be maintained across RCP No. 1 seals.

3.13 The following precautions apply in the case of a RCP #1 seal failure.

3.13.1 Do not restart an RCP with an indicated No. 1 seal failure.

3.13.2 Refer to FNP-2-ARP-1.4, MAIN CONTROL BOARD ANNUNCIATOR PANEL 'D', for guidance if No. 1 seal leakoff flow is abnormally low (Ann. DC1) or abnormally high (Ann. DC2)

3.14 Prior to starting a RCP, consideration should be given to raising the 230 bus voltage such that the emergency 4160 volt buses are approaching the 4200 volt limit to preclude spurious RCP breaker trip. (AI2010200357)

3.15 The No. 1 seal bypass valve should not be opened unless either the pump bearing temperature (seal inlet temperature) or the No. 1 seal leakoff temperature approaches its alarm level. The No. 1 seal bypass valve should then be opened only if all of the following conditions are met:

3.15.1 Reactor coolant system is greater than 100 PSIG but less than 1000 PSIG.

3.15.2 No. 1 seal leakoff valve is open.

3.15.3 No. 1 seal leakoff flow rate is less than one GPM.

3.15.4 Seal injection water flow rate to each pump is greater than six GPM.

3.16 For RCP operations, the required minimum back pressure of 15 psig on the RCP No. 1 seals is ensured by maintaining a pressure of at least 18 psig in the VCT.

3.17 The following precautions apply to the operation of the RCPs:

3.17.1 IF all RCPs have been idle for more than 5 minutes with seal water flow established during solid plant operations, THEN refer to FNP-2-UOP-1.1, STARTUP OF UNIT FROM COLD SHUTDOWN TO HOT STANDBY, Appendix 5, prior to starting an RCP.

3.17.2 At least one RCP should be running when the RCS temperature is greater than 160°F.

3.17.3 The number of operating RCPs is limited to one at RCS temperatures less than 110°F, with the exception that a second pump may be started for the purpose of maintaining continuous flow while taking the operating pump out of service.

3.17.4 Verify open 2C and 2A RCS LOOP TO 2A and 2B RHR Pump valves Q2E11MOV8701A & B and Q2E11MOV8702A & B prior to starting a RCP during solid plant operation.

3.17.5 A RCP shall not be started with one or more of the RCS cold leg temperatures ≤ 325°F unless the PRZR water volume is less than 24% wide range cold PRZR level indication or the secondary water temperature of each steam generator is less than 50°F above each of the RCS cold leg temperatures.

3.18 After any significant change in charging flow, the RCP seal injection flow should be checked and adjusted, if necessary, to maintain injection flow rates between 6 gpm and 13 gpm to each RCP.

3.19 The RCPs are not designed for "start-stop" operations. Too frequent starting may damage the motor windings. To prevent such damage, the following maximum starting duty should be observed:

3.19.1 Only one RCP is to be started at any one time.

3.19.2 After any running period or after any attempted start that fails, allow a minimum 30 minute idle period before attempting a restart.

3.19.3 Do not exceed three starts or attempted starts in a two hour period. IF three starts or attempted starts have been made within a two hour period, THEN allow a 60 minute idle period before attempting an additional start.

3.20 Following a change of boron concentration of 50 ppm or greater in the RCS, the PRZR spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the PRZR heaters when there is a bubble in the PRZR.

3.21 Continuous spray line flow is provided by normal leakage past the seat of the spray valves. This minimum flow will prevent the spray and surge lines from cooling below operating temperature and will also aid in maintaining uniform water chemistry and temperature conditions within the PRZR.

3.22 To minimize temperature transients to the PRZR during plant heatup or cooldown operations, the following precautions should be observed when PRZR spray flow is initiated:

3.22.1 Spray should not be used if the temperature difference between the PRZR and the spray fluid is greater than 320°F.

3.22.2 Auxiliary spray should only be used during plant cooldown. Auxiliary spray flow should be initiated slowly by opening RCS PRZR AUX SPRAY Q2E21HV8145 and gradually increasing CHG line flow.

3.23 IF CCW will be secured to the RCP motor oil coolers for longer than 2 months, THEN contact Maintenance to have the oil coolers drained and dried per RCP Technical Manual Technical Bulletin 81-02.

3.24 IF an RCP is to be secured for greater than one month, THEN its termination box strip heaters should be energized.

3.25 IF a RCP's Lower Seal Water Bearing temperature reaches 225°F, THEN that RCP must be shutdown immediately.

3.26 Technical Requirement 13.8.1 requires the RCP space heater breakers (FCI2, FCN4 and FDG3) to be open in Modes 1-4 (OR 2-98-209).

4. 004A3.11 004/MOD/RO/C/A 3.6/3.4/004A3.11/N///A

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

- Pressurizer level is stable and on program.
- Seal injection flow is 8 gpm per RCP.
- RCP #1 Seal leakoff flow is 3 gpm per RCP.
- Letdown is in service with HV-8149C, LTDN ORIF ISO 60 GPM, open.
- All control systems are in AUTO.

Which one of the following sets of indications for CVCS Charging and Letdown flow represent steady-state conditions with no RCS leakage?

	CHG FLOW FI-122A (gpm)	LTDN HX OUTLET FLOW FI-150 (gpm)
A.✓	60	75
B.	75	75
C.	60	84
D.	75	60

This is not a 2+2 question, this is a mathematical equation. All answer choices are plausible if the candidate plugs in the incorrect value, or if the candidate thinks charging flow and letdown flow will indicate the same when there is no RCS leakage. Candidate is required to monitor charging and letdown flows and perform a flow balance calculation to determine the correct answer. With no leakage, a flow balance is calculated by:

Charging flow (60 gpm)+ seal injection flow (24 gpm for 3 RCP's) = letdown flow (75 gpm) + #1 seal leakoff flow (9 gpm for 3 RCP's)

A. Correct - Per above flow balance.

B. Incorrect - Plausible if candidate thinks Charging flow indication should equal Letdown flow indication, without taking seal injection / seal return into consideration.

C. Incorrect - Plausible if candidate takes seal injection into consideration, but not seal return - Charging flow (60)+ seal injection flow (24) = letdown flow (84)

D. Incorrect - Plausible if candidate transposes effects of seal injection and seal return - Charging flow (75) + #1 seal leakoff flow (9) = letdown flow (60)+ seal injection flow (24)

004A3.11

004 Chemical and Volume Control System

Ability to monitor automatic operation of the CVCS, including:
(CFR: 41.7 / 45.5)
A3.11 Charging/letdown 3.6 3.4

Importance Rating:	3.6 / 3.4
Technical Reference:	FNP-1-AOP-1.0 v20
References provided:	None
Learning Objective:	RELATE AND IDENTIFY the operational characteristics including design features, capacities and protective interlocks for the components associated with the Chemical and Volume Control System, to include the components found on Figure 3, Chemical and Volume Control System and Figure 4, RCP-Seal Injection System (OPS-40301F02).
Question origin:	Modified FNP BANK CVCS-40301F07 036
Basis for meeting K/A:	K/A is met by requiring candidate to monitor charging and letdown during normal steady state operation, and determine charging and letdown flow rates that indicate normal conditions. All control systems are in Auto and the candidate must demonstrate that he can effectively determine normal parameters for charging/letdown.
SRO justification:	N/A

Step	Action/Expected Response	Response NOT Obtained
___ 3	**Determine RCS leak rate.**	
3.1	Determine RCS leak rate from CVCS flow balance. 60 (charging flow) + 24 (seal injection flow) - 75 (letdown flow) - 9 (#1 seal leakoff flow) = 0 (RCS leak rate)	
3.2	IF plant conditions are stable, THEN determine RCS leak rate using FNP-1-STP-9.0, RCS LEAKAGE TEST.	
___ 4	[CA] WHEN RCS leak rate determined, THEN evaluate required actions using Technical Specifications.	
___ 5	[CA] WHEN RCS leak rate determined, THEN evaluate event classification and notification requirements using FNP-0-EIP-8, NON-EMERGENCY NOTIFICATIONS and FNP-0-EIP-9, EMERGENCY CLASSIFICATION AND ACTIONS.	
___ 6	[CA] WHEN RCS leak rate greater than 50 gpm, THEN align 1A and 1B post LOCA containment hydrogen analyzers for service using Attachment 1.	

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Chemical And Volume Control

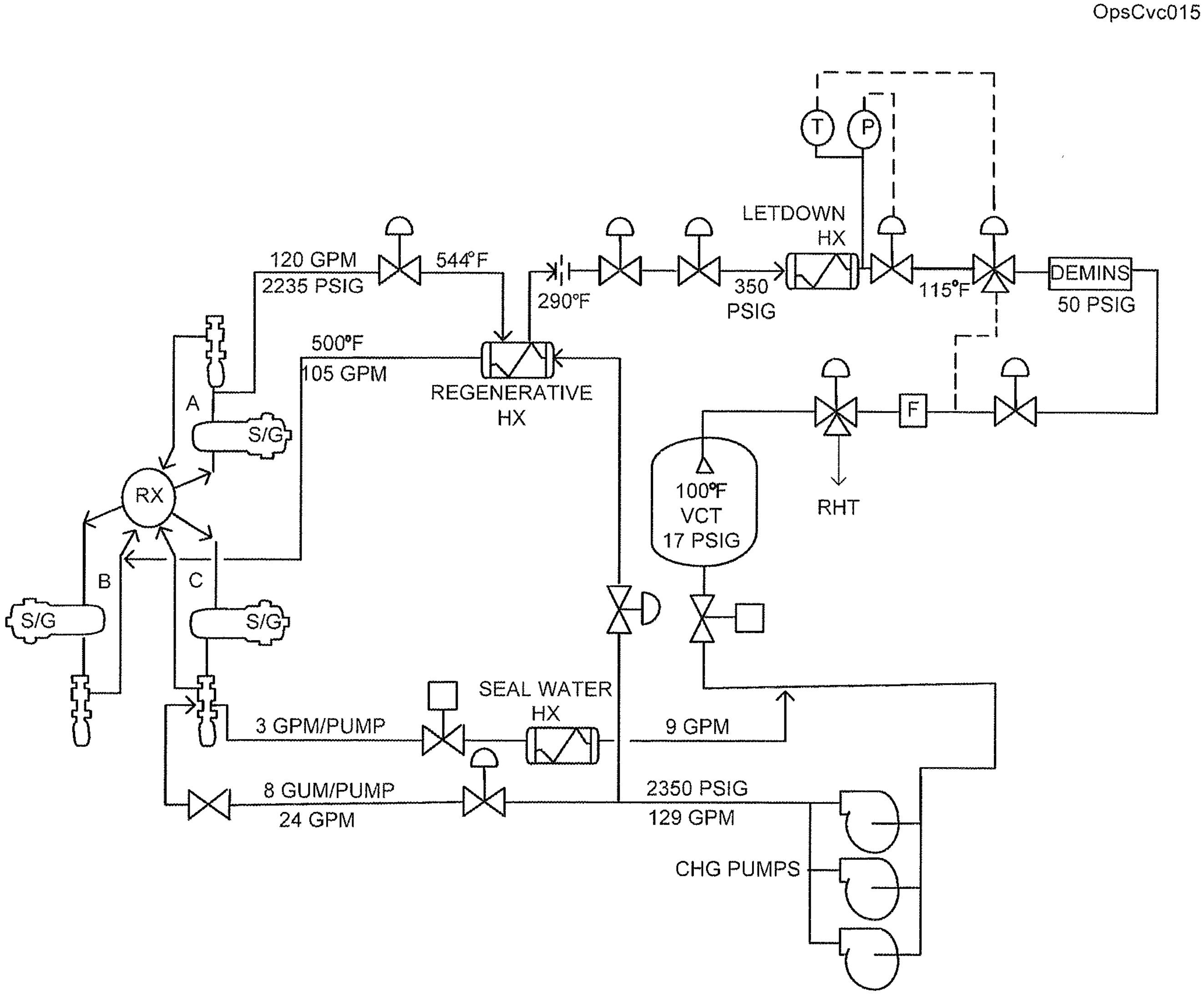


Figure 2 - Chemical And Volume Control System Flow Balance

Chemical And Volume Control

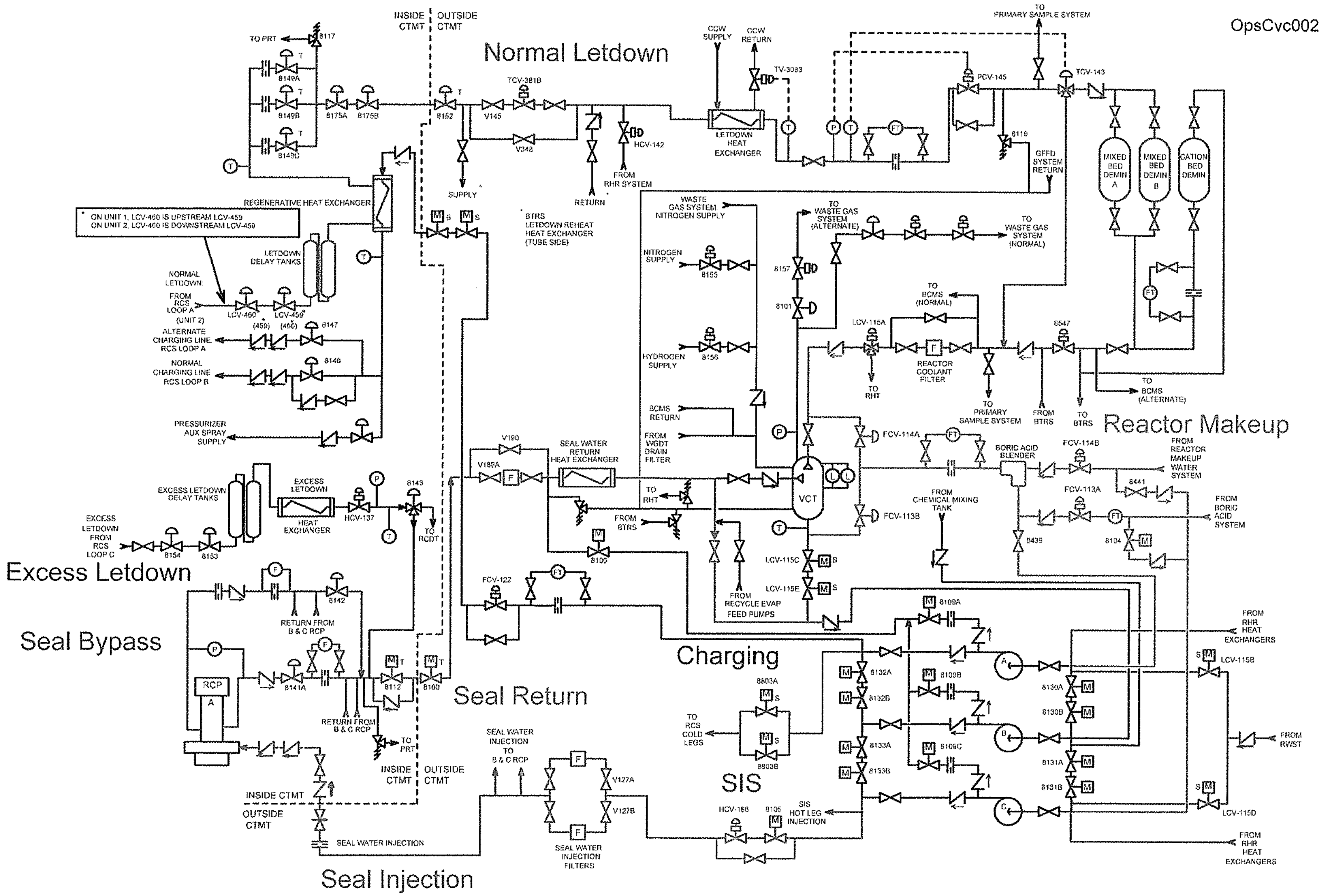


Figure 3 - Chemical And Volume Control System

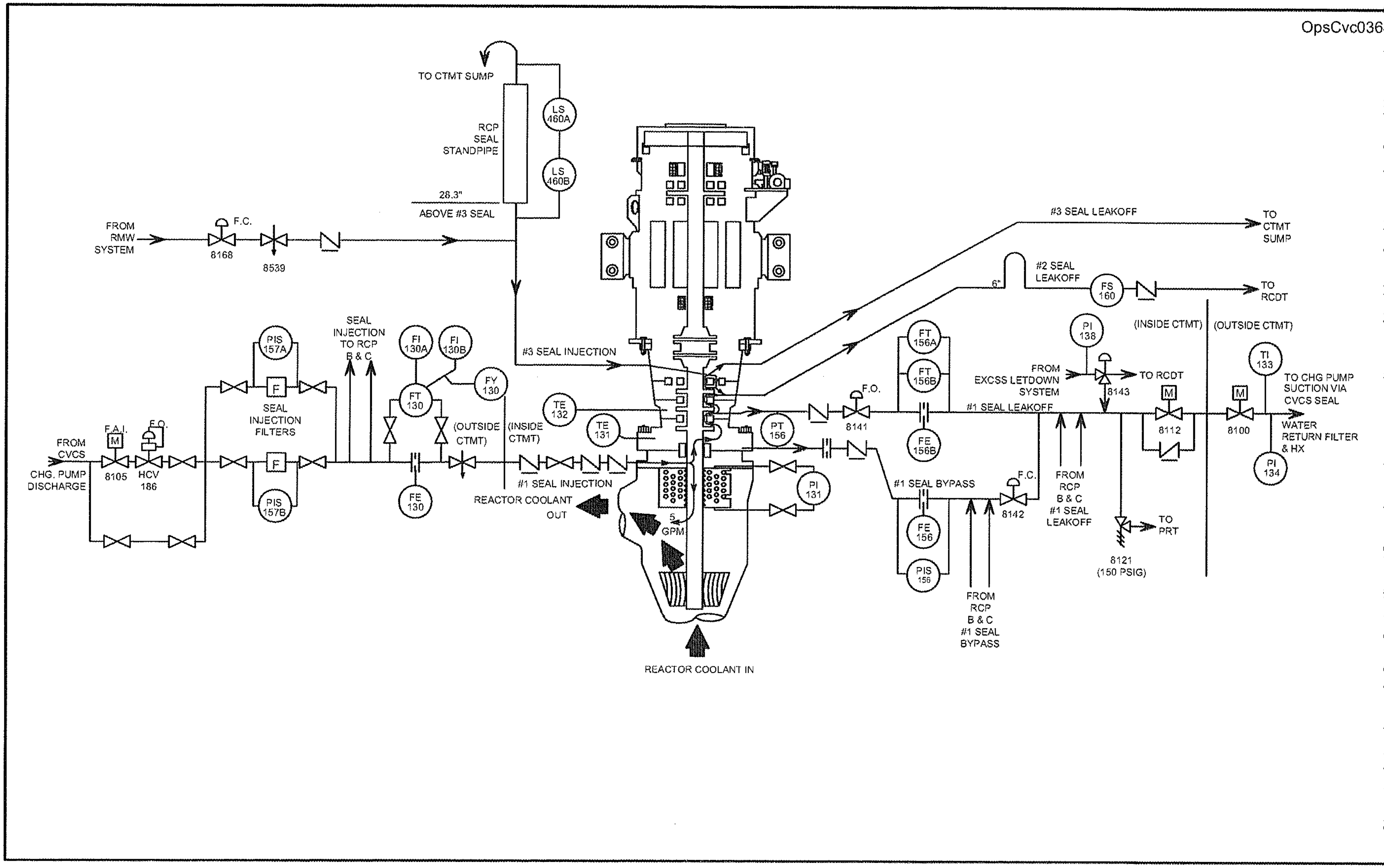


Figure 4 - RCP-Seal Injection System

1. CVCS-40301F07 036 604A3.11

The following conditions exist:

- Rx power 100%
- Pressurizer level steady at program
- Seal injection flow - 8 gpm per RCP
- #1 Seal leakoff flow - 3 gpm per RCP
- Letdown in service
- Charging flow control valve FCV-122 is in automatic

Which one of the following sets of values for CVCS charging and letdown flow represent steady-state conditions?

A. 79 gpm charging and 70 gpm letdown.

B. 90 gpm charging and 75 gpm letdown.

C. 50 gpm charging and 70 gpm letdown.

D✓ 53 gpm charging and 68 gpm letdown.

AOP-1.0

FNP-1-AOP-1.0	RCS LEAKAGE

Step	Action/Expected Response
___ 3	**Determine RCS leak rate.**
	3.1 Determine RCS leak rate from CVCS flow balance. ______(charging flow) +______(seal injection flow) -______(letdown flow) -______(#1 seal leakoff flow) =______(RCS leak rate)

A,B, & C. Incorrect. With a zero RCS leakrate, 8 gpm seal injection per RCP, and 3 gpm #1 Seal leakoff flow per RCP, the letdown flow must be 15 gpm greater than charging flow. (Not 9 gpm less-A., 15 gpm less-B., or 20 gpm more-C.)

D. 53 gpm chg — 68 gpm ltdn
+ 24 gpm Seal inj — + 9 gpm seal return
77 gpm total chg = 77 gpm total ltdn

HLT-28 AUDIT EXAM

5. 004K3.04 005/BANK/RO/M 3.7/3.9/004K3.04/N///C

0Unit 1 has experienced a **Safety Injection**.

Which one of the following completes the statement below?

RCP #1 Seal Leakoff will be directed to the ____ .

A. Reactor Coolant Drain Tank

B. Containment Sump

C✓ Pressurizer Relief Tank

D. Volume Control Tank

Seal Water Return Line Relief

Relief valve 8121, located upstream of the isolation valves, protects the seal water return piping inside containment from over-pressurization. It is designed to relieve the maximum flow from all seals and maximum excess letdown flow. **The valve relieves to the PRT. The valve setpoint is 150 psig.**

A. Incorrect - Plausible because many reliefs and valve leakoffs in Containment go to the RCDT.

B. Incorrect - Plausible because many reliefs in Containment go directly to the floor / Ctmt sump.

C. Correct - Correct per above.

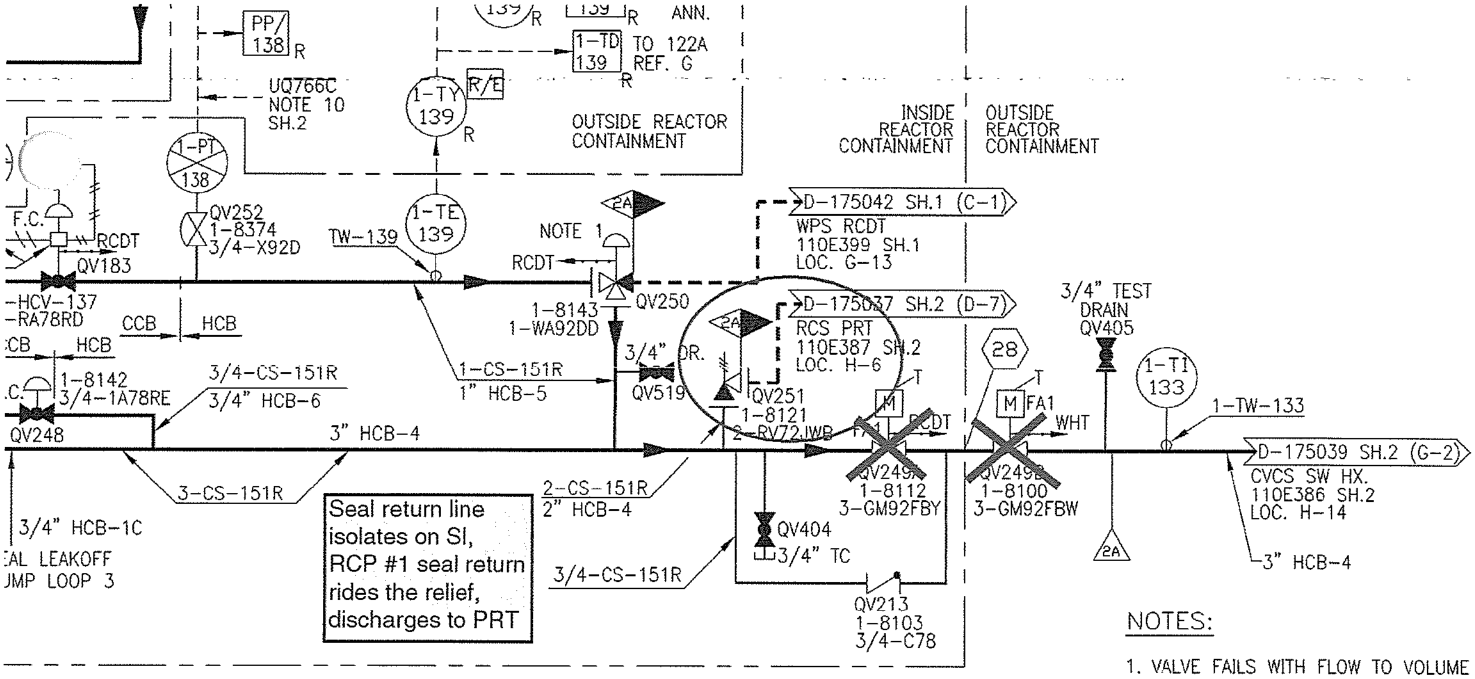
D. Incorrect - Plausible because the normal seal return flowpath has a relief that goes directly to the VCT. This flow path is isolated when the SI occurs.

004K3.04

004 Chemical and Volume Control System

Knowledge of the effect that a loss or malfunction of the CVCS will have on the following:
(CFR: 41.7/45/6)
K3.04 RCPS 3.7 3.9

Importance Rating:	3.7 / 3.9
Technical Reference:	PID 175039 sheet 1, FSD A-181009 Functional System Description CVCS, HHSI, Accumulators and Reactor Water System
References provided:	None
Learning Objective:	LABEL AND ILLUSTRATE the Chemical and Volume Control System flow paths in the normal, and Safety Injection mode to include the components found on Figure 3, Chemical and Volume Control System, Figure 4, RCP-Seal Injection System and Figure 20, Solid Plant Pressure Control. (OPS-40301F05)
Question origin:	Modified FNP BANK CVCS-40301F02 12
Basis for meeting K/A:	K/A is met by placing candidate in a situation with an SI and resultant isolation (loss) of the normal RCP seal return flow path. Candidate is required to determine the effect on RCP #1 seal return. Seal return MOV's will isolate and seal return will be directed to the PRT by a relief valve.
SRO justification:	N/A



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LE A
MP INSTRUMENTATION

#1B	RCP #1C
'	FE-124
A	FI-124A
B	FI-124B
'	FT-124
27	FQY-124
'	FD/124
7	FB-124
	FY/124
3	TE-125
}	TE-126
5B	FE-154B
5A	FB-154A
5B	FB-154B
A	FY/154A
B	FY/154B
5A	FT-154A
5B	FT-154B
55A	FQY-154A
55B	FQY-154B
B	FI-154B
5	FE-154
5	FIS-154
5	PY/154
5	PB-154
5	PT-154
55	PQY-154
A	PI-154A
B	PI-154B
7A	LS-408A
7B	LS-408B
	PI-125
01B	FO-6001C
}	FS-158
MON TO ALL 3 RCP'S	

TABLE B
REACTOR PRESSURE SENSING
INSTRUMENTATION

INSTRUMENTS	TRAIN
Q1G21PSH2852A	A
B	A
C	A
D	B
E	B
F	A
G	B
Q1G21PSH2852H	B
Q1G12PSH2851A	A
B	A
C	B
D	A
E	B
Q1G12PSH2851F	B

NOTES:

1. VALVE FAILS WITH FLOW TO VOLUME CONTROL
2. SPECIAL SPRING LOADED CHECK VALVE.
3. (DELETED)
4. PRESSURIZER LOW LEVEL SIGNAL CLOSES THES
5. ALL Ⓦ ITEM NO'S. IN CVCS ARE SHOWN WITHOU ALACS.
6. FOR LEGEND SEE DWG. D-175044.
7. A 3/8" FLOW RESTRICTOR IS REQUIRED AS NO LEGEND.
8. ALL VALVES & LINE IDENTIFICATIONS IN PUMP FOR PUMPS 1B & 1C ARE NUMBERED THE SA PUMP 1A (SHOWN). SUFFIX A ON VALVE OR LI SIGNIFIES PUMP 1A CIRCUITRY. SUFFIX B FOR AND SUFFIX C FOR PUMP 1C.
9. ALL VALVE NUMBERS IN THIS SYSTEM ARE PRE (Q OR N, 1E21).
10. MULTIPLE LOOP PWR. SUPPLY (CONTROL BOAR NOT SHOWN.
11. FOR VALVE INFORMATION SEE MASTER VALVE LI (SPEC. SS-1102-39).
12. FOR EQUIPMENT LIST SEE DWG. D-175070.
13. FOR INSTRUMENT INSTALLATION DETAILS SEE RE IN INSTRUMENT INDEX B-175803.
14. (DELETED)
15. FOR PIPING CLASS SUMMARY SHEETS SEE (SPEC. SS-1109-2).
16. (DELETED)
17. RUN PIPING HORIZONTAL OR UPWARD TO LOOP ABOVE RCP NO. 2 SEAL LEAKOFF CONNECTION. LOOP, RUN PIPING HORIZONTAL OR DOWNWARD RUN TO RCDT.
18. LOCATE BOTTOM OF STANDPIPE 28'-4 1/8" ± ABOVE CONN. TO RCP #3 SEAL.
19. SENSOR LOCATIONS ARE SHOWN ON D-175143 D-175146, & D-175147.

REFERENCES

1. FOR ALPHA REFERENCES SEE DWG. D-175044.

6. 005K5.05 006/MOD/RO/C/A 2.7/3.1/005K5.05/N///A

Unit 1 is in Mode 5 with the following conditions:

At 1000:

- RCS is in solid plant conditions.
- A Train RHR is on service in the cooldown mode.
- Low Pressure Letdown is aligned to A Train.
- Charging and Letdown flows are balanced.
- RCS pressure is stable at 250 psig.
- PK-145, LP LTDN PRESS controller, is in AUTO.

At 1010:

- A crud burst causes the **RCS Filter** to immediately clog.

Which one of the following completes the statement below?

RCS pressure will ____ .

A.✓ rise until RHR suction reliefs lift

B. rise until PK-145 stabilizes RCS pressure

C. lower and the VCT will divert to the RHTs

D. lower and total Seal Injection flow will decrease

RCS pressure in the solid plant condition is controlled by the amount of charging and letdown. If charging and letdown are equal, RCS pressure is stable. More charging (or less letdown) would increase pressure; conversely, less charging (or more letdown) would reduce pressure. In this situation, the RCS Filter clogs. To answer this question correctly, candidate has to know where the RCS Filter is located in the CVCS system. The RCS Filter is on the letdown line prior to entry into the VCT. The RCS Filter clogged, basically causes a loss of letdown, while Charging continues at the same rate. This causes RCS pressure to rapidly rise until the RHR suction reliefs lift at 450 psig.

A. Correct - See above.

B. Incorrect - Plausible because normally, PK145 will modulate to control RCS pressure due to any changes in Charging flow. Since this failure is a clogged RCS Filter, PK145 will attempt to control pressure, but the clog is downstream of PK145, so it will have no effect.

C. Incorrect - Plausible because the candidate my think that the RCS Filter is on the discharge of the Charging pumps, rather than the inlet side to the VCT. If it were on the discharge of the Charging pumps, it would cause Charging flow to be diminished, VCT level to rise and eventually divert to the RHTs, and RCS pressure to go down.

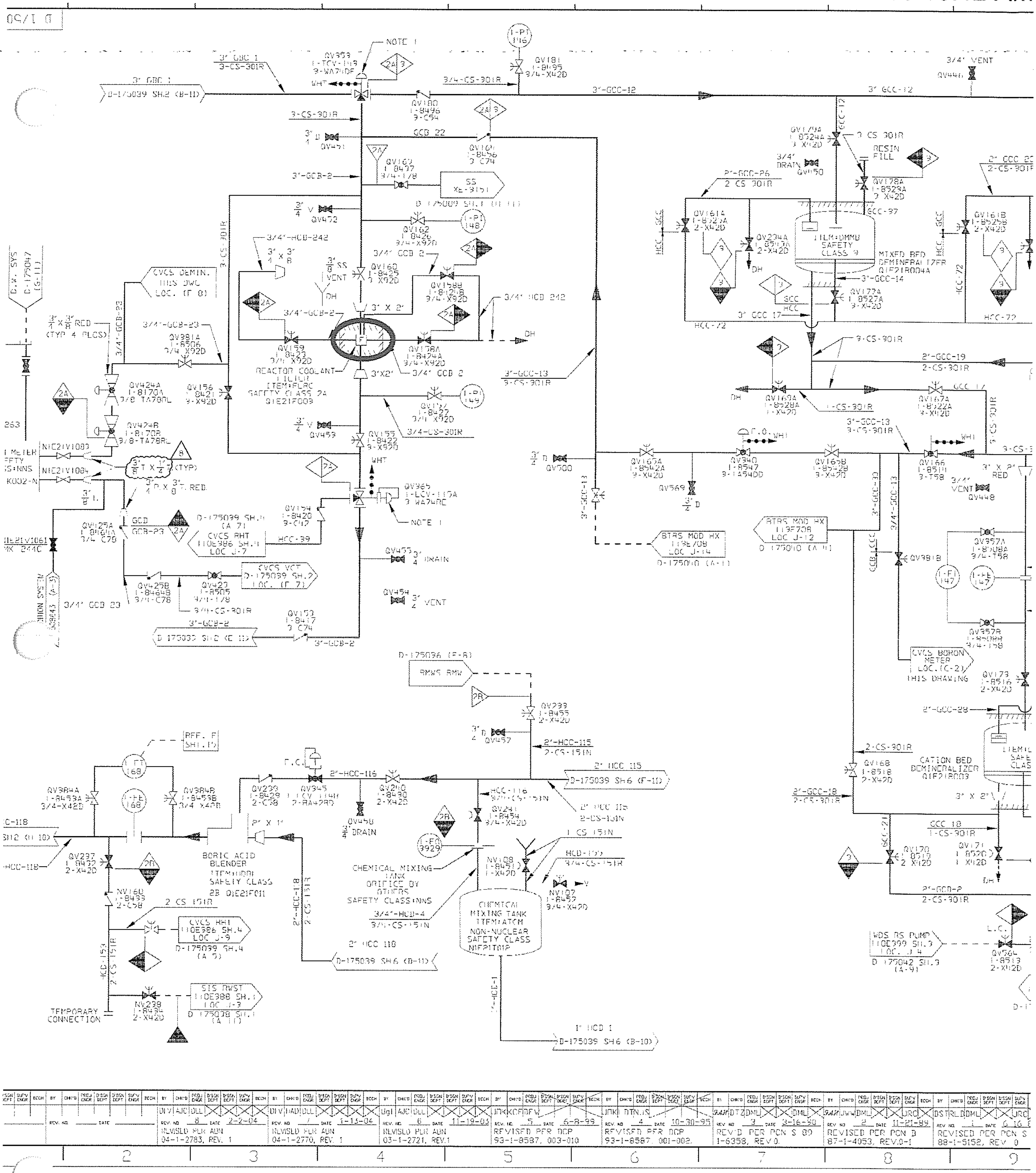
D. Incorrect - Plausible because the candidate my think that the RCS Filter is in series with the Seal Injection line. There is a Seal Injection Filter on the Seal Injection line. If the RCS Filter were on the Seal Injection line, it would cause seal injection flow to decrease and a decrease in RCS pressure due to the Seal Injection flow decrease.

005K5.05

005 Residual Heat Removal System (RHRS)

Knowledge of the operational implications of the following concepts as they apply the RHRS:
(CFR: 41.5 / 45.7)
K5 05 Plant response during "solid plant": pressure change due to the relative incompressibility of water 2.7* 3.1*

Importance Rating:	2.7 / 3.1
Technical Reference:	P&ID 175039 sh7
References provided:	None
Learning Objective:	STATE AND EXPLAIN any special considerations such as safety hazards and plant condition changes that apply to the Residual Heat Removal System (OPS-52101K04). Decrease in low pressure letdown flow HCV-142 fails closed or open RHR heat exchanger discharge flow increases and decreases
Question origin:	Modified FNP BANK RHR-52101K04 09
Basis for meeting K/A:	K/A is met by placing candidate in a situation with RHR in service and the plant in solid plant conditions. The RCS filter clogging causes letdown to basically go to zero, and a resultant RCS pressure rise due to continued charging. With no operator action, the operational implications are that RCS pressure will rise until the RHR suction reliefs lift to maintain RCS pressure at the relief setpoint.
SRO justification:	N/A


NOTE 1
3" GCC-12
3/4" VENT
REACTOR COOLANT FILTER ITEM:FLRC SAFETY CLASS 2A Q1E21F003
CVCS DEMIN. THIS DWG LOC. (F 8)
MIXED BED DEMINERALIZER Q1E21B004A
FILM:DMMU SAFETY CLASS 3
RESIN FILL
CATION BED DEMINERALIZER Q1E21B003
BORIC ACID BLENDER
CHEMICAL MIXING TANK ITEM:ATCM NON-NUCLEAR SAFETY CLASS N1E21T012
CHEMICAL MIXING TANK ORIFICE BY OTHERS SAFETY CLASS:NNS
TEMPORARY CONNECTION
SIS RWST
CVCS RHT
CVCS VCT
BTRS MOD HX
CVCS BORON METER LOC. (C-2) THIS DRAWING
RMWS RMW
WDS RS PUMP
REVISED PER DCP
REVISED PER PCN

Chemical And Volume Control

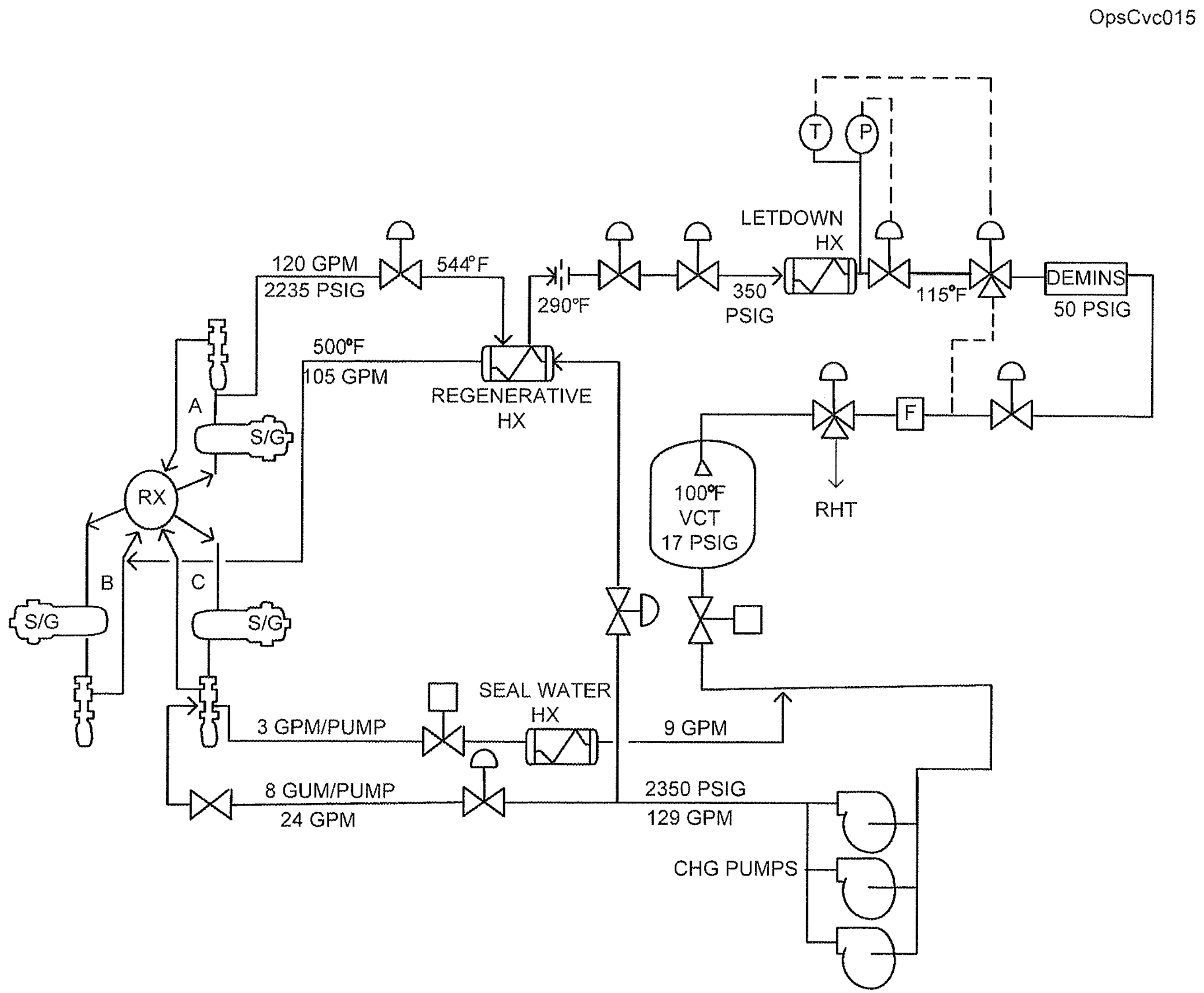


Figure 2 - Chemical And Volume Control System Flow Balance

Chemical And Volume Control

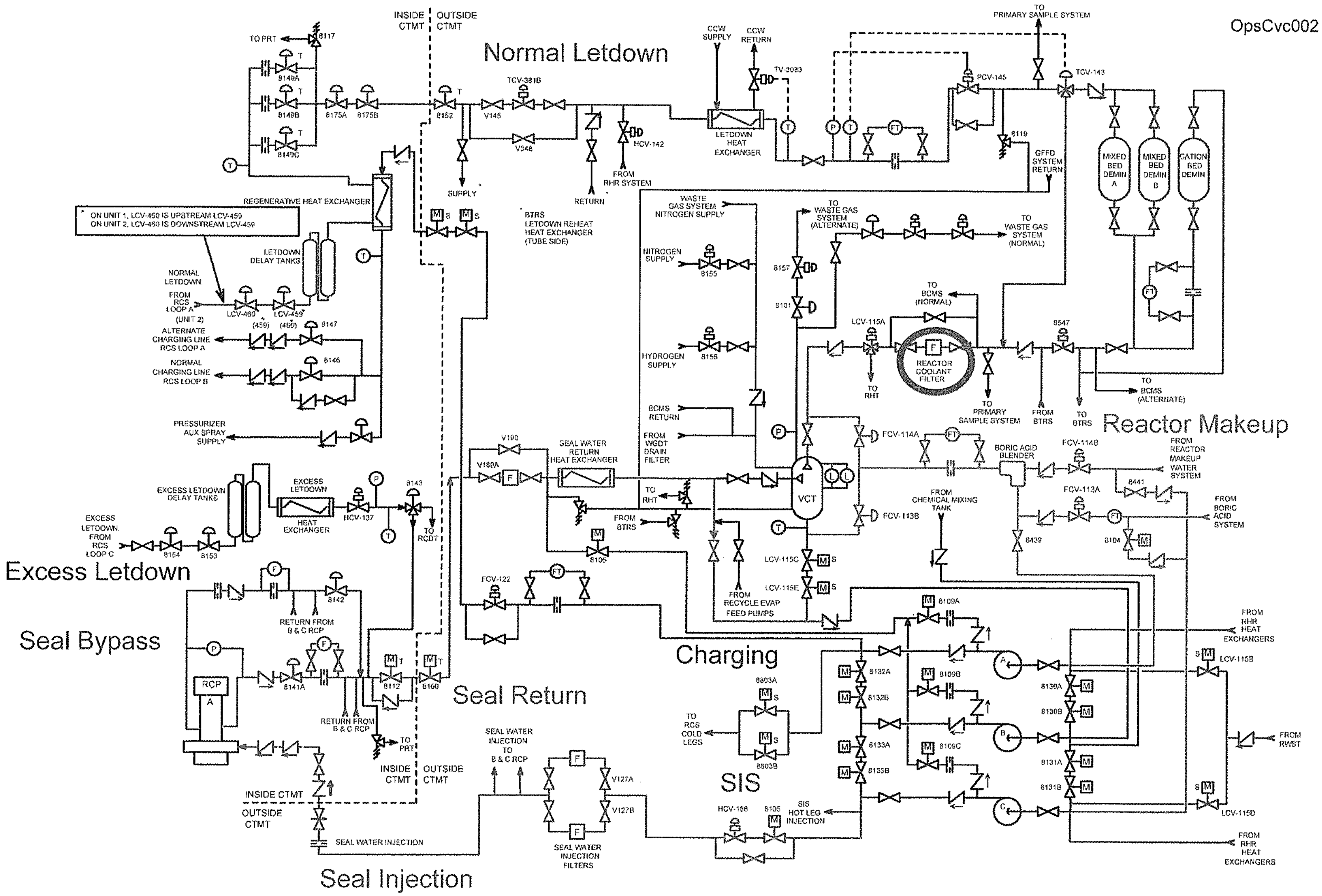


Figure 3 - Chemical And Volume Control System

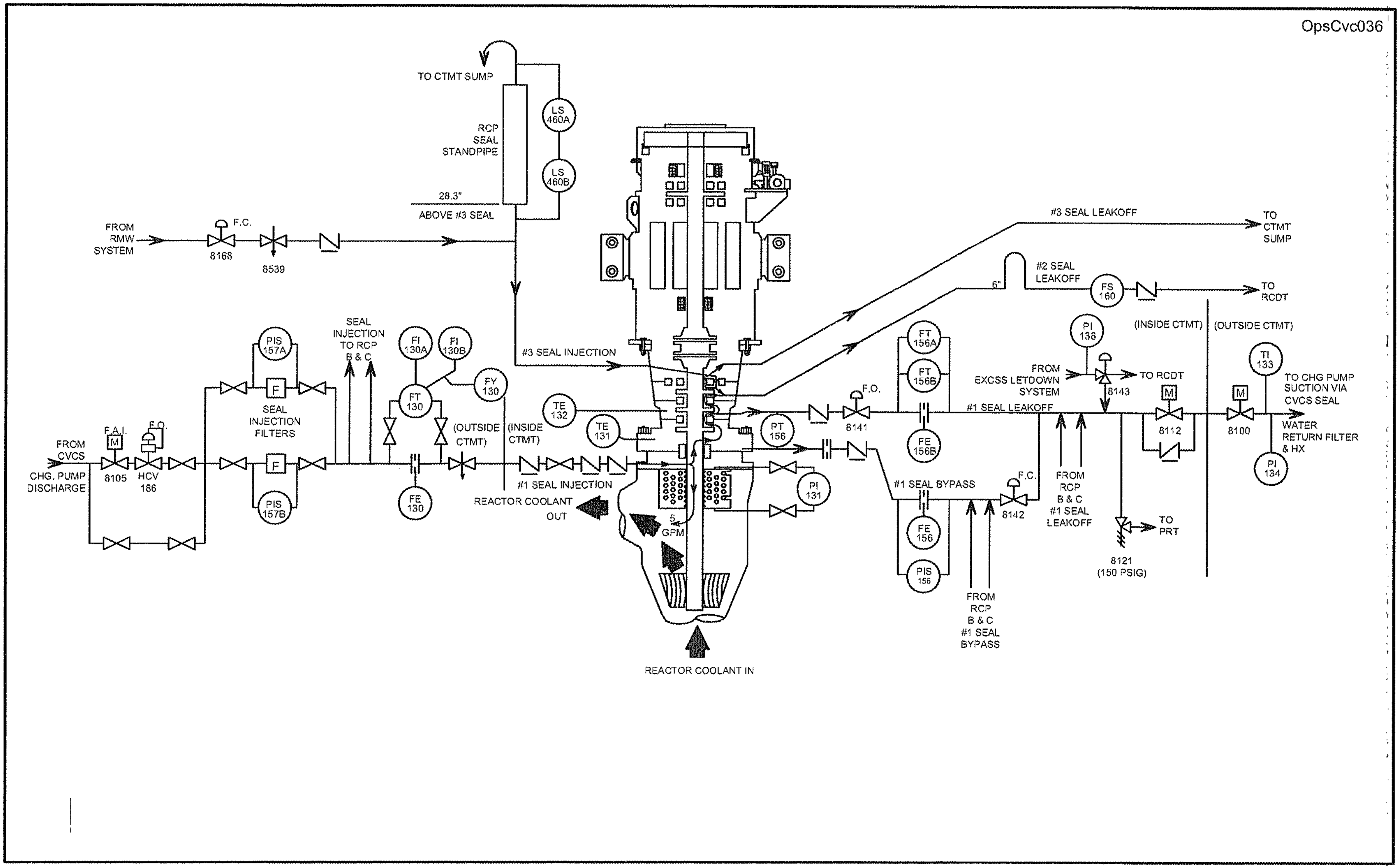


Figure 4 - RCP-Seal Injection System

1. RHR-52101K04 009 065K5.05

Given the following Unit 1 conditions:

- The plant is in Mode 5.
- Solid plant conditions have been established.
- RCS temperature is being maintained at 160°F by operation of the "B" RCP.
- RHR train "A" is in service with "A" RHR pump running in the cooldown mode
- Low pressure letdown is established on RHR train "A" and the orifice isolation valves are closed.
- Seal injection to each RCP is established at 8 gpm.
- #1 Seal leakoff 1 gpm for each pump.

With letdown flow at 90 gpm, charging flow at 85 gpm, and RCS pressure at 370 psig, letdown pressure control valve PCV-145 is in manual. Which one of the following will occur if NO further operator action is taken?

A. RCS pressure will remain constant.

B.✓ RCS pressure will increase to 450 psig.

C. "B" RCP #1 seal differential pressure will fall below minimum.

D. "B" RCP #1 seal leakoff will decrease.

OPS 52101K

RCS pressure in the solid plant condition is controlled by the amount of charging and letdown. If charging and letdown are equal, RCS pressure is stable. More charging (or less letdown) would increase pressure; conversely, less charging (or more letdown) would reduce pressure.

Charging + seal injection to the RCS	85 + (8X3) = 109
Letdown + #1 seal leakoff	90 + 3 = 93

More going into RCS than is being letdown or returned

A. Incorrect - Charging into the RCS > letdown and leakoff will result in RCS pressure rise

B. Correct - Pressure will rise in the RCS till the RHR suction reliefs lift at 450#

C. Incorrect - Due to the rise in RCS pressure, The #1 seal DP will increase

D. Incorrect - Due to the increase in the #1 seal DP, #1 seal leakoff will increase

7. ~~006K2.01 007/BANK/RO/M 3.6/3.9/006K2.01/N///D~~

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

- 1B Charging pump is aligned to B Train.
- 1C Charging pump is Tagged Out.

At 1000:

- 1F 4160V Bus is de-energized and remains de-energized.

Which one of the following combinations lists the ECCS pumps that have power available?

	Charging pump with power	RHR pump with power
A.	1A	1A
B.	1A	1B
C.	1B	1A
D.✓	1B	1B

B Train components are powered from 1G 4160V Bus, in this situation, 1B Charging Pump and 1B RHR pump.

A. Incorrect - Plausible if candidate confuses B train components with A train components. These are both A Train components and both have lost power. Both are incorrect.

B. Incorrect - Plausible because some plant equipment nomenclature is backward from the normal convention (i.e. CCW, SFP). In this instance 1A Charging pump is A Train and 1B RHR pump is B Train. 1A Charging pump is incorrect.

C. Incorrect - Plausible because some plant equipment nomenclature is backward from the normal convention (i.e. CCW, SFP). In addition, 1B Charging Pump can be aligned to either A or B Train. In this instance 1B Charging pump is B Train and 1A RHR pump is A Train. 1A RHR pump is incorrect.

D. Correct - Both components are powered from B Train 4160V Bus 1G. Both are correct.

006K2.01

006 Emergency Core Cooling System (ECCS)

Knowledge of bus power supplies to the following:
(CFR: 41.7)
K2.01 ECCS pumps 3.6 3.9

Importance Rating:	3.6 / 3.9
Technical Reference:	
References provided:	None
Learning Objective:	NAME AND IDENTIFY the Bus power supplies, for those electrical components associated with the Emergency Core Cooling System, to include those items in Table 4- Power Supplies (OPS-40302C04).
Question origin:	FNP BANK ECCS-40302C04 02
Basis for meeting K/A:	K/A is a simple requirement for knowledge of Bus power supplies to ECCS pumps. The candidate is given conditions with a dedicated ECCS train component and a swing train ECCS component, and has to determine which ones are powered from the 1G 4160V bus.
SRO justification:	N/A

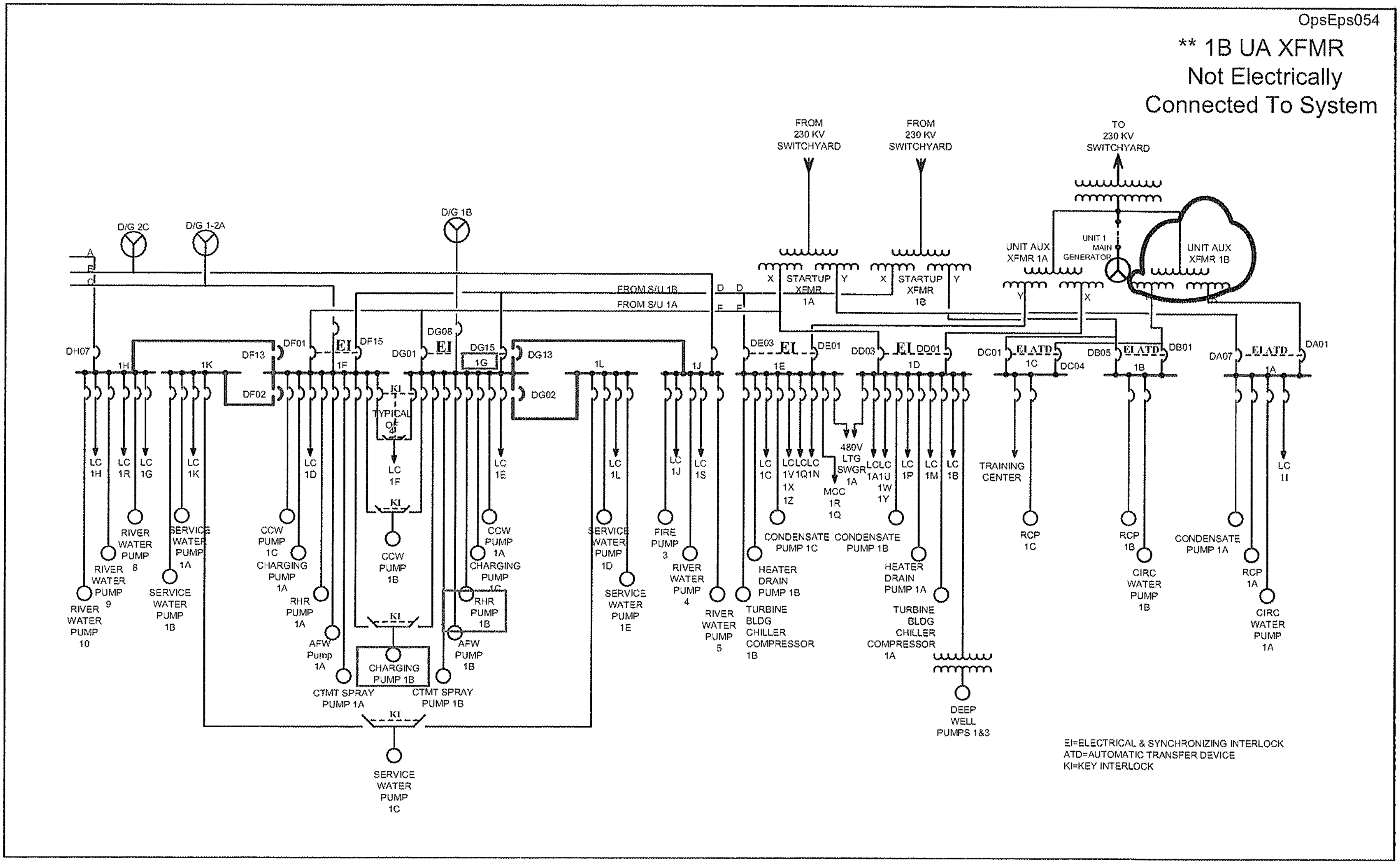


FIGURE 4 - Unit 1 4160 Volt Electrical Distribution

8. 007A4.10 008/NEW/RO/C/A 3.6/3.8/007A4.10/N///A

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

- HA5, PRZR PORV TEMP HI, is in alarm.
- Pressurizer pressure is 2225 psig and slowly going down.
- PRT pressure is slowly rising.
- Both PORV's indicate closed.

Which one of the following completes the statements below?

TI-463, PORV tailpipe temperature, will increase to __(1)__ .

PI-472, PRT PRESS, will reach a maximum pressure of __(2)__ .

	(1)	(2)
A.✓	between 220 and 340°F	100 psig
B.	greater than 600°F	100 psig
C.	greater than 600°F	150 psig
D.	between 220 and 340°F	150 psig

When a PORV is leaking by the seat, PRT pressure, temperature, and level will slowly rise. Since the temperature element is downstream of the PORV and upstream of the PRT, temperature will be based on pressure in the PRT (due to the constant enthalpy throttling process of the PORV). As PRT pressure rises, temperature will rise to approximately saturation temperature for the PRT pressure (between 220 and 340°F), even though Pressurizer vapor space temperature is 650°F.

The PRT pressure will increase to a maximum of 100 psig, and then the rupture discs will blow out. 150 psig is plausible because it is the setpoint for the RCDT relief.

A. Correct - 1) correct, see above.
2) correct, the PRT rupture discs blow at 100 psig.

B. Incorrect - 1) incorrect, plausible if candidate thinks temperature will be approximately the same as Pressurizer vapor space temperature.
2) correct, see A.2.

C. Incorrect - 1) incorrect, see B.1.
2) incorrect, plausible because this is the setpoint for the RCDT relief.

D. Incorrect - 1) correct, see A.1.
2) incorrect, see C.2.

007A4.10

007 Pressurizer Relief Tank/Quench Tank System (PRTS)
Ability to manually operate and/or monitor in the control room:
(CFR: 41.7 / 45.5 to 45.8)
A4.10 Recognition of leaking PORV/code safety 3.6 3.8

Importance Rating:	3.6 / 3.8
Technical Reference:	FNP-1-ARP-1.8 v35
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the Pressurizer System components and equipment, to include the following (OPS-40301E07): Normal Control Methods Abnormal and Emergency Control Methods Automatic actuation including setpoints Actions needed to mitigate the consequence of the abnormality
Question origin:	NEW
Basis for meeting K/A:	K/A is met by giving candidate indications of a PORV that is leaking by the seat. Candidate has to demonstrate ability to monitor the effects on indications by determining how PORV tailpipe temperature will be affected as PRT pressure rises (related to TMI event). In addition, candidate is questioned on equipment required to be operated for a leaking PORV per an Annunciator Response Procedure associated with the PORV tailpipe high temperature alarm.
SRO justification:	N/A

7141 to the PRT. An internal spray header reintroduces the water into the PRT and condenses the remaining steam. The heat transfer capacity of the RCDT heat exchanger is sufficient to cool the contents of the PRT to 120°F within eight hours following a design relief actuation. The RCDT is returned to normal operation after completing the PRT cooldown. This is the preferred cooldown method since no liquid waste is produced as a result of the PRT cooldown.

As a backup method for cooling, cool reactor makeup water can be sprayed into the PRT via HV-8028 and 8030 and then drained to the recycle holdup tank via the RCDT pumps. Reactor makeup water is the source of water for initial fill and makeup to the PRT. This backup method will cool the PRT contents from an initial temperature of 200°F to 120°F in one hour. The valves mentioned (HV-8028 and 8030) are controlled remotely from the MCB. HV-7141 is controlled from the liquid waste processing panel. All three valves fail closed on loss-of-electrical power or -air.

The PRT is not designed to accept a continuous discharge from the Pressurizer. If the pressure in the tank exceeds 100 psig, two rupture discs relieve the PRT contents to the containment atmosphere. This creates the potential for increased containment pressure, temperature, humidity, and radiation levels. Depending on the PRT contents, the system which is relieving to the PRT, and the flow rate into the PRT, the adverse containment parameters can or will increase to an extent where significant problems with containment equipment and instrumentation could be encountered. The rupture discs have a relief capacity equal to the combined capacity of the Pressurizer code safety valves. The PRT design pressure and the rupture disc setpoints are twice the calculated pressure resulting from the maximum code safety valve discharge. This margin prevents deformation of the discs during releases less than design. The PRT and rupture disc holders also are designed for full vacuum to prevent tank collapse if the contents cool following a discharge.

The PRT is equipped with temperature, level, and pressure detectors that provide indication on the MCB and alarms for high pressure, high temperature, and high or low level.

The PRT instrumentation is utilized in the Emergency Response Procedures (ERPs) as an indication of a leaking safety valve or PORV. High temperature, level, and pressure are indicative of inleakage into the tank. If a safety or PORV is suspected of leaking by its seat, the associated valve's tail piece temperature will indicate higher than the others. If a PORV is leaking by its seat, the valves will have to be isolated using their associated block valves, usually

9. 008A2.05 009/NEW/RO/C/A 3.3/3.5/008A2.05/N///C

Unit 1 is in Mode 3 with the following conditions:

- 1A RHR pump is running for a boron sample.
- A & B Train CCW are in operation.
- Normal Letdown is in service with 75 gpm flow.
- Excess Letdown is in service in preparation for a Tag Out of the Normal Letdown line.

Which one of the following is the effect of a **loss of Instrument Air** to individual CCW components?

A loss of air to _(1)_ , would require _(2)_ .

A. 1) TCV-3083, LTDN HX CCW TEMP CONTROLLER

2) isolating Letdown per DF1, LTDN TO DEMIN DIVERTED-TEMP HI

B. 1) HV-3404A, RHR PUMP 1A SEAL HX CCW PRESS REG

2) securing 1A RHR pump per CG1, 1A RHR PUMP CCW FLOW LO

C✓ 1) HV-3095, CCW TO EXCESS LTDN/RCDT HX'S

2) isolating Excess Letdown per CH1, EXC LTDN HX OUTLET TEMP HI

D. 1) RCV-3028, CCW SURGE TANK AIR VENT

2) closing RCV-3028 with the manual jack per SOP-23.0, Component Cooling Water System

A. Incorrect - A loss of air to this component would cause the valve to go open and would not cause a loss of cooling to Letdown. Plausible if candidate determines that this valve fails closed on a loss of air.

B. Incorrect - A loss of air to this component would cause the valve to go open and would not cause a loss of seal cooling. Plausible if candidate determines that this valve fails closed on a loss of air.

C. Correct - A loss of air causes this valve to fail closed, isolating CCW to the Excess Letdown Heat Exchanger, and requiring Excess Letdown flow to be secured.

D. Incorrect - A loss of air causes this valve to fail closed. This would isolate the CCW Surge Tank Vent. Plausible if candidate determines that this valve fails open on a loss of air, because if it was failed open, it could not fulfill its function to close on a Hi Rad signal.

008 Component Cooling Water System (CCWS)
Ability to (a) predict the impacts of the following malfunctions or operations on the CCWS, 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)
A2.05 Effect of loss of instrument and control air on the position of the CCW valves that are air operated 3.3* 3.5

Importance Rating:	3.3 / 3.5
Technical Reference:	PID 175002 sheet 2, FNP-1-AOP-6.0 V37
References provided:	None
Learning Objective:	RELATE AND DESCRIBE the effect(s) on the CCW System for a loss of an AC or DC bus, or a malfunction of the Instrument Air System (OPS-40204A06).
Question origin:	NEW
Basis for meeting K/A:	K/A is met by having candidate correctly predict the impact of a loss of instrument air on individual CCW valves, and then determine the procedurally required actions to mitigate the consequences of the loss of air.
SRO justification:	N/A

LOCATION DF1

SETPOINT: 135°F

F1	LTDN TO DEMIN DIVERTED-TEMP HI

ORIGIN: 1-TY-143X Auxiliary Relay actuated by Temperature Bistable (N1E21TB143)

PROBABLE CAUSE

1. Low or Loss of CCW Flow to the Letdown Heat Exchanger.
2. Letdown Flow greater than Charging Flow.

AUTOMATIC ACTION

1. Letdown High Temperature Divert Valve Q1E21TCV143 diverts Letdown Flow to the VCT. {CMT 0008644}

OPERATOR ACTION

1. Verify Q1E21TCV143 has diverted letdown flow to VCT to bypass demins

2. Monitor charging and letdown flows and temperatures.

3. Take manual control of LTDN HX Outlet Temp TK-144 and attempt to increase CCW flow to the Letdown Heat Exchanger.

4. Adjust charging or letdown flow as required to reduce the letdown flow temperature.

5. IF cause for the elevated temperature has been corrected, THEN refer to FNP-1-SOP-2.1, CHEMICAL AND VOLUME CONTROL SYSTEM PLANT STARTUP AND OPERATION to return TCV143 to DEMIN.

6. IF letdown temperature can NOT be reduced, THEN close LTDN ORIF ISO 45 (60) GPM Q1E21HV8149A, B, and C.

NOTE: Transients that will require boration or dilution should be avoided if letdown has been secured.

7. IF a ramp is in progress, THEN place turbine load on HOLD

8. Go to FNP-1-AOP-16.0, CVCS MALFUNCTION to address the loss of letdown flow.

References: A-177100, Sh. 206; D-175039, Sh.2; D-177091; D-177375; U-175997; PLS Document

LOCATION CG1

SETPOINT: 3 + 1 GPM
− 0

G1
1A RHR PUMP CCW FLOW LO

ORIGIN: 1. Flow Switch (Q1P17FISL3062A-A) when 1A RHR Pump breaker DF09 racked in and closed.

NOTE: Alarm is interlocked with 1A RHR pump supply breaker such that the alarm is disabled unless the breaker is racked in and closed.

PROBABLE CAUSE

1. Loss of A Train Component Cooling Water.
2. Improper valve lineup.
3. 1A RHR Pump Seal Cooler flow blockage.

AUTOMATIC ACTION

NONE

OPERATOR ACTION

1. IF a loss of A Train component cooling water has occurred, THEN perform the actions required by FNP-1-AOP-9.0, LOSS OF COMPONENT COOLING WATER.
2. Place the B RHR Train in service in accordance WITH FNP-1-SOP-7.0, RESIDUAL HEAT REMOVAL SYSTEM.
3. Stop the 1A RHR pump and shutdown the A RHR Train in accordance with FNP-1-SOP-7.0, RESIDUAL HEAT REMOVAL SYSTEM.
4. Refer to FNP-1-SOP-23.0, COMPONENT COOLING WATER SYSTEM.
5. Notify appropriate personnel to determine and correct the cause of the alarm.
6. Return the RHR System to normal operation when CCW flow to the RHR Pump has been restored.
7. Refer to Technical Specifications, Sections 3.4.6, 3.4.7, 3.4.8, 3.5.3, 3.9.4 and 3.9.5, for LCO Requirements.

References: A-177100, Sh. 171; B-175968, Pg. 7; D-175041; D-175002, Sh. 1; Technical Specifications

TABLE 1

COMPONENT NUMBER	NAME	MANUAL OPERATOR	FAILED POSITON	OPERATOR DRAWING
Q1P16V705B	SW PUMP 1B BRG CLG SUPPLY	NO	OPEN	
Q1P16V705C	SW PUMP 1C BRG CLG SUPPLY	NO	OPEN	
Q1P16V705D	SW PUMP 1D BRG CLG SUPPLY	NO	OPEN	
Q1P16V705E	SW PUMP 1E BRG CLG SUPPLY	NO	OPEN	
N1P16V734A	CHILLER A COND SW FCV	NO	OPEN	
N1P16V734B	CHILLER B COND SW FCV	NO	OPEN	
N1P16V901	TURB OIL CLR SW FLOW REG	YES	OPEN	U-161477
N1P16V903A	SGFP A OIL COOLER TCV	YES	OPEN	U-161481
N1P16V903B	SGFP B OIL COOLER TCV	YES	OPEN	U-161481
N1P16V904	SW FROM H2 COOLER FCV	YES	OPEN	U-161479
Q1P17HV2229 (1-CCW-HV-2229)	CCW SUPPLY TO SAMPLE COOLERS	YES	CLOSED	
Q1P17HV3045 (1-CCW-HV-3045)	CCW FROM RCP THRM BARR	YES	CLOSED	U-176881
Q1P17HV3067 (1-CCW-HV-3067)	CCW FROM EXCESS LTDN/RCDT HX'S	YES	CLOSED	U-176889
Q1P17HV3095 (1-CCW-HV-3095)	CCW TO EXCESS LTDN/RCDT HX'S	YES	CLOSED	U-176889
Q1P17HV3096A (1-CCW-HV-3096A)	CCW TO/FROM EVAP PK & H2 RECOMB	YES	CLOSED[2]	U-176890 U-176891
Q1P17HV3096B (1-CCW-HV-3096B)	CCW TO/FROM EVAP PK & H2 RECOMB	YES	CLOSED[2]	U-176890 U-176891
Q1P17HV3184 (1-CCW-HV-3184)	CCW DISCH RCP THRM BARR ISO	YES	CLOSED	U-176882
Q1P17PCV3404A (1-CCW-PCV-3404A)	RHR PUMP 1A SEAL HX CCW PRESS REG	NO	OPEN	

[2] Q1P17HV3096A&B must have the jack engaged before the cushion air pressure bleeds down to ensure the valves remain closed.

TABLE 1

COMPONENT NUMBER	NAME	MANUAL OPERATOR	FAILED POSITON	OPERATOR DRAWING
Q1P17PCV3404B (1-CCW-PCV-3404B)	RHR PUMP 1B SEAL HX CCW PRESS REG	NO	OPEN	
Q1P17HV3443 (1-CCW-HV-3443)	CCW FROM EXC LTDN/RCDT HX'S	YES	CLOSED	
Q1P17RCV3028 (1-CCW-RCV-3028)	CCW SURGE TANK AIR VENT	YES		U-176886
Q1P17TCV3083 (1-CCW-TCV-3083)	LTDN HX CCW TEMP CONTROLLER	YES	OPEN	U-176888
N1P17V177 (1-CVC-FCV-307)	CCW FROM EVAP COND	NO	OPEN	
N1P17V178 (1-CCW-FCV-329)	CCW FROM EVAP COND	NO	OPEN	
N1P18HV2935A (1-BA-HV-2935A)	BREATHING AIR SUP CYLINDER ISO		OPEN	
N1P18HV2935B (1-BA-HV-2935B)	BREATHING AIR HEADER AUTO ISO		CLOSED	
N1P18HV2935C (1-BA-HV-2935C)	BREATHING AIR HEADER AUTO ISO		CLOSED	
N1P18V901	SERVICE AIR HDR AUTO ISO	YES	CLOSED	
Q1P19HV2228 (1-IA-HV-2228)	PORV BACKUP AIR SUPPLY	NO	CLOSED	
Q1P19HV3611 (1-IA-HV-3611)	INST AIR SUPPLY TO CTMT	YES	CLOSED	U-258028
N1P19V077 (1-IA-HV-3825)	INST AIR TO PENE RM AUTO ISO	YES	CLOSED	U-162164
N1P19V080 (1-IA-HV-3885)	INST AIR TO PENE RM AUTO ISO	YES	CLOSED	U-162164
N1P19V902	INST AIR DRYER AUTO BYPASS	YES	OPEN	
N1P19V903	ESSENTIAL IA HDR AUTO ISO	YES	OPEN	
N1P19V904	NON-ESS IA HDR AUTO ISO	YES	CLOSED	

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 CH1

SETPOINT: 170°F

ORIGIN: Temperature Bistable TB/139 from Temp. Element (N1E21TE139)

H1
EXC LTDN HX OUTLET TEMP HI

PROBABLE CAUSE

1. Abnormally high Excess Letdown Flow.
2. Improper CCW to Excess Letdown Heat Exchanger valve lineup.
3. Decreased Component Cooling Water flow.

AUTOMATIC ACTION

NONE

OPERATOR ACTION

1. Determine actual temperature as indicated by TI-139, on the MCB.
2. Reduce excess letdown flow by modulating valve 1-CVC-HCV-137.
3. Verify that the CCW valve lineup to the excess letdown heat exchanger is correct and that CCW flow is normal.
4. IF excess letdown is being directed to the VCT, THEN verify that reactor coolant pumps, no. 1 seal leakoff flows are normal.
5. Refer to FNP-1-SOP-2.7, CHEMICAL AND VOLUME CONTROL SYSTEM EXCESS LETDOWN.
6. IF Excess Letdown Heat Exchanger outlet temperature does not decrease to normal, THEN secure Excess Letdown flow.
7. Continue investigation for the cause of the alarm.
8. Once the cause of the alarm is determined and corrected, return the Excess Letdown Heat Exchanger to service.

References: A-177100, Sh. 176; D-175039, Sh. 1; PLS Document is in AUTO, the dedicated pump A or C (depending on which train it is lined up to) has tripped on overload, or its supply breaker has been racked out.

Any of the following will trip the circuit breaker if:

1. An overload condition on the motor occurs
2. A signal from the load shed sequencer occurs
3. The local or remote handswitch, for the breaker, is taken to the stop positions. (The switch allowing operations depends upon the position of the local/remote selector switch of the hot shutdown panel.)

CCW Surge Tank Vent (RCV-3028)

The surge tank vent valve (RCV-3028) (Figure 8) is kept open by air pressure that passes through two series solenoid valves. Deenergizing either the train B (SV-3028A) or train A (SV-3028B) solenoid will cause RCV-3028 to shut. Each solenoid has its own three-position handswitch (CLOSE/AUTO/OPEN, spring return to AUTO). Both handswitches must be taken to the OPEN position, thus energizing their respective solenoid valves and allowing air to open RCV-3028. A high radiation signal on R-17A or B will deenergize their respective solenoid valves, allowing RCV-3028 to shut. The surge tank vent is a soft seat valve to ensure positive isolation of radioactive gases. The valve fails closed on loss of air or DC power.

Excess Letdown and RCDT Heat Exchanger Isolation Valves (HV-3067, HV-3095 and HV-3443)

Each of these valves (Figure 9) is controlled by a three-position handswitch (CLOSE/AUTO/OPEN, spring return to AUTO). Turning the switch to open energizes a solenoid that allows air to open the particular valve. The valve can be closed by either turning the handswitch to CLOSE or by receiving a "T"-signal (phase A containment isolation signal), or a loss of air or DC power.

CCW to Sample System Heat Exchangers (AOV-2229)

This key-operated valve switch is locally mounted beside the post accident sample control panel. Once opened, AOV-2229 (Figure 9) automatically closes: (1) upon receiving a CCW surge tank Lo-Lo level signal from train A or train B; (2) upon receiving an "S"-signal from A-train solid

10. ~~009EA2.01 010/NEW/RO/C/A 4.2/4.8/EPE009EA2.01/N//B~~

Unit 1 has experienced a small break LOCA with the following conditions:

- RCS pressure is 2100 psig.
- CETCs are 750°F.
- All RCP's are stopped.
- FI-943, A TRAIN HHSI FLOW, indicates 0 gpm.
- FI-940, HHSI B TRAIN RECIRC FLOW, indicates 0 gpm.

Which one of the following actions is required as the primary mitigation strategy?

A. Start a RCP.

B✓ Establish HHSI flow.

C. Perform a max rate cooldown.

D. Reduce RCS pressure by opening one PORV.

Background document for FRP-C.2 states "The most effective method to restore adequate core cooling is to increase RCS inventory via safety injection. The operator should verify or establish maximum SI flow to the RCS." All other distractors listed are not performed in FRP-C.2, but would be employed in other procedures.

A. Incorrect - Plausible because this action is performed in many other emergency procedures, in particular FRP-C.1.

B. Correct - see above.

C. Incorrect - Plausible because this action is performed in many other emergency procedures, in particular FRP-C.1.

D. Incorrect - Plausible because this action is performed in many other emergency procedures and candidate may think this is required in FRP-C.2 to allow RHR flow.

009EA2.01

EPE: 009 Small Break LOCA :

Ability to determine or interpret the following as they apply to a small break LOCA: (CFR 43.5 / 45.13)

EA2.01 Actions to be taken, based on RCS temperature and pressure, saturated and superheated 4.2 4.8

Importance Rating:	4.2 / 4.8
Technical Reference:	FNP-1-FRP-C.2 v17
References provided:	None
Learning Objective:	LIST AND DESCRIBE the sequence of major actions, when and how continuous actions will be implemented, associated with (1) FRP-C.1, Response to Inadequate Core Cooling; (2) FRP-C.2, Response to Degraded Core Cooling; (3) FRP-C.3, Response to Saturated Core Cooling. (OPS-52533C04)
Question origin:	NEW
Basis for meeting K/A:	K/A is met by placing candidate in an FRP-C.2 scenario and have him determine the correct actions required by FRP-C.2 for mitigation. Entry into FRP-C.2 is due to core exit temperature >700°F, and with RCS pressure at 2100 psig, the core is saturated/superheated. Action to verify HHSI flow established is the primary mitigation strategy employed by FRP-C.2.
SRO justification:	N/A

RESPONSE TO DEGRADED CORE COOLING
Plant Specific Background Information

Section: Procedure

Unit 1 ERP Step: 3 **Unit 2 ERP Step:** 3 ***ERG Step No:*** *2*

ERP StepText: Check any HHSI flow - GREATER THAN 0 gpm.

ERG StepText: *Verify SI Flow In All Trains*

Purpose: To verify delivery of SI flow to the RCS

Basis: This step will alert the operator to the existence of a degraded SI system. The most effective method to restore adequate core cooling is to increase RCS inventory via safety injection. The operator should verify or establish maximum SI flow to the RCS. If SI flow to the RCS cannot be verified, the operator should establish any other form (source) of RCS injection (makeup) flow available.

Knowledge: N/A

References: DW-98-06

Justification of Differences:

1 Changed to make plant specific.

2 Placed LHSI verification in separate ERP step to simplify step.

3 Deleted reference to separate HHSI pumps. These are not part of FNP design.

4 Step (RNO) revised to indicate the intent to try and establish any form of RCS injection available. Not just HHSI flow (Reference DW-98-06).

11. ~~010K1.06 011~~/BANK/RO/C/A 2.9/3.1/~~010K1.06~~/N///A

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

- HV-8145, RCS PRZR AUX SPRAY valve, has just started leaking by the seat at 10 gpm.
- HC1, PRZR PRESS HI-LO, is in alarm.

Which one of the following completes the statement below?

Indication on FI-122A, CHG FLOW, will **initially** __(1)__ .

Demand on PK-444A, PRZR PRESS REFERENCE controller, will __(2)__ .

	(1)	(2)
A.✓	increase	increase
B.	increase	decrease
C.	decrease	increase
D.	decrease	decrease

When leakby on HV8145 is initiated, Charging flow will immediately increase somewhat due to opening an additional flow path. Even more importantly, as RCS pressure starts dropping due to the additional Pressurizer Spray (indicated by annunciator HC1, setpoint 2185 psig), Charging flow will continue to increase based on a larger DP across the Charging Flow Control Valve. Charging flow will initially rise, but at some point the automatic level control system will respond and lower flow, to drive Pressurizer level back to program.
PK444A output will increase to try to raise Pressurizer pressure back to setpoint.

A. Correct - 1) Charging flow will increase about 3 gpm and then decrease due to pzr level rising which is due to pzr pressure decreasing. Charging flow decreases about 10 gpm over 5 minutes.

2) PK444A output will increase due to RCS pressure decreasing.

B. Incorrect - 1) see A.1
2) plausible because some controllers operate backwards from what might be expected. As this controller output rises it is trying to increase RCS pressure by turning on heaters and causing sprays to go closed. Since this controller operates Pressurizer Spray, Heaters and PORVs, a candidate may expect output to go down when less spray flow is desired. Actually output would go up when less spray flow is desired.

C. Incorrect - 1) Plausible if candidate believes that the leakby on HV8145 is not sensed by FI122A. He may expect Charging flow to initally drop because Charging flow is being robbed from its normal flow path. Also the RCS pressure response is so quick the candidate may believe the initial response is decrease since the increase is so short lived.
2) see A.2.

D. Incorrect - 1) see C.1
2) see B.2

010K1.06

010 Pressurizer Pressure Control System (PZR PCS)

Knowledge of the physical connections and/or cause-effect relationships between the PZR PCS and the following systems:
(CFR: 41.2 to 41.9 / 45.7 to 45.8)
K1.06 CVCS 2.9 3.1

Importance Rating: 2.9 / 3.1

Technical Reference:

References provided: None

Learning Objective: Given a set of plant conditions, LIST AND DESCRIBE the actions/effects that will occur following a CVCS Malfunction with no operator action (OPS-52201H15).

Question origin: Adapted from Vogtle 2005 NRC Exam Question #12

Basis for meeting K/A: K/A is met by requiring candidate to determine the effects of leakby on the PRZR AUX SPRAY valve. Aux Spray is delivered from the discharge of the Charging pumps, part of the CVCS system, and sprays into the top of the Pressurizer to provide for RCS pressure control. Candidate must have knowledge of the interconnection between the Aux Spray valve and where Charging flow on FI122A is sensed. In addition, candidate must determine the resultant effect on the Pressurizer's automatic control system response.

SRO justification: N/A

Chemical And Volume Control

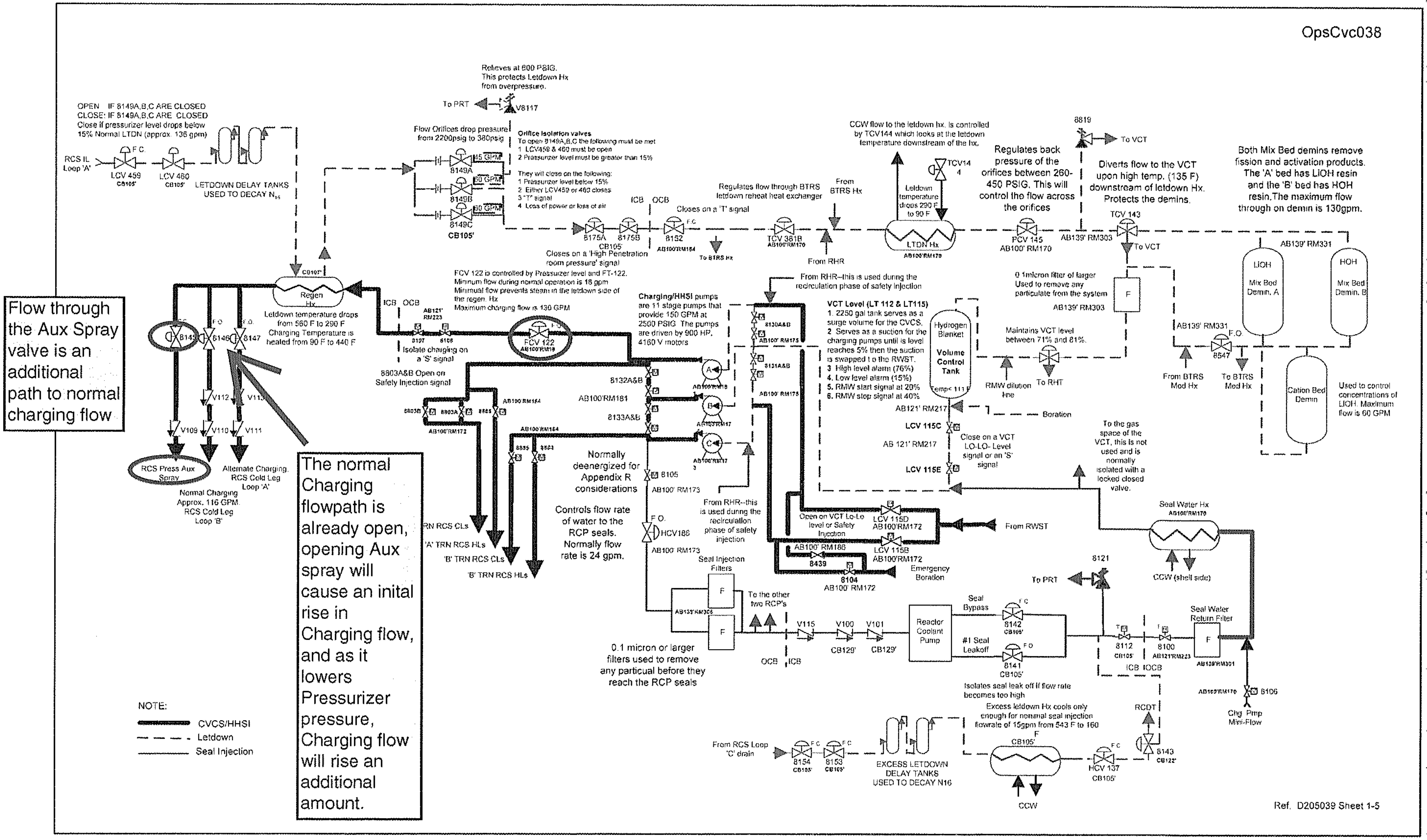


Figure 21 - Chemical And Volume Control System

Chemical And Volume Control

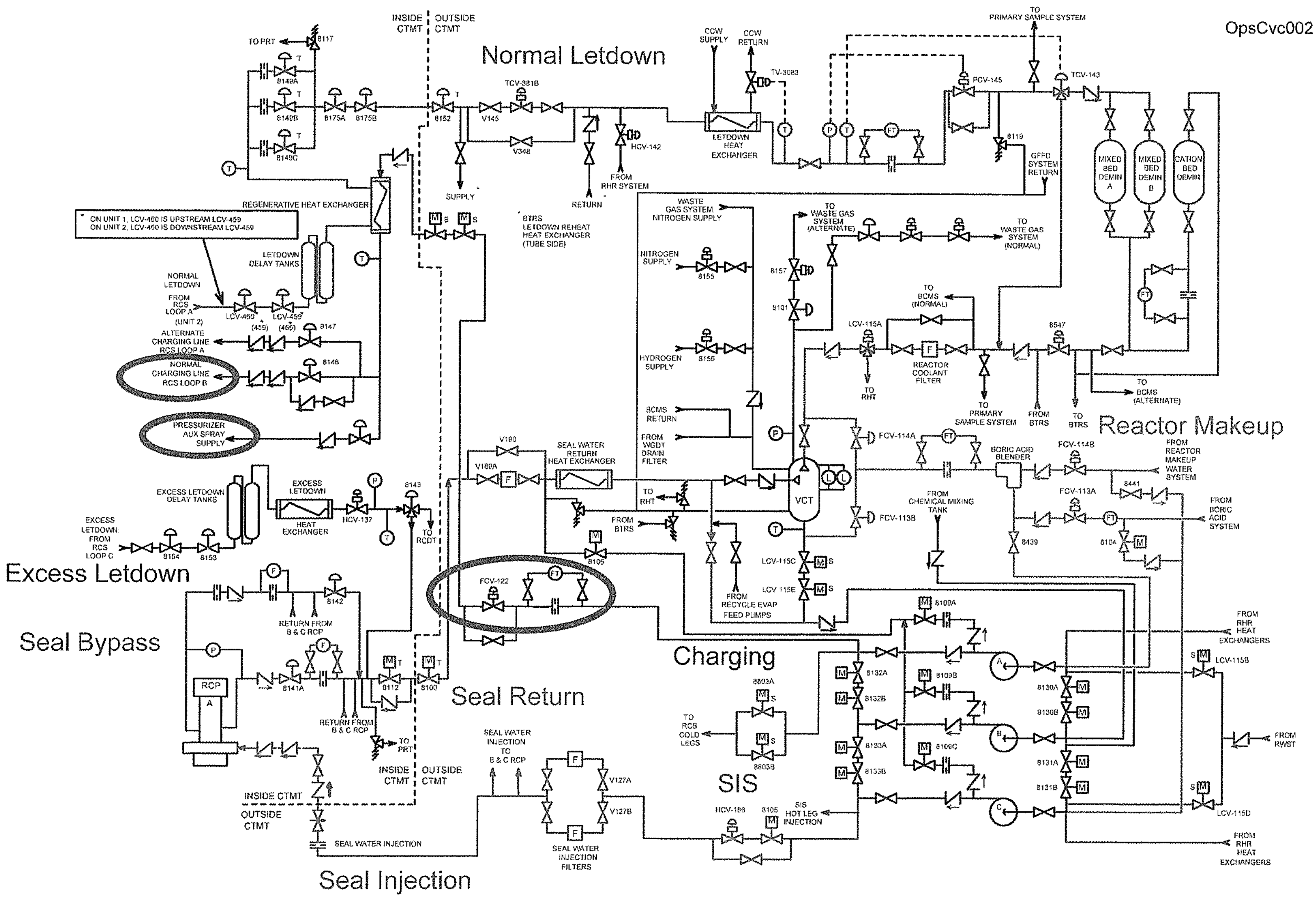


Figure 3 - Chemical And Volume Control System

12. ~~011A4.01 012/MOD/RO/C/A~~ 3.5/3.2/~~011A4.01/N~~///D

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

At 10:00:

- 1B Charging pump is aligned to B Train.
- 1A Charging pump is running.

At 10:10:

- Pressurizer level is falling.
- VCT level is rising.
- DD1, RCP SEAL INJ FLOW LO, alarm is LIT.
- DE1, REGEN HX LTDN FLOW DISCH TEMP HI, alarm is LIT.
- EA2, CHG HDR FLOW HI-LO, alarm is LIT.

Which one of the following events has occurred?

A. A Small RCS piping break has occurred.

B. Charging FCV-122 has failed open.

C. Charging FCV-122 has failed closed.

D✓ 1A Charging pump has tripped.

For the given conditions, a trip of the running 1A Charging pump is the only thing that will give all of the provided indications. Normally the running Charging pump will be on the same Train as the 1B Charging pump. If a running Charging pump trips, the standby pump in the same Train will automatically start. For these conditions, there is no standby pump. Therefore, when the 1A Charging pump trips, there will be no Charging or Seal Injection flow and the given conditions will occur.

A. Incorrect - Some of the conditions will occur, but VCT level will not rise and DE1 would not alarm.

B. Incorrect - Some of the conditions will occur, but Pressurizer level will not fall, VCT level will not rise and DE1 would not alarm

C. Incorrect - All conditions would occur except alarm DD1.

D. Correct - all given conditions would occur.

011A4.01

011 Pressurizer Level Control System (PZR LCS)
Ability to manually operate and/or monitor in the control room:
(CFR: 41.7 / 45.5 to 45.8)
A4.01 Charging pump and flow controls 3.5 3.2

Importance Rating:	3.5 / 3.2
Technical Reference:	
References provided:	None
Learning Objective:	STATE the symptoms and PREDICT the impact a loss or malfunction of Chemical and Volume Control System components will have on the operation of the Chemical and Volume Control System (OPS-52101F02)
Question origin:	Modified FNP BANK AOP-1.0-52520A02 03
Basis for meeting K/A:	K/A is met by testing candidate's ability to monitor Charging pump controls and indications and determine what has occurred during a malfunction.
SRO justification:	N/A

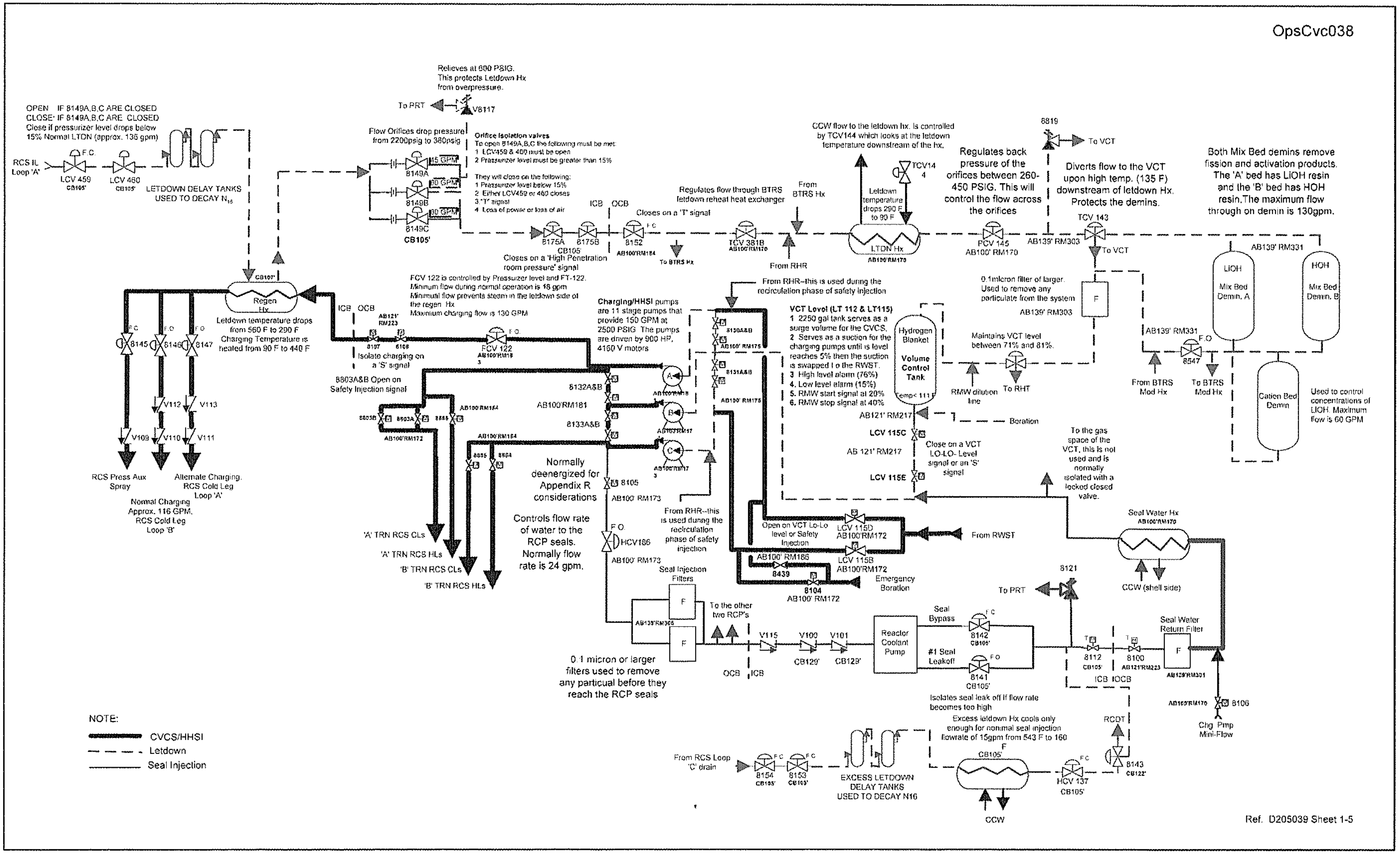


Figure 21 - Chemical And Volume Control System

Chemical And Volume Control

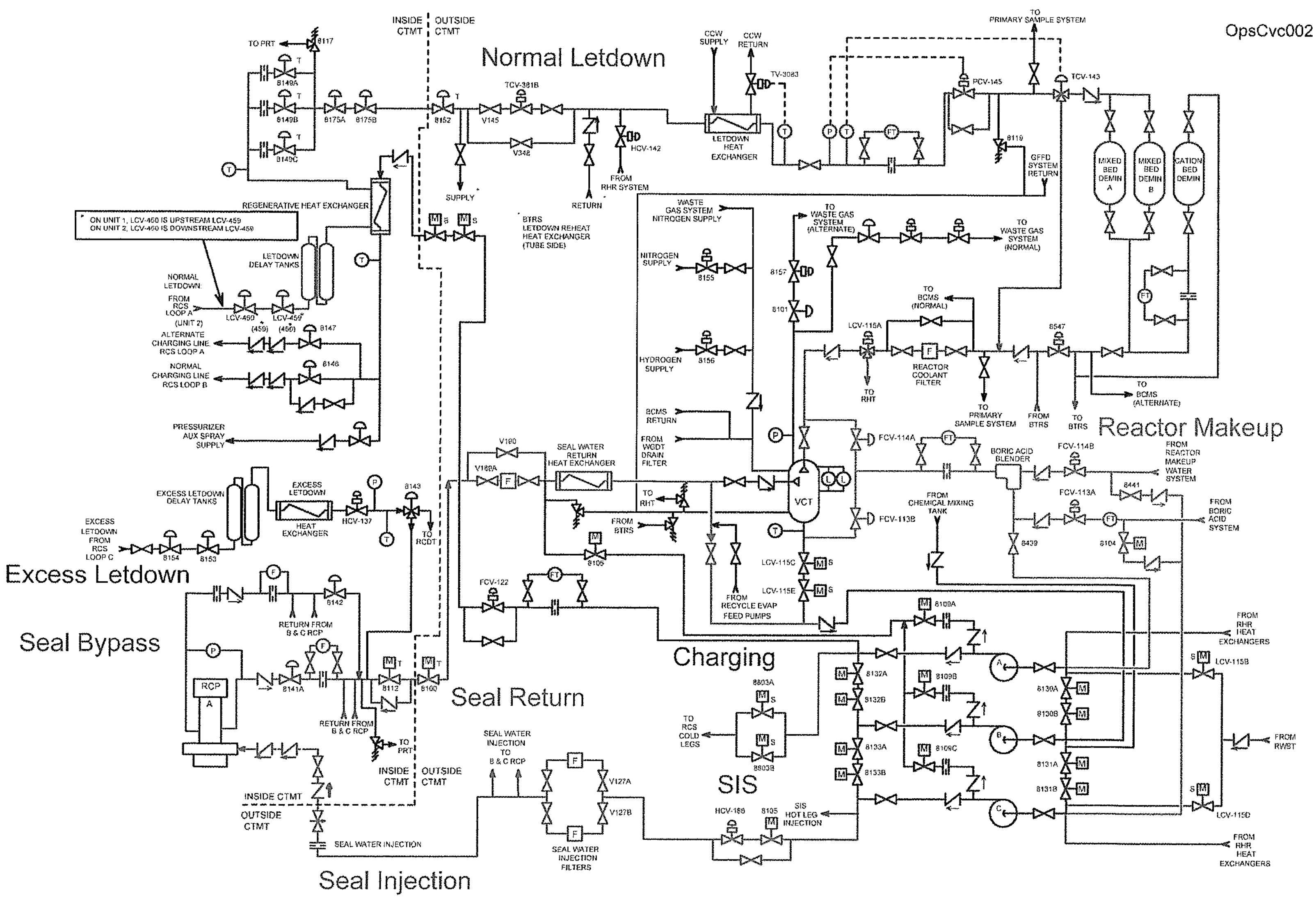


Figure 3 - Chemical And Volume Control System

1. AOP-1.0-52520A02 003 — 011 A4.01

Given the following:

- Unit 1 is operating at 100% power.
- All controls are in the normal power operation lineup.
- Pressurizer level is falling.
- VCT level is rising.
- DD1, RCP SEAL INJ FLOW LO, alarm is lit.
- DE1, REGEN HX LTDN FLOW DISCH TEMP HI, alarm is lit.
- EA2, CHG HDR FLOW HI-LO, alarm is lit.

Which one of the following events has occurred?

A.✓ Loss of charging

B. Letdown isolation

C. Small break LOCA

D. Pressurizer PORV failed open

AOP-1.0

A. Correct - If charging flow is lost completely, there would be no SI or charging flow and with letdown still in service, the regen Hx hi temp alarm will come in.

B. Incorrect- If letdown had isolated and charging was still running, then VCT level would be falling, DE1 would not be in alarm, EA2 would not be in alarm

C. Incorrect- there are no rad monitors in alarm and DD1 & DE1 would not be in.

D. Incorrect- None of the alarms would be in for this failure.

13. 011EK2.02 013/MOD/RO/C/A 2.6/2.7/EPE011EK2.02/N///C

Unit 1 has had a Reactor Trip and Safety Injection actuation with the following conditions:

- A Large Break LOCA has occurred.
- Containment pressure has reached 29 psig.
- EEP-0, Reactor Trip or Safety Injection, is in progress.
- RCS pressure is 200 psig and dropping.

Which one of the following describes the reason for securing RCP's under the above conditions?

A. To lower peak clad temperatures.

B. To delay two-phase flow in the RCS.

C.✓ To prevent overheating RCP motor bearings.

D. To prevent a deeper and longer core uncovery later in the event.

A. Incorrect - Plausible because this is the criteria for a SB LOCA as shown below.

EEP-1 lesson plan

RCP Trip Criteria During LOCAs

Analysis has shown that, for certain cold leg small break LOCAs, RCP trips within different time frames in the event produce different effects on final peak clad temperature. **The lowest final clad temperatures were the result of allowing the RCPs to continue to run throughout the transient.** However, the analysis must assume a loss of off-site power as a possibility any time during the accident, and, therefore, continued RCP operation cannot be guaranteed. Studies were conducted to determine the best and worst time frame for an RCP trip in terms of final peak clad temperature. The analysis was set up with a 3-inch diameter cold leg break and all RCPs in operation. The analysis for a 3-loop plant was run with the RCP trip occurrence at different time intervals after the initiation of the transient (Figure 7). The results show that if the RCP trips occur early in the transient, peak clad temperatures are lower. The bounding time frame appears to be about 10 minutes. If the RCPs are tripped later in this accident than 10 minutes, **the peak clad temperatures are higher.**

B. Incorrect - There would be two phase flow in the RCS with the pumps running, but stopping RCPs would actually provide less flow to the core and would not delay onset of two phase flow. SI flow is required to provide cooling to the core during a LBLOCA.

C. Correct - Phase B would isolate all cooling to the bearings when CCW to the RCP's isolated. They would overheat in as little as 3 minutes with the pump running.

D. Incorrect - This would be correct for a SBLOCA. During a LBLOCA, core uncovery and it's consequence is relatively unaffected by RCPs operating or being secured.

011EK2.02

EPE: 011 Large Break LOCA :
Knowledge of the interrelations between the **PUMPS** and the following Large Break LOCA
(CFR 41.7 / 45.7)
EK2.02 Pumps 2.6* 2.7*

Importance Rating: 2.6 / 2.7

Technical Reference: FNP-0-SOP-0.8 v19.0

References provided: None

Learning Objective: EVALUATE plant conditions and DETERMINE if any system components need to be operated while performing (1) EEP-0, Reactor Trip or Safety Injection and (2) ESP-0.0, Rediagnosis. (OPS-52530A06)

Question origin: Modified FNP Bank - E-0/ESP-0.0-52530A06 18

Basis for meeting K/A: K/A is met by evaluation of conditions during a Large Break LOCA and its effects on the RCP's. Criteria for shutdown of an RCP can be due to the foldout page of EEP-0.0, or due to not having support conditions, per SOP-0.8. In this particular instance, the foldout page criteria is not an answer choice, and the RCP should be shutdown due to not meeting support conditions. This meets the K/A by testing the knowledge of the interrelationships between operation of a major pump and conditions encountered during a Large Break LOCA.

SRO justification: N/A

The immediate actions in EEP-0, FRP-S.1, and ECP-0.0 will be performed, in order, by the OATC. If available, the UO will ensure performance of the immediate actions are done correctly and will take action as needed to trip the turbine in the event an automatic turbine trip does not occur. Typically, the UO will station himself at the Turbine Panel to allow for an immediate turbine trip in the event the turbine does not trip. When the operator has finished his/her immediate actions and reported completion to the Shift Supervisor, the shift supervisor will verify performance of the actions using the applicable ERP. It is expected for the operator to perform manual actions to address failed ESF component actuations and to address foldout page items after the immediate actions are performed. Early operator actions should not occur until after the immediate actions are verified by the Shift Supervisor. Following verification of immediate actions, the Shift Supervisor will proceed expeditiously to implement subsequent actions.

3.8 Manual Operator Actions and Early Operator Actions

3.8.1 If the condition is recognized in sufficient time, crews are expected to take manual actions prior to reaching the automatic setpoint for the following ESF actuations: Reactor Trip, Turbine Trip, SI and MSIV isolation. The determination of whether to manually initiate an anticipated automatic action would include consideration of parameter trends and applicable plant parameter values being near the setpoint.

3.8.2 Operators are expected to take manual action to address ESF components which fail to actuate when required (with the exception of starting a DG or closing the output breaker, which requires the procedure to be used to ensure load shed is verified). Operators are also expected to take manual action to secure ESF components which do not have support conditions (this is to include securing RCPs when support conditions are not met) The Shift Supervisor should be informed as soon as possible after initiating the manual action.

3.8.3 Crews may take early operator action when the step will mitigate the consequence of the event but not interfere with optimal recovery strategies. (Examples include: securing all but one condensate pump and calling for backup cooling to be aligned, taking manual control of Auxiliary Feedwater flow, restoring instrument air to containment, etc) The Shift Supervisor will be notified prior to the commencement of early operator action. The applicable procedure step(s) will be referenced.

1. E-0/ESP-0.0-52530A06 018 611EK2.02

A Large Break LOCA has occurred inside containment resulting in automatic actuation of the Containment Spray Pumps. EEP-0, Reactor Trip or Safety Injection, is in progress. RCS pressure is 200 psig and dropping.

Which one of the following describes the reason for RCP trip criteria under the above conditions?

A. To prevent loss of all cooling to the RCP seals.

B✓ To prevent overheating RCP motor bearings due to the loss of CCW.

C. To prevent delaying two-phase flow in the RCS.

D. To prevent a deeper and longer core uncovery later in the event.

DISTRACTORS:

A INCORRECT. CCW to the thermal barrier would be secured, but Seal injection would still be available.

B CORRECT. Phase B would isolate all cooling to the bearings. They would overheat in as little as 3 minutes with the pump running.

C INCORRECT There would be two phase flow in the RCS, but stopping RCPs would actually provide less flow to the core. Single phase SI flow is required to provide cooling to the core during a LBLOCA.

D INCORRECT This would be correct for a SBLOCA. During a LBLOCA, core uncovery and it's the consequence is relatively unaffected by RCPs operating or being secured.

14. 012A3.05-014/NEW/RO/M 3.6/3.7/012A3.05/N///C

Which one of the following completes the statements below?

The **minimum** coincidence (fewest number of channels or input signals) required to initiate an Intermediate Range High Flux Reactor Trip is __(1)__ .

The **minimum** coincidence (number of Throttle Valves closed) to initiate a Reactor Trip from Turbine Trip is __(2)__ .

	(1)	(2)
A.	1 out of 2	3 out of 4
B.	2 out of 2	3 out of 4
C✓	1 out of 2	4 out of 4
D.	2 out of 2	4 out of 4

Per EEP-0, 1 out of 2 Intermediate Range High Flux signals are required for a Reactor trip and 4 out of 4 Throttle Valve Closed signals are required for a Reactor trip signal.

A. Incorrect - 1) Correct per above from EEP-0.
2) Second part is plausible because 2/3 is required for auto stop oil turbine trip. Also very few trip/actuation signals require 4 detectors to trip. 3 out of 4 would be more logical than 4 out of 4.

B. Incorrect - 1) incorrect. Plausible because most trip signals require more than one detector to initiate a trip signal. General warning is a 2/2 coincidence, C-9 and C-20 is 2/2, C-5, 7 and 11 clear on 1/1,
2) see A.2

C. Correct - 1) Correct per above from EEP-0.
2) Correct per above from EEP-0.

D. Incorrect - 1) see B.1
2) Correct per above from EEP-0.

012A3.05

012 Reactor Protection System (RPS)

Ability to monitor automatic operation of the RPS, including:
(CFR: 41.7 / 45.5)
A3.05 Single and multiple channel trip indicators 3.6 3.7

Importance Rating:	3.6 / 3.7
Technical Reference:	FNP-1-EEP-0 v38
References provided:	None
Learning Objective:	EVALUATE plant conditions and DETERMINE if entry into (1) EEP-0, Reactor Trip or Safety Injection and/or (2) ESP-0.0, Rediagnosis is required. (OPS-52530A02)
Question origin:	NEW
Basis for meeting K/A:	K/A is met by evaluating candidate's ability to determine if a Reactor trip is required when questioned on the coincidence of certain Reactor trip signals. Examples of a single channel trip signal and multiple channel trip signal, Reactor trip coincidence, are given for the candidate to evaluate.
SRO justification:	N/A

B. **Symptoms**

I. The following are symptoms that require a reactor trip, if one has not occurred:

Reactor Trip	Instrumentation (TSLB)	Setpoint	Coincidence
1. Source Range High Flux (If not blocked)	NI-31,32 (TSLB3 1-1,1-2)	10^5 cps	1/2
2. Intermediate Range High Flux (If not blocked)	NI-35,36 (TSLB3 2-1,2-2)	Reference Surveillance Test Data Book for current S.P.	1/2
3. Power Range High Flux, Low Setpoint (If not blocked)	NI-41,42,43,44 (TSLB3 6-1,6-2,6-3,6-4)	25% Rx Pwr	2/4
4. Power Range High Flux, High Setpoint	NI-41,42,43,44 (TSLB2 11-1,11-2,11-3, 11-4)	109% Rx Pwr	2/4
5. Power Range High Positive Flux Rate	NI Cabinets (TSLB2 12-1,12-2,12-3, 12-4)	+5%/2 sec.	2/4
6. OTΔT	TI-412C,422C,432C (TSLB2 7-1,7-2,7-3)	+credits 117% -penalties	2/3
7. OPΔT	TI-412B,422B,432B (TSLB2 8-1,8-2,8-3)	110%-penalties	2/3
8. Pressurizer Low Pressure	PI-455,456,457 (TSLB2 19-1,19-2,19-3)	1865 psig (rate compensated)	2/3 (Rx Pwr > 10%)
9. Pressurizer High Pressure	PI-455,456,457 (TSLB2 20-1,20-2,20-3)	2385 psig	2/3

Reactor Trip	Instrumentation (TSLB)	Setpoint	Coincidence
10. Pressurizer High Water Level	LI-459A,460,461 (TSLB2 18-1,18-2,18-3	92%	2/3 (RX Pwr >10%)
11. Low Reactor Coolant Flow	FI-414,415,416 FI-424,425,426 FI-434,435,436 (TSLB2 4-1,4-2,4-3, 5-1,5-2,5-3, 6-1,6-2,6-3)	90%	2/3 per loop on 1/3 loops (Rx Pwr > 30%) 2/3 per loop on 2/3 loops (30% > Rx Pwr > 10%)
12. RCP Undervoltage	RCP Undervoltage Relays (TSLB2 1-1,1-2,1-3)	2680 V (0.6 sec time delay)	1/2 detectors on 2/3 RCPs (Rx Pwr > 10%)
13. RCP Bus Underfrequency	BUS Underfrequency Relays (TSLB2 2-1,2-2,2-3)	57 Hz (0.3 sec . time delay)	1/2 detectors on 2/3 Busses (Rx Pwr > 10%)
14. Low Low SG Water Level	LI-474,475,476 LI-484,485,486 LI-494,495,496 (TSLB4 4-1,4-2,4-3, 5-1,5-2,5-3, 6-1,6-2,6-3)	28%	2/3 Detectors on 1/3 SGs
15. Turbine Trip	DEHC (TSLB2 13-1,13-2,13-3, 14-1,14-2,14-3, 14-4)	Low Auto Stop Oil at 45 psig or Throttle Valves Closed	2/3 for Auto Stop Oil or 4/4 Throttle Valves Closed (Rx Pwr > 35%)
16. SI	N/A	Any SI Signal	1/2 Trains
17. General Warning	N/A	N/A	2/2 Trains
18. Manual	N/A	N/A	1/2

II. The following are symptoms of a reactor trip:

a. Any reactor trip annunciator lit.

b. Rapid decrease in neutron level indicated by nuclear instrumentation.

c. All shutdown and control rods are fully inserted. Rod bottom lights are lit.

15. 013K5.02 015/NEW/RO/C/A 2.9/3.3/013K5.02/N///B

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

At 10:00:

- PT-950, CTMT PRESS, has failed **HIGH**.
- The appropriate Tech Spec actions of T.S. 3.3.2, Engineered Safety Feature Actuation System (ESFAS) Instrumentation, have been completed.
- SPRAY ACTUATION BYPASS CH I TEST light is illuminated on the BYPASS & PERMISSVE panel.

At 10:30:

- PT-953, CTMT PRESS, fails **HIGH**.

Which one of the following automatic actuations, if any, will occur?

A. Safety Injection

B.✓ No automatic actuations

C. Safety Injection and MSIV isolation

D. Safety Injection, MSIV isolation, Phase B and Ctmt Spray actuation

PT950 feeds **only** the Hi-3 CTMT Pressure Phase B and Containment Spray actuation circuit. It does not feed the SI/MSIV closure circuit. When PT950 fails, Tech Specs requires that the bistable for Hi-3 be placed in the Bypass position, so that it does not supply a signal to the logic for Hi-3. This prevents an inadvertent actuation of CTMT Spray if the failure of another channel occurs. As a result, when the second channel fails high, there is no actuation.

A. Incorrect -No actuations occur, see above. Plausible because these are all signals generated by High Ctmt Pressure if any other ctmt pressure transmitter failed high.

B. Correct - see above.

C. Incorrect - No actuations occur, see above. Plausible because these are all signals generated by High Ctmt Pressure if any other ctmt pressure transmitter failed high AND the student mixed up which transmitter only fed certain bistables (hi-1/2 vs hi-3)

D. Incorrect - No actuations occur, see above. Plausible because these are all signals generated by High Ctmt Pressure if any other ctmt pressure transmitter failed high.

013K5.02

013 Engineered Safety Features Actuation System (ESFAS)

Knowledge of the operational implications of the following concepts as they apply to the ESFAS:

(CFR: 41.5 / 45.7)

K5.02 Safety system logic and reliability 2.9 3.3

Importance Rating: 2.9 / 3.3

Technical Reference:

References provided: None

Learning Objective: DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the Plant Design and ESF components and equipment to include the following (OPS-52102J02):
Normal Control Methods
Abnormal and Emergency Control Methods
Automatic actuation including setpoints (examples - SI, Phase A, Phase B, MSLIAS, LOSP or SG level)
Actions needed to mitigate the consequence of the abnormality

Question origin: NEW

Basis for meeting K/A: K/A is met by evaluating candidate's knowledge of the operational implications of ESF actuation logic, and in addition, the reliability of the ESF system when failures are present. Candidate must know actuation signals and coincidences, and the instruments that generate the signals. This knowledge is applied to determine the automatic actuations that will occur under given equipment failures.

SRO justification: N/A

isolation phase B (train A and B). All four push buttons must be momentarily depressed to clear the containment spray actuation and containment isolation phase B signals.

Tech Spec application for Containment pressure transmitters

The Containment pressure transmitters PT-950, 951, 952, 953 have cards associated with each function capability. PT-950 has one Hi-3 card associated with it. The other three transmitters each feed a Hi-1, Hi-2 and Hi-3 card. When a failure occurs on one of these transmitters, Tech Spec 3.3.2 requires one or two actions to be taken depending on which transmitter it is. In the case of PT-950, only one action is taken since it feeds only Hi-3. In applying TS 3.3.2 to these transmitters three different conditions need to be referenced. Table 3.3.2-1 refers to the three conditions that need to be referenced. 1c and 4c are for Hi-1 and Hi-2 which requires 3 channels to be OPERABLE and refers to condition D if one channel is INOPERABLE. Required action with one channel inoperable, place channel in trip within 72 hours or be in mode 3 within 78 hours and mode 4 within 84 hours. The other condition is 3b.3 which is for Hi-3 which requires 4 channels to be OPERABLE and refers to condition E to place the channel in the BYPASS condition in 72 hours. These actions are completed on the respective cards in the solid state racks. STP-220.1, .2, .3 and .4 describe how I&C will accomplish this task. In short, the cards are placed to the TEST position and the bi-stables (TSLB1- 1.2, 1.3, 1.4, 2.2, 2.3 or 2.4 respectively) for Hi-1 and 2 are checked to make sure they illuminate. For the Hi-3 condition, TSLB1 3.1 (3.2, 3.3, and 3.4) is checked NOT lit and on the BYPASS and PERMISSIVE Panel, the Spray Actuation Bypass Channel I (II, III, IV) light is checked illuminated. In the case where two or more of the Hi-3 cards are placed in the TEST position, EC3, PROCESS CH SPR ACT TEST SEQ VIOLATION, will alarm alerting the operator that the system is now in a 2 of 2 coincidence rather than the required 2 of 3 coincidence required by the STP.

Feedwater Isolation (Figure 17)

A feedwater isolation signal occurs automatically from the following conditions:

1. Safety injection
2. Reactor trip and low T_{avg}
3. (high-high steam generator level)

REACTOR PROTECTION

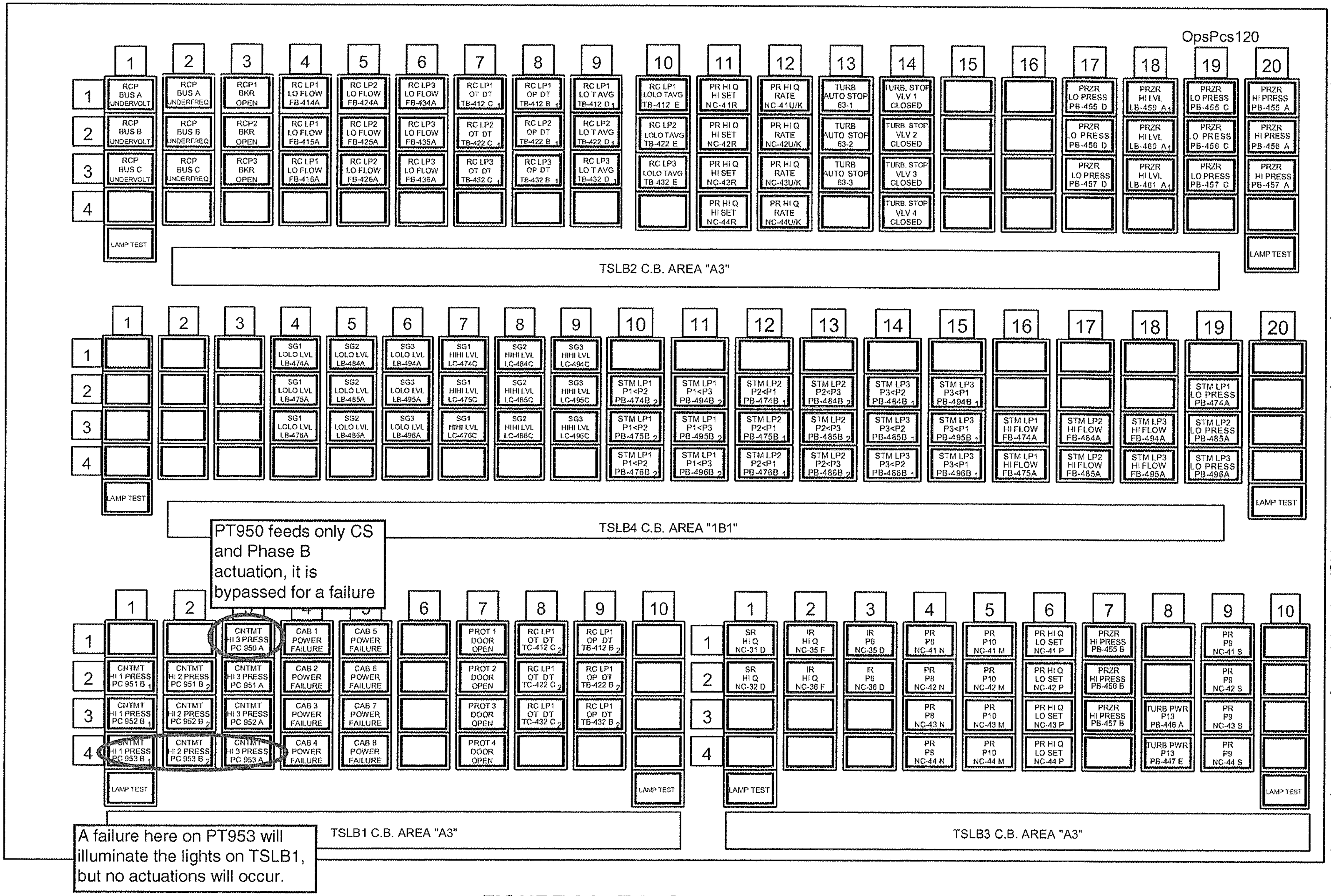


FIGURE 34 - Trip Status Light Boxes

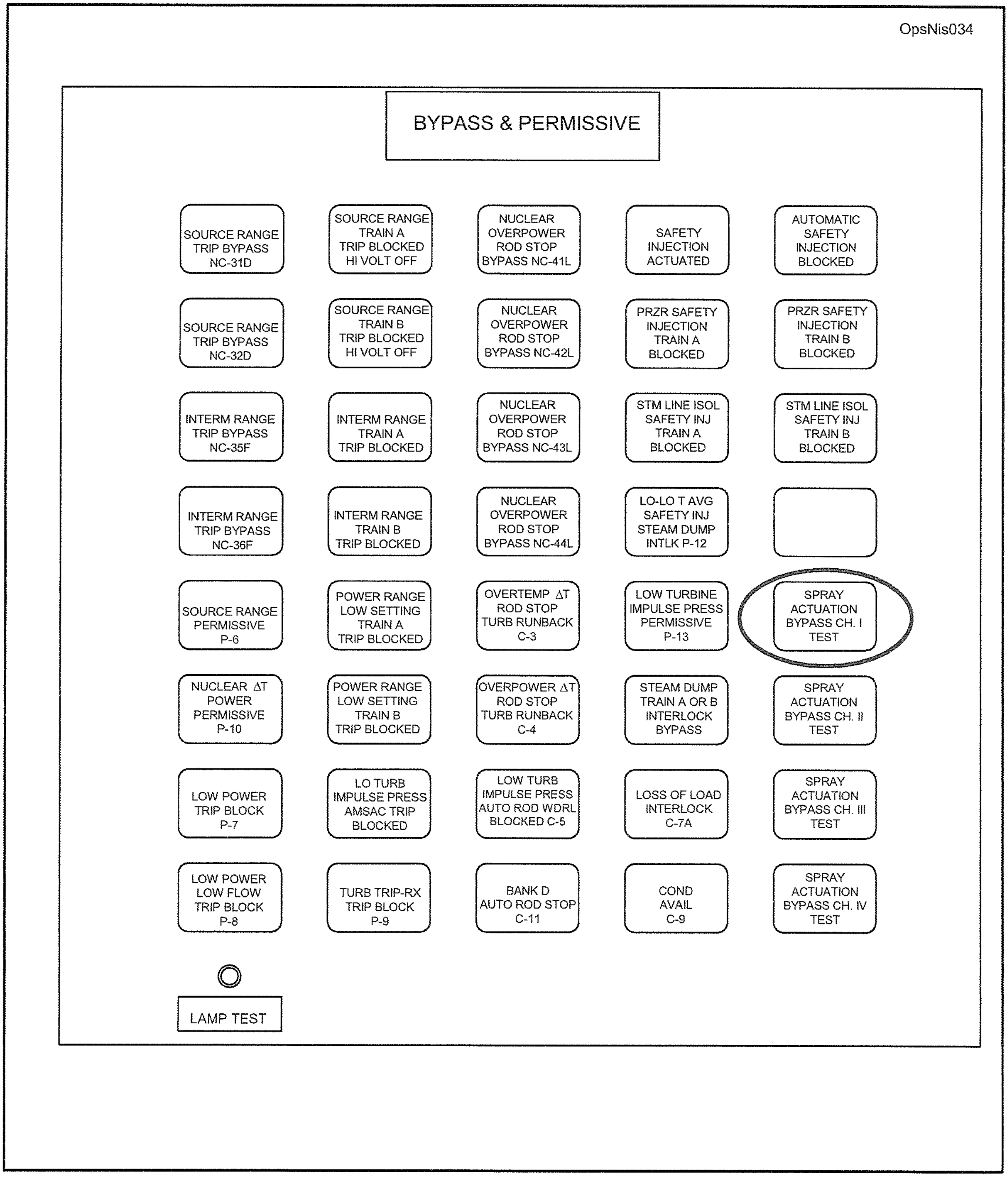


FIGURE 36 - Bypass-And-Permissive Light Box

16. ~~015/017AK1.04~~ 016/BANK/RO/C/A 2.9/~~3.1~~/APE~~015/017AK1.04/N~~///D

Unit 1 is at 25% power with the following conditions:

- 1C RCP trips.

Which one of the following completes the statements below?

1C Steam Generator narrow range level will (1) .

After 1C RCP stops, 1C Loop delta T indication will be (2) than 1A and 1B Loop delta T indications.

	(1)	(2)
A.	swell	higher
B.	swell	lower
C.	shrink	higher
D.✓	shrink	lower

AOP-4.0 lesson plan
During the transient, the affected SG main feed regulating or bypass feed regulating valve controller(s) is in automatic. Initially, the regulating valve will go shut in response to the reduced steam flow from the affected SG. This causes SG level in the affected SG to begin to fall. Contributing to the drop in SG level is the phenomenon of SG shrink. Shrink is caused by the density change in the tube section of the SG, which occurs as a result of the drop in temperature on the primary side of the affected SG.

A. Incorrect - 1) incorrect, candidate may incorrectly assess the effects of shrink and swell due to the thermodynamics associated with the RCP trip, and think that the 1C SG level will increase due to temperature rise.
2) incorrect, candidate may incorrectly assess that the hot and cold leg temperatures may diverge since the RCP is no longer running, causing delta T to increase. In reality, back flow from the operating RCP's will cause the idle loop hot and cold legs to equalize.

B. Incorrect - 1) incorrect, see A.1.
2) correct, delta T will be lower since there is minimal heat transfer in that loop.

C. Incorrect - 1) correct, Steam Generator level will immediately decrease due to minimal heat transfer and the resultant shrink in level.
2) incorrect, see A.2.

D. Correct - 1) correct, see C.1.
2) correct, see B.2.

APE: 015/017 Reactor Coolant Pump (RCP) Malfunctions:
Knowledge of the operational implications of the following concepts as they apply to Reactor Coolant Pump Malfunctions (Loss of RC Flow)
(CFR 41.8 / 41.10 / 45.3)
AK1.04 Basic steady state thermodynamic relationship between
RCS loops and S/Gs resulting from unbalanced RCS flow. 2.9 3.1*

Importance Rating:	2.9 / 3.1
Technical Reference:	None
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of abnormal plant or equipment conditions associated with the operation of the Reactor Protection System (RPS) components and equipment to include the following (OPS-52201I09). Normal Control Methods Abnormal and Emergency Control Methods Automatic actuation including setpoint (example SI, Phase A, Phase B, MSLIAS, LOSP, SG level) Actions needed to mitigate the consequence of the abnormality
Question origin:	Watts Bar 2008 NRC exam - Question #3
Basis for meeting K/A:	K/A is met by evaluation of conditions following the trip of an RCP. The operational implications for the candidate are the effects on SG level and RCS loop temperature. The thermodynamic effects are evaluated by the candidate and he is required to determine the effect of the RCP trip on primary loop delta T and SG level. This question uses the terms "shrink" and "swell" like question 045A1.06. This has been evaluated to ensure that there is no double jeopardy issues between the two questions and concepts. **Each one is testing a different concept** associated with SG level. This question is related to the effects from trip of an RCP and the other is related to a Turbine trip. In this question shrink and swell was used to indicate the immediate effect due to the RCP trip, in an effort to exclude the effects of the Feedwater control system on level. Validators have had trouble with the wording "immediate effect", so shrink and swell was chosen.
SRO justification:	N/A

AOP-4.0, LOSS OF REACTOR COOLANT FLOW

INTRODUCTION

This lesson addresses operator actions necessary to respond to a loss of reactor coolant flow that does not result in a reactor trip and/or a reactor trip is not required. The actions taken will be determined by the resulting plant conditions following the transient. If a loss of reactor coolant flow results in a reactor trip, then the operator will go directly to the EEP-0, "Reactor Trip or Safety Injection." If the loss of coolant flow does not cause a reactor trip in Mode 1 or if the loss of coolant flow occurs while in Modes 2 - 4, the operator will carry out the required actions in accordance with AOP-4.0, "Loss of Reactor Coolant Flow."

DETAILED DESCRIPTION

Partial Loss of Flow

A reactor trip signal is generated if either of the following conditions occurs: a loss of coolant flow occurring in one loop if reactor power is greater than 30% (P-8) or a loss of coolant flow in two loops if reactor power is greater than 10% (P-7). For a discussion on the plant response and operator actions expected, refer to lesson plans OPS-52530A, "EEP-0, Reactor Trip or Safety Injection," and OPS-52531B, "ESP-0.1, Reactor Trip Response."

If the reactor is less than 30% power and there is a loss of coolant flow in one loop (two or more loops if below 10% power), the operator must respond in an efficient manner in order to minimize the effects on primary and secondary systems. In the loop that has lost coolant flow, temperatures will stabilize at approximately the cold leg temperature (T_C) of the unaffected loop(s). This will drop the saturation temperature and pressure of the affected loop's steam generator (SG), causing SG level to drop (shrink), and will also reduce the amount of steaming and power output from the affected SG to a minimum.

Assuming reactor power hasn't changed, the core ΔT must increase to compensate for the reduced mass flow rate through the core. This means that the unaffected loop's hot leg temperature(s) (T_H) increases and cold leg temperature(s) (T_C) remains relatively stable. This

plausibility for DT distracter being higher will effectively increase the unaffected SG's steaming rate and power output to compensate for the reduced steaming rate from the affected SG.

During the transient, the affected SG main feed regulating or bypass feed regulating valve controller(s) is in automatic. Initially, the regulating valve will go shut in response to the reduced steam flow from the affected SG. This causes SG level in the affected SG to begin to fall. Contributing to the drop in SG level is the phenomenon of SG shrink. Shrink is caused by the density change in the tube section of the SG, which occurs as a result of the drop in temperature on the primary side of the affected SG. The drop in indicated level causes the feed valves to reopen fully in an attempt to bring SG level back up. Overfeeding of the affected SG can occur, which could lead to a turbine trip and SG feed pump (SGFP) trips followed by a reactor trip. The turbine trip and SGFP trip occur at 82% SG level (P-14). To minimize the effects a loss of coolant flow has on the affected SG level, the operator is instructed to take manual control of the affected SGs feed regulating valves.

Another concern on any loss of coolant flow situation is pressurizer pressure control. Automatic control of pressurizer pressure will be affected due to the loss of spray flow if the loss of coolant flow occurs in loops A and/or B. If only one loop is involved, the affected loop's spray valve controller should be placed in MANUAL and the valve closed to prevent spray flow from the unaffected loop bypassing the pressurizer. If both A and B loops are affected, auxiliary spray flow should be utilized if normal letdown is available.

The loop flow indications observed by the operators would be as follows: For the affected loop, flow would slowly decrease to 0 and then return to approximately 10%; for the unaffected loops, the flow should increase to approximately 105% (each loop). The flow indication in the idle loop occurs as flow stops and then begins again in the reverse direction. Since flow rates in the RCS loops are derived from the differential pressure felt in an elbow in each loop, any flow at all will be indicated, regardless of the direction. The indication observed in the two loops with the running pumps is due simply to the pumps in those loops picking up a small portion of the flow lost in the idle loop.

17. 015K5.10 017/BANK/RO/C/A 2.8/3.0/015K5.10/N///B

Unit 1 tripped from 75% power with the following conditions:

- N-35, Intermediate Range NI, is overcompensated.

Which one of the following completes the statements below?

N-35 will indicate __(1)__ than actual power.

The Source Range NI's will energize as soon as __(2)__ , Intermediate Range NI, reaches the P-6 setpoint.

	(1)	(2)
A.	lower	N-35
B.✓	lower	N-36
C.	higher	N-35
D.	higher	N-36

Compensation is provided to the Intermediate Range Nuclear Instruments to correct for high Gamma flux when the Neutron flux is low. The high Gamma flux will cause the NI to read higher than actual. An overcompensated channel means that compensating voltage is too high for the channel, cancelling out part of the actual signal, resulting in a **lower** indication than actual power level. When a reactor trip has occurred, the neutron population declines until Permissive P-6 (fed from the Intermediate Range NI's) clears, and the Source Ranges automatically energize. P-6 clearing requires both Intermediate Range NI's N-35 and N-36 to be $<10^{-10}$ amps.

A. Incorrect - First part is correct. Second part is incorrect. N-35 being overcompensated will cause it to read lower than N-36, so N-35 will be $<10^{-10}$ amps first. Once N-36 is $<10^{-10}$ amps, P-6 will clear and the source ranges will energize.

B. Correct - see above.

C. Incorrect - Both parts are incorrect. If N-35 was undercompensated, this would be the correct answer.

D. Incorrect - First part is incorrect, second part is correct. See above.

015K5.10

015 Nuclear Instrumentation System (NIS)

Knowledge of the operational implications of the following concepts as they apply to the NIS:

(CFR: 41.5 / 45.7)

K5.10 Ex-core detector operation 2.8 3.0

Importance Rating:	2.8 / 3.0
Technical Reference:	
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of abnormal plant or equipment conditions associated with the operation of the Excore Nuclear Instrumentation System components and equipment to include the following (OPS-52201D07): Normal control methods Abnormal and Emergency Control Methods Automatic actuation including setpoint (example SI, Phase A, Phase B, MSLIAS, LOSP, SG level) Protective isolations such as high flow, low pressure, low level including setpoint Protective interlocks Actions needed to mitigate the consequence of the abnormality
Question origin:	FNP BANK EXCORE-52201D08 27 - 2007 FNP NRC Exam
Basis for meeting K/A:	K/A is met by testing candidate's knowledge of the operational implications of ex-core Nuclear Instrument N-35 when it is in an overcompensated condition, and its effects on the plant after a Reactor Trip.
SRO justification:	N/A

Effects of Improper Compensation

Refer to Figures 12 and 13. The applied voltage to the inner volume (the compensation voltage) determines how many ion pairs will be collected for each gamma event. The inner volume current will be increased with an increased compensating voltage and decreased with a decreased compensating voltage. An increase or decrease in compensation voltage from the proper value is referred to as overcompensation or under-compensation, respectively.

With neutron flux high in the intermediate range, greater than 10^{-9} amps, the gamma flux becomes so insignificant that a compensation error will have no effect. However, as power decreases, the gamma flux becomes significant.

Overcompensation results in the inner volume gamma current being too high, causing the indicated neutron flux to be too low.

$$(I_{neutron})_{meter}\downarrow = (I_{neutron} + I_{gamma})_{outer\ volume}\rightarrow - (I_{gamma})_{inner\ volume}\uparrow$$

Under-compensation results in the inner volume gamma current being too low, causing the indicated neutron flux to be too high.

$$(I_{neutron})_{meter}\uparrow = (I_{neutron} + I_{gamma})_{outer\ volume}\rightarrow - (I_{gamma})_{inner\ volume}\downarrow$$

Under-compensation or overcompensation would show up on a reactor shutdown or trip. A properly compensated intermediate range (IR) will initially show a prompt drop of about two decades. Following the prompt drop, power will continue to decrease until the idling current causes the indicated intermediate range power to level off at 10^{-11} amps.

An overcompensated channel would act the same way until low in the intermediate range where it would drop off much faster.

An under-compensated channel would start to level off at a higher level than 10^{-11} amps. The worst case would occur if one intermediate range channel stalled above the P-6 set point (10^{-10} amps), preventing the source range from automatically re-energizing. The operators should now manually reset the source range at the MCB.

If these two channels do not read the same following a trip, the SUR is the key to recognizing which channel is improperly compensated. An overcompensated channel will have a more negative SUR than negative one third (-1/3). An under-compensated channel SUR will drop to zero.

18. 022A1.02 018/BANK/RO/C/A 3.6/3.8/022A1.02/N///D

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

- An **LOSP** occurs and 1B Diesel Generator trips.
- Containment pressure is 34 psig due to a steam line break.
- BA1, 1A CTMT CLR FAN FAULT, comes into alarm due to a trip of the 1A Containment Cooler.

Which one of the following completes the statements below?

The __(1)__ CTMT CLR FAN is required to be started per EEP-0, Reactor Trip or Safety Injection.

After the fan is started, Containment Pressure and Temperature __(2)__ exceed design limits.

	(1)	(2)
A.	1C	MAY
B.	1B	MAY
C.	1C	will **NOT**
D.✓	1B	will **NOT**

From TS Bases for 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).

In addition, from Bases 3.3.6 D.1
With two required containment cooling trains inoperable, one of the required containment cooling trains must be restored to OPERABLE status within 72 hours. The components in this degraded condition provide iodine removal capabilities and are capable of providing at least 100% of the heat removal needs after an accident. The 72 hour Completion Time was developed taking into account the redundant heat removal capabilities afforded by combinations of the Containment Spray System and Containment Cooling System, the iodine removal function of the Containment Spray System, and the low probability of DBA occurring during this period.

A. Incorrect - Both parts are incorrect. 1C CTMT CLR FAN has no power available since the 1B DG is tripped, so it cannot be started. 1A CS pump should start under these conditions, and one CS pump running and one ctmt cooler is sufficient to prevent exceeding design for Containment Pressure and Temperature. In addition, the 1B CTMT CLR fan should be started and this will ensure design bases are not exceeded.

B. Incorrect - First part is correct.

Second part is incorrect - see A.

C. Incorrect - First part is incorrect - see A.

Second part is correct - see A.

D. Correct - Both parts correct - see A.

022A1.02

022 Containment Cooling System (CCS)

Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCS controls including:
(CFR: 41.5 / 45.5)
A1.02 Containment pressure 3.6 3.8

Importance Rating:	3.6 / 3.8
Technical Reference:	Tech Spec Bases 3.6.6
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the Containment Spray and Cooling System components and equipment, to include the following (OPS-40302D07): Normal Control Methods Abnormal and Emergency Control Methods Automatic actuation including setpoint (example SI, Phase-B, LOSP) and the effect of selecting the containment cooler control to local. Protective isolations such as high flow, low pressure, low level including setpoint Protective interlocks Actions needed to mitigate the consequence of the abnormality
Question origin:	FNP BANK CS&COOL-62102C02 04
Basis for meeting K/A:	K/A is met by having candidate monitor parameters associated with operation of the Containment Spray and Cooling system. As a result, candidate must show the ability to operate components when there is a component failure, and determine if design limits associated with Containment pressure will be exceeded.
SRO justification:	N/A

BASES

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.

BASES

ACTIONS

B.1 and B.2 (continued)

to reach MODE 5 allows additional time for attempting restoration of the containment spray train and is reasonable when considering the driving force for a release of radioactive material from the Reactor Coolant System is reduced in MODE 3.

C.1

With one of the required containment cooling trains inoperable, the inoperable required containment cooling train must be restored to OPERABLE status within 7 days. The components in this degraded condition provide iodine removal capabilities and are capable of providing at least 100% of the heat removal needs. The 7 day Completion Time was developed taking into account the redundant heat removal capabilities afforded by combinations of the Containment Spray System and Containment Cooling System and the low probability of DBA occurring during this period.

The 10 day portion of the Completion Time for Required Action C.1 is based upon engineering judgment. It takes into account the low probability of coincident entry into two Conditions in this Specification coupled with the low probability of an accident occurring during this time. Refer to Section 1.3 for a more detailed discussion of the purpose of the "from discovery of failure to meet the LCO" portion of the Completion Time.

D.1

With two required containment cooling trains inoperable, one of the required containment cooling trains must be restored to OPERABLE status within 72 hours. The components in this degraded condition provide iodine removal capabilities and are capable of providing at least 100% of the heat removal needs after an accident. The 72 hour Completion Time was developed taking into account the redundant heat removal capabilities afforded by combinations of the Containment Spray System and Containment Cooling System, the iodine removal function of the Containment Spray System, and the low probability of DBA occurring during this period.

(continued)

19. 022A3.01 019/NEW/RO/M 4.1/4.3/022A3.01/N//D

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

At 10:00:

- All containment fan coolers are operating in FAST speed.

At 10:05:

- A manual Reactor Trip and SI was actuated due to a steam leak inside Containment.

Which one of the following describes the expected operation of the Containment Coolers?

The Containment Coolers will be operating in __(1)__ speed.

The Containment Cooler discharge dropout plate will open when the Containment __(2)__ .

	(1)	(2)
A.	FAST	pressure reaches 4 psig
B.	SLOW	pressure reaches 4 psig
C.	FAST	temperature reaches 135°F
D.✓	SLOW	temperature reaches 135°F

All Containment Cooler fans start upon a SI signal, and will start in slow speed. The Containment Cooler fan dropout plate fusible link will melt based on Containment temperature of 135°F.

A. Incorrect - 1) incorrect, plausible because fans were previously operating in fast speed. Candidate must know that a SI signal shifts the Containment Cooler fans to slow speed.
2) incorrect, candidate must know that the dropout plate opens based on Containment temperature >135°F, not based on Containment pressure.

B. Incorrect - 1) correct, Containment Cooler fans shift to slow speed upon receipt of an SI signal.
2) incorrect, see A.2.

C. Incorrect - 1) incorrect, see A.1.
2) correct, the dropout plate opens based on Containment temperature of 135°F causing a fusible link to melt.

D. Correct - fans shift to slow speed and the fusible link melts to open the dropout plate at 135°F.

022 Containment Cooling System (CCS)
Ability to monitor automatic operation of the CCS, including:
(CFR: 41.7 / 45.5)
A3.01 Initiation of safeguards mode of operation 4.1 4.3

Importance Rating:	4.1 / 4.3
Technical Reference:	
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the Containment Spray and Cooling System components and equipment, to include the following (OPS-40302D07): Normal Control Methods Abnormal and Emergency Control Methods Automatic actuation including setpoint (example SI, Phase-B, LOSP) and the effect of selecting the containment cooler control to local. Protective isolations such as high flow, low pressure, low level including setpoint Protective interlocks Actions needed to mitigate the consequence of the abnormality
Question origin:	FNP Bank CS&COOL-40302D02 08
Basis for meeting K/A:	K/A is met by giving candidate conditions for an ESF actuation of the Containment cooling system. Candidate must be able to determine how the Coolers should operate during Emergency conditions.
SRO justification:	N/A

CONTAINMENT SPRAY AND COOLING

GENERAL DESCRIPTION

Containment Spray System

The containment spray system (Figures 1 and 3) consists of two pumps, two spray ring headers, and the required piping and valves to complete the separate and redundant headers.

The containment spray system has two modes of operation, the injection phase and the recirculation phase.

During normal plant operation, the spray pump suctions are aligned to the refueling water storage tank (RWST) with the motor-operated valves on the pump discharge closed. Upon the receipt of a spray actuation signal (P-signal - a high containment pressure =/>27 psig), the pumps start, the discharge valves open and water is pumped from the RWST to the containment spray headers.

As the lower elevations of containment fill during the injection phase, crystals of trisodium phosphate (TSP) contained in the three baskets, located on the lower elevation of containment, perform the function of raising the pH.

The containment spray pump discharges to the spray ring headers, which encircle the inside of the containment dome. Each ring header contains spray nozzles aimed in various predetermined directions to ensure maximum spray coverage of the containment. The ring header's design provides coverage of the containment even if one spray pump does not start on demand.

Upon receiving the low-low level alarm in the RWST, the spray system will be manually aligned to take a suction from the containment sump by opening the sump suction valves for each pump and closing the suction from the RWST.

Adequate instrumentation allows verification of proper operation of all portions of the spray system.

Containment Cooling System (Figure 2)

The containment cooling system consists of four 2-speed fan cooler units and the required ductwork, all located inside containment.

During normal operation, the fan cooler units will provide adequate cooling and mixing of the containment atmosphere. During accident conditions, the fan coolers provide the required cooling and depressurization of the containment. Each cooler was originally designed to handle 1/3 of the normal containment heat load.

Each fan cooler unit consists of a 2-speed fan and a finned cooling coil, which is supplied with service water. During normal operation, each fan takes a suction at the 155-foot elevation of the containment. The air then flows through an inlet screen, over the cooling coils through the fan, past the normally closed dropout damper, and into a common discharge header. The discharge header distributes the cooled air to the lower regions of containment via distribution ductwork. During this mode of operation, the fans are in fast speed with service water being supplied to each cooling coil.

Upon receipt of a safety injection signal (SIS), the fan coolers operating in fast speed will stop. If a loss of off-site power has occurred, the selected fan cooler in each train will automatically start in slow speed. With off-site power available, all available fan coolers will automatically start in slow speed. The fans run in slow speed to protect them from motor overload in a steam environment. The service water flow will automatically increase to 2000 gallons per minute per cooling unit, thus increasing the cooling capacity of the fan coolers. Each fan discharge duct has a dropout type damper held in place by fusible links. If the temperature reaches 135°F, the fusible link will fail open, the damper will drop out, and the backpressure on the fan will be reduced to provide free flow through the fan.

The fan coolers can be controlled locally at their respective load center or remotely from the main control board (MCB). The service water valves are controlled from the MCB and the balance of plant (BOP) panel. The outlet damper opens and closes automatically when starting or stopping the fan. Appropriate instrumentation on the main control board determines proper operation in both the normal and emergency mode.

20. 025AK1.01 020/NEW/RO/C/A 3.9/4.3/APE025AK1.01/N//B

The following conditions exist on Unit 1:

- Mode 6.
- The RCS level is at midloop.
- Both RHR pumps are in operation.
- Low Pressure Letdown is in service on A Train.

At 10:00:
The 1A RHR pump is in the following configuration:
- HIK-603A, 1A RHR HX DISCH VLV, is 0%.
- FK-605A, 1A RHR HX BYP FLOW, is in manual with 75% demand.

The 1B RHR pump is in the following configuration:
- HIK-603B, 1B RHR HX DISCH VLV, is 50%.
- FK-605B, 1B RHR HX BYP FLOW, is in manual with 25% demand.

At 10:05:
- 1A RHR pump trips.

Which one of the following completes the statement below?

RCS level will __(1)__ , and RCS temperature will __(2)__ .

	(1)	(2)
A.	increase	increase
B.✓	increase	remain the same
C.	remain the same	remain the same
D.	remain the same	increase

1A RHR pump is running and supplying Low Pressure Letdown, but is not providing cooling (the RHR Heat Exchanger Bypass valve is the only one open). 1B RHR pump is providing cooling. When 1A RHR pump trips, low pressure letdown goes away, so charging flow will raise RCS level. Since 1A RHR pump is not providing cooling, RCS temperature will not change.

A. Incorrect - First part is correct. See B.

Second part is incorrect: Given the conditions, candidate may incorrectly determine that RCS temperature will increase due to the valve configuration for RHR cooling. This part would be correct if 1B RHR pump had tripped.

B. Correct - With 603A closed and 605A open, the 1A RHR pump is in an alignment for providing flow through the core, but no cooling. In addition, the low pressure letdown valve (V013A) is open supplying low pressure letdown. When the RHR pump trips, core cooling will not be affected, but there will no longer be any low pressure letdown. Charging flow will cause RCS level to rise and RCS temperature will remain the same.

C. Incorrect - First part is incorrect. This would be true if the 1B RHR pump had tripped. See B.

Second part is correct per B.

D. Incorrect - Both parts incorrect.

025AK1.01

APE: 025 Loss of Residual Heat Removal System (RHRS) :

Knowledge of the operational implications of the following concepts as they apply to Loss of Residual Heat Removal System:

(CFR 41.8 / 41.10 / 45.3)

AK1.01 Loss of RHRS during all modes of operation 3.9 4.3

Importance Rating:	3.9 / 4.3
Technical Reference:	None
References provided:	None
Learning Objective:	EVALUATE plant conditions and DETERMINE if entry into AOP-12.0, RHR System Malfunction and/or STP-18.4, Containment Closure is required. (OPS-52520L02)
Question origin:	NEW
Basis for meeting K/A:	K/A is met by evaluation of the operational implications and effects on the RCS upon the trip of a running RHR pump. Conditions are given with one RHR pump running and providing core cooling, while another RHR pump is running and providing Low Pressure letdown, but not providing core cooling. Candidate must determine the effects on RCS temperature and RCS level upon the trip of the RHR pump that is providing low pressure letdown.
SRO justification:	N/A

RESIDUAL HEAT REMOVAL

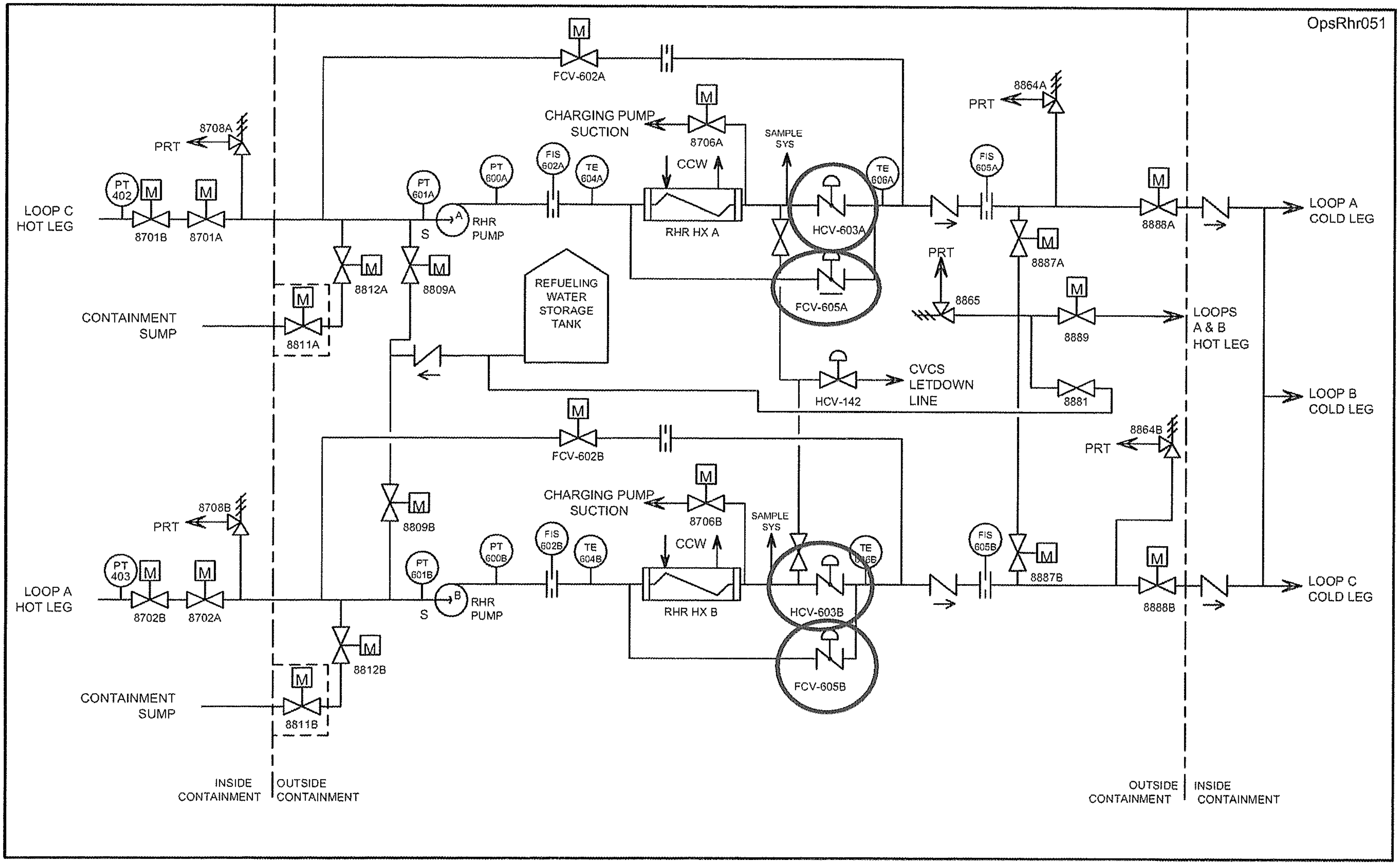


Figure 2 - Residual-Heat Removal System

21. 026AA1.06 021/NEW/RO/C/A 2.9/2.9/APE026AA1.06/N///C

Unit 1 is at 75% power with the following conditions:

- Automatic control of TK-144, LTDN HX OUTLET TEMP, has failed.
- Letdown temperature is 150°F and rising.

Which one of the following completes the statements below?

The alarm expected for this condition is __(1)__ .

The appropriate ARP will direct the operator to place TK-144 in MANUAL and __(2)__ controller demand.

	(1)	(2)
A.	DF1, LTDN TO DEMIN DIVERTED-TEMP HI	raise
B.	DE1, REGEN HX LTDN FLOW DISCH TEMP HI	raise
C✓	DF1, LTDN TO DEMIN DIVERTED-TEMP HI	lower
D.	DE1, REGEN HX LTDN FLOW DISCH TEMP HI	lower

TK-144 temperature controller is human factored to raise temperature by raising output, and lower temperature by lowering output. Actual valve position will go closed when demand is raised and open when demand is lowered. This is different than the normal effect on a valve being controlled. Candidate must understand the effects from his actions to operate the controller properly.

Both annunciators are Letdown Hi temperature alarms. One comes in upon a loss of Charging flow, the other comes in upon a loss of cooling to the Letdown Heat Exchanger.

A. Incorrect - 1) correct, this annunciator would come in to alert the operator to high letdown temperature on the outlet of the Letdown Heat Exchanger.

2) incorrect, this action would be taken to raise Letdown temperature.

B. Incorrect - 1) incorrect, This alarm would come in on a loss of Charging flow and would **not** come in on a loss of cooling to the Letdown Heat Exchanger. Plausible because it is also a Letdown flow Hi temperature alarm.

2) incorrect, see A.2.

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

2) correct, demand would be lowered to lower Letdown temperature.

D. Incorrect - 1) incorrect, see B.1
2) correct, see C.1.

026AA1.06

APE: 026 Loss of Component Cooling Water (CCW):
Ability to operate and / or monitor the following as they apply to the Loss of Component Cooling Water:
(CFR 41.7 / 45.5 / 45.6)
AA1.06 Control of flow rates to components cooled by the CCWS 2.9 2.9

Importance Rating:	2.9 / 2.9
Technical Reference:	FNP-1-ARP-1.4 v51
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the Chemical and Volume Control System components and equipment, to include the following (OPS-40301F07): Normal Control Methods Abnormal and Emergency Control Methods (Changes in system flow rates, Loss of control from the control room) Automatic actuation including setpoints (examples - Reactor Trip, SI, Phase A, LOSP/loss of all AC power) Actions needed to mitigate the consequence of the abnormality.
Question origin:	NEW
Basis for meeting K/A:	K/A is met by evaluation of the ability of a candidate to monitor and control restoration of CCW flow to the Letdown Heat Exchanger. A failure caused a loss of CCW to the Letdown Heat Exchanger and would cause DF1 to annunciate. Candidate must demonstrate ability to operate TK-144 to restore cooling to the Letdown Heat Exchanger.
SRO justification:	N/A

LOCATION DE1

SETPOINT: 365°F

E1	REGEN HX LTDN FLOW DISCH TEMP HI

ORIGIN: Temperature Bistable TB-140 from Temperature Element (N1E21TE140-N)

PROBABLE CAUSE

1. Low Charging Flow.

AUTOMATIC ACTION

NONE

OPERATOR ACTION

CAUTION: If actual VCT level is low, refer to annunciator DF3. (SOER 97-1)

1. Determine actual letdown flow temperature as indicated by TI-140 (REGEN HX Outlet Temp) on the MCB.

2. Monitor charging and letdown flows and temperatures.

3. IF the cause is determined to be a CVCS malfunction, THEN go to FNPAOP-16.0, CVCS MALFUNCTION.

4. Refer to FNP-1-SOP-2.1, CHEMICAL AND VOLUME CONTROL SYSTEM PLANT STARTUP AND OPERATION.

5. IF operating at a minimum Charging Flow rate, THEN;
   a) Verify that the Letdown Flow is being cooled below 380°F.
   b) Adjust Charging or Letdown Flow, if required, to lower the temperature.

6. Correct the cause of the alarm and return the system to normal as soon as possible.

References: A-177100, Sh. 201; D-175039, Sh. 1; U-175992; PLS Document

LOCATION DF1

SETPOINT: 135°F

F1	LTDN TO DEMIN DIVERTED-TEMP HI

ORIGIN: 1-TY-143X Auxiliary Relay actuated by Temperature Bistable (N1E21TB143)

PROBABLE CAUSE

1. Low or Loss of CCW Flow to the Letdown Heat Exchanger.
2. Letdown Flow greater than Charging Flow.

AUTOMATIC ACTION

1. Letdown High Temperature Divert Valve Q1E21TCV143 diverts Letdown Flow to the VCT. {CMT 0008644}

OPERATOR ACTION

1. Verify Q1E21TCV143 has diverted letdown flow to VCT to bypass demins

2. Monitor charging and letdown flows and temperatures.

3. Take manual control of LTDN HX Outlet Temp TK-144 and attempt to increase CCW flow to the Letdown Heat Exchanger.

4. Adjust charging or letdown flow as required to reduce the letdown flow temperature.

5. IF cause for the elevated temperature has been corrected, THEN refer to FNP-1-SOP-2.1, CHEMICAL AND VOLUME CONTROL SYSTEM PLANT STARTUP AND OPERATION to return TCV143 to DEMIN.

6. IF letdown temperature can NOT be reduced, THEN close LTDN ORIF ISO 45 (60) GPM Q1E21HV8149A, B, and C.

NOTE: Transients that will require boration or dilution should be avoided if letdown has been secured.

7. IF a ramp is in progress, THEN place turbine load on HOLD

8. Go to FNP-1-AOP-16.0, CVCS MALFUNCTION to address the loss of letdown flow.

References: A-177100, Sh. 206; D-175039, Sh.2; D-177091; D-177375; U-175997; PLS Document

Chemical And Volume Control

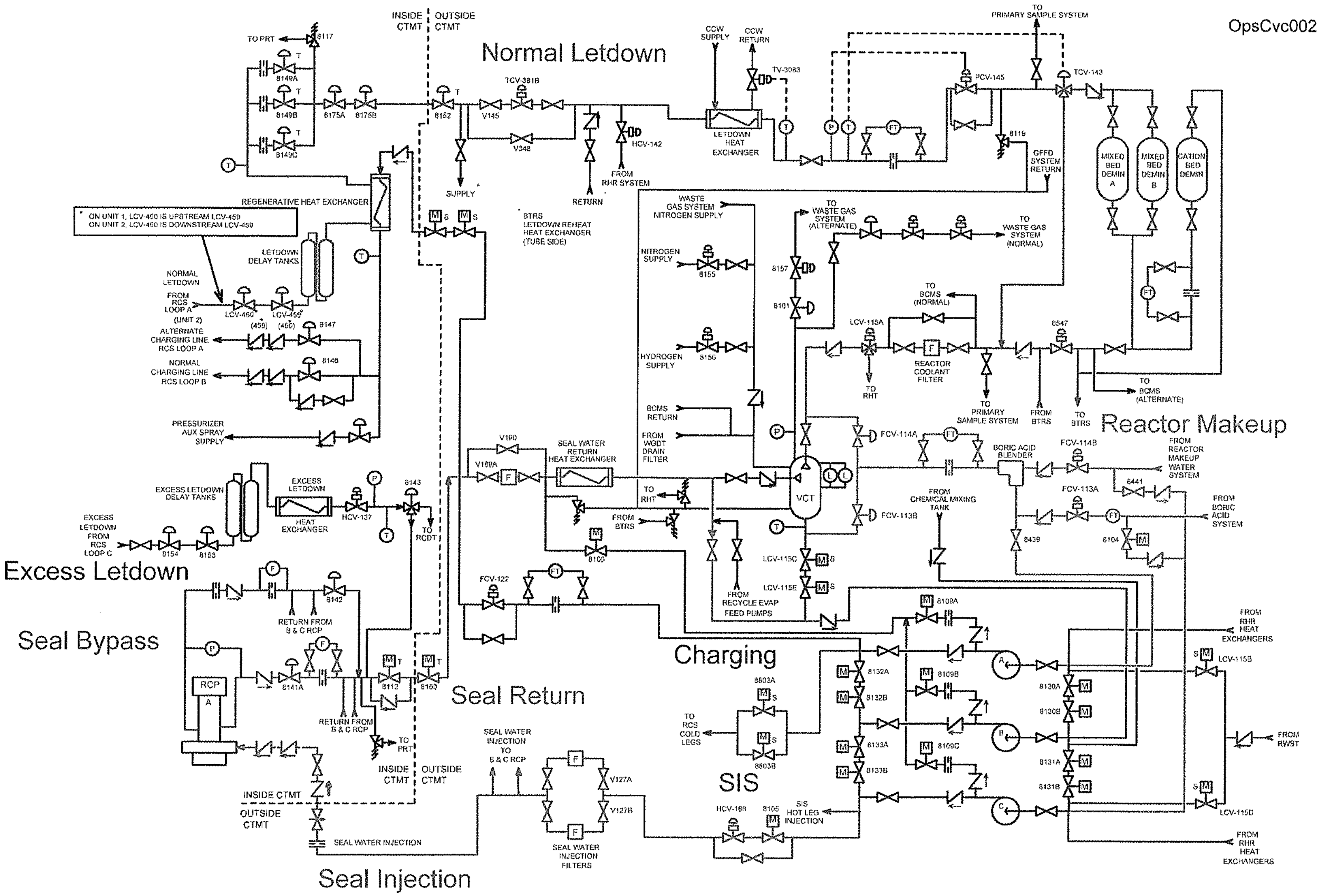


Figure 3 - Chemical And Volume Control System

Excess Letdown Flow Divert Valve (8143)

A two-position switch (VCT/RCDT) controls the valve. Valve position indication lights are located above the switch. In the RCDT position, the actuation air solenoid valve is energized to position the divert valve to the RCDT. In the VCT position, the solenoid is de-energized and the valve is positioned to direct flow to the VCT.

Excess Letdown Flow Control Valve (HCV-137)

This valve is controlled by REMOTE/MANUAL setpoint station HIK-137. Fully open corresponds to a station setpoint setting of 0%.

Seal Injection Flow Control Valve (HCV-186)

This valve is controlled by REMOTE/MANUAL setpoint station HIK-186. Fully open corresponds to a station setpoint setting of 100%.

Letdown Heat Exchanger Discharge Temperature Control Valve TV-3083 (also called TCV-144 and TCV-3083)

The control valve is controlled from a MANUAL/AUTO (MA) station TK-144. In AUTO control, the MA station potentiometer should be set at 3.30, which corresponds to 100°F. The setpoint is variable from 50°F to 200°F (which corresponds to 0.0 to 10.0 on the potentiometer). In MANUAL control, an output of 100% corresponds to the valve being fully closed. Both Unit's have procedural guidance for controlling Letdown Temperature on TV-3083 manual bypass valve OR by placing TV-3083 operator on the manual jacking device.

Pressure Control Valve (PCV-145)

This valve is controlled by MA station PK-145. In AUTO control, the MA station should be set to maintain between 260 and 450 psig. The setpoint is variable from 0 to 600 psig (which corresponds to 0.0 to 10.0 on the potentiometer). In MANUAL control, a controller output of 100% corresponds to the valve being fully closed.

22. 026G2.4.50 022/NEW/RO/MEM 4.2/4.0/026G2.4.50/N///B

Unit 1 tripped from 100% power with the following conditions:

- Safety Injection is in progress due to a Large Break LOCA.
- Containment Spray has actuated.
- The following MCB annunciators are in alarm:
  - CH4, RWST LVL A TRN LO-LO
  - CH5, RWST LVL B TRN LO-LO

Which one of the following completes the statements below?

The setpoint for the RWST LO-LO alarms is __(1)__ .

The operator is required to __(2)__ using ESP-1.3, Transfer to Cold Leg Recirculation.

	(1)	(2)
A.	4'6"	verify the CS sump suction MOV's automatically opened
B.✓	4'6"	open the CS sump suction MOV's
C.	12'6"	verify the RHR sump suction MOV's automatically opened
D.	12'6"	open the RHR sump suction MOV's

Per the Annunciator Response Procedure, the RWST LEVEL LO LO alarms come in at 4'7"+/- 1", and the procedure directs the operator to refer to ESP-1.3 for transfer of Containment Spray to Sump recirculation.

A. Incorrect - First part is correct for level associated with the alarm.

Second part is incorrect, but plausible. Ctmt Spray sump suction MOV's don't open automatically on low RWST level, but the RHR sump suction MOV's do.

B. Correct - per ARP-1.3, for CH4 and CH5. see above.

C. Incorrect - First part is incorrect, but plausible. Annunciators come in at 12'6" for RWST LVL LO, not LO LO.

Second part is incorrect, but plausible. RHR suction MOV's open automatically at 4'6", but not at 12'6".

D. Incorrect - First part is incorrect see C.1

Second part is incorrect, but plausible. When the ctmt sump level = 12'6" then ESP-1.3 is entered.

~~026G2.4.50~~

026 Containment Spray System (CSS)

2.4 Emergency Procedures / Plan

2.4.50 Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.
(CFR: 41.10 / 43.5 / 45.3) IMPORTANCE RO 4.2 SRO 4.0

Importance Rating:	4.2 / 4.0
Technical Reference:	FNP-1-ARP-1.3 V28
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the Containment Spray and Cooling System components and equipment, to include the following (OPS-40302D07): Normal Control Methods Abnormal and Emergency Control Methods Automatic actuation including setpoint (example SI, Phase-B, LOSP) and the effect of selecting the containment cooler control to local. Protective isolations such as high flow, low pressure, low level including setpoint Protective interlocks Actions needed to mitigate the consequence of the abnormality
Question origin:	NEW
Basis for meeting K/A:	K/A is met by placing a candidate in a condition with a Containment Spray actuation and annunciators in alarm for low RWST level. Candidate has to determine the actual RWST level setpoint and actions required as a result of the low level alarm per the Annunciator Response Procedure.
SRO justification:	N/A

LOCATION CH2

H2
RWST LVL A TRN LO

SETPOINT: 12′7″ ± 1″ above Tank Bottom
(150,000 Gallons)

ORIGIN: Level Transmitter Q1F16LT-501 through a comparator card bistable designated LSL503 in BOP Cabinet J.

PROBABLE CAUSE

1. RWST in use for Safety Injection purposes.
2. RWST in use for Refueling purposes.
3. Failed Level Transmitter.

AUTOMATIC ACTION

NONE

OPERATOR ACTION

1. IF an ECCS actuation signal is present, THEN refer to FNP-1-ESP-1.3, TRANSFER TO COLD LEG RECIRCULATION.
2. Determine actual tank level as indicated by LI-4075A & B, on the MCB OR the local level indicator on the side of the RWST.
3. IF an ECCS Actuation Signal is NOT present OR the tank is NOT being used for Refueling, THEN notify appropriate personnel to determine and correct the cause of the alarm.
4. IF required, THEN restore RWST level to normal per FNP-1-SOP-2.3, CHEMICAL AND VOLUME CONTROL SYSTEM REACTOR MAKEUP CONTROL SYSTEM, section 4.2.3.
5. Refer to Technical Specification 3.3.3 for LCO requirements.

References: A-177100, Sh. 177; A-170750, Pg. 95; D-173497; Technical Specifications

LOCATION CH3

H3	RWST LVL B TRN LO

SETPOINT: 12'7" ± 1" above Tank Bottom (150,000 Gallons)

ORIGIN: Level Transmitter Q1F16LT502 through a comparator card bistable designated LSL504 in BOP Cabinet K.

PROBABLE CAUSE

1. RWST in use for Safety Injection purposes.
2. RWST in use for Refueling purposes.
3. Failed Level Transmitter.

AUTOMATIC ACTION

NONE

OPERATOR ACTION

1. If an ECCS actuation signal is present, THEN refer to FNP-1-ESP-1.3. TRANSFER TO COLD LEG RECIRCULATION.
2. Determine actual tank level as indicated by LI-4075A & B, on the MCB OR the local level indicator on the side of the RWST.
3. IF an ECCS Actuation signal is NOT present OR the tank is NOT being used for Refueling, THEN notify appropriate personnel to determine and correct the cause of the alarm.
4. IF required, THEN restore RWST level to normal per FNP-1-SOP-2.3, CHEMICAL AND VOLUME CONTROL SYSTEM REACTOR MAKEUP CONTROL SYSTEM, section 4.2.3.
5. Refer to Technical Specification 3.3.3 for LCO requirements.

References: A-177100, Sh. 178; A-170750, Pg. 95; B-170058, Sh. 72; D-173497; Technical Specifications

LOCATION CH4

H4
RWST LVL A TRN LO-LO

SETPOINT: 4′7″ ± 1″ above Tank Bottom
(50,000 Gallons)

ORIGIN: Level Transmitter Q1F16LT501 through a comparator card bistable designated LSL505 in BOP Cabinet J.

PROBABLE CAUSE

1. RWST in use for Safety Injection purposes.
2. RWST in use for Refueling purposes.
3. Failed Level Transmitter.

AUTOMATIC ACTION

NOTE: The automatic opening of the containment sump to LHSI valves uses separate RWST level switches. These switches (Q1F16LS507 for Q1E11MOV8811A and Q1F16LS508 for Q1E11MOV8812A) are set at the same setpoint as this alarm. Since different level switches accomplish the valve opening action, failure of the instrumentation associated with this alarm would not affect the valve opening function.

1. IF \`S' Signal present, THEN ECCS valve Switchover occurs.

OPERATOR ACTION

1. IF an ECCS actuation signal is present, THEN refer to FNP-1-ESP-1.3, TRANSFER TO COLD LEG RECIRCULATION, for transfer of containment spray to sump recirculation.
2. Determine actual tank level as indicated BY LI-4075A & B, on the MCB.
3. IF an ECCS Actuation signal is not present OR the tank is not being used for Refueling, THEN notify appropriate personnel to determine and correct the cause of the alarm.
4. Restore RWST level to normal, IF required per FNP-1-SOP-2.3, CHEMICAL AND VOLUME CONTROL SYSTEM REACTOR MAKEUP CONTROL SYSTEM, section 4.2.3.
5. Refer to Technical Specification 3.3.3 for LCO requirements.

References: A-177100, Sh. 179; A-170750, Pg 95a; D-173497; B-170058, Sh. 72;Technical Specifications

LOCATION CH5

H5
RWST LVL B TRN LO-LO

SETPOINT: 4′7″ ± 1″ above Tank Bottom
(50,000 Gallons)

ORIGIN: Level Transmitter Q1F16LT502 through a comparator card bistable designated LSL506 in BOP Cabinet K.

PROBABLE CAUSE

1. RWST in use for Safety Injection purposes.
2. RWST in use for Refueling purposes.
3. Failed Level Transmitter.

AUTOMATIC ACTION

NOTE: The automatic opening of the containment sump to LHSI valves uses separate RWST level switches. These switches (Q1F16LS515 for Q1E11MOV8811B and Q1F16LS516 for Q1E11MOV8812B) are set at the same setpoint as this alarm. Since different level switches accomplish the valve opening action, failure of the instrumentation associated with this alarm would not affect the valve opening function.

1. IF 'S' signal present, THEN ECCS valve Switchover occurs.

OPERATOR ACTION

1. IF an ECCS actuation signal is present, THEN refer TO FNP-1-ESP-1.3, TRANSFER TO COLD LEG RECIRCULATION, for transfer of containment spray to sump recirculation.
2. Determine actual tank level as indicated by LI-4075A & B, on the MCB.
3. IF an ECCS Actuation signal is not present OR the tank is not being used for Refueling, THEN notify appropriate personnel to determine and correct the cause of the alarm.
4. Restore RWST level to normal, IF required per FNP-1-SOP-2.3, CHEMICAL AND VOLUME CONTROL SYSTEM REACTOR MAKEUP CONTROL SYSTEM, section 4.2.3.
5. Refer to Technical Specification 3.3.3 for LCO requirements.

References: A-177100, Sh. 180; A-170750, Pg. 95a; D-173497; B-170058, Sh. 72; Technical Specification

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	10.2 <u>IF</u> unable to open a containment sump suction isolation valve, <u>THEN</u> perform the following: 10.2.1 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 10.2.2 Verify closed BOTH containment sump suction isolation valves in affected train. CTMT SUMP TO 1A CS PUMP [] Q1E13MOV8826A [] Q1E13MOV8827A CTMT SUMP TO 1B CS PUMP [] Q1E13MOV8826B [] Q1E13MOV8827B

Step 10 continued on next page.

23. ~~026K4.01 023/MOD/RO/M 4.2/4.3/026K4.01/N//B~~

Which one of the following design features prevents clogging of the Containment Spray nozzles during the Recirculation Phase following a design basis LOCA?

A. A vortex breaker blocks debris entry to the sump suction piping.

B.✓ The containment sump suction screens will block debris entry to the sump suction piping.

C. The containment sump suctions are located above the containment floor to prevent debris entry.

D. The spray nozzles are a non pluggable orifice design that will maintain spray flow under any condition.

A. Incorrect - Plausible because anti-vortex blades are present in the sump suction to improve flow conditions to the pumps, thus minimizing the potential for cavitation.

B. Correct - Containment sump suction screens are designed to "prevent solid material larger than the smallest containment spray nozzle orifice from entering the pumps".

C. Incorrect - The FSD does indicate that the design of the sump suction promotes settling of debris, but this is not the factor that prevents nozzle clogging.

D. Incorrect - Nozzles are not subject to clogging by particles $\leq$ 1/4", but they are not a non pluggable orifice.

026K4.01

026 Containment Spray System (CSS)

Knowledge of CSS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)

K4.01 Source of water for CSS, including recirculation phase after LOCA 4.2 4.3

Importance Rating:	4.2 / 4.3
Technical Reference:	RHR FSD A-181002 (contains info on sump suction screens), Containment Spray FSD A-181008 (contains info on discharge nozzles)
References provided:	None
Learning Objective:	RELATE AND IDENTIFY the operational characteristics including design features, capacities and protective interlocks for the components associated with the Containment Spray and Cooling System to include the components found on Figure 2, Containment Cooling System, Figure 3, Containment Spray System and Figure 4, Service Water to Containment Coolers and the following (OPS-40302D02): Containment Cooler Service Water Inlet Isolation Valves (MOV-3019A, B, C, and D) Trisodium Phosphate Baskets
Question origin:	FNP BANK CS&COOL-40302D02 05
Basis for meeting K/A:	K/A is met by evaluating candidate's knowledge of a design feature of the Containment Spray system that ensures that a source of water is maintained for spray nozzle discharge flow during the recirculation phase after a LOCA.
SRO justification:	N/A

4.2.2 Functional Requirements

The high-high sump level alarm set point shall be set to provide early warning of flood levels approaching the CSS pump electrical motor (Reference 6.7.008).

4.3 CONTAINMENT SUMPS

For containment sump design information, see the RHR-FSD (A-181002).

4.0 STRUCTURAL DESIGN FEATURES

4.1 CONTAINMENT RECIRCULATION SUMP

4.1.1 Basic Functions

4.1.1.1 The containment recirculation sump is a collecting reservoir designed to provide an adequate supply of water, with a minimum amount of particulate matter, to the containment spray system and RHRS. (References 6.1.34 and 6.2.2)

4.1.1.2 During the safety injection and recirculation modes of the RHRS, the containment sump level is monitored by LT/LQ/LI-3594A and LT/LQ/LR-3594B. These level monitoring/recording channels have a 10-foot span, with the zero level located at Elevation 106'-6". This corresponds to a water volume from 62,000 to 622,000 gallons. The instruments do not indicate down to zero gallons per the requirements of Regulatory Guide 1.97 because of physical constraints of the transmitters. This is satisfactory since no operator actions are required in the range of 0 to 62,000 gallons. (Reference 6.7.45, 6.4.61, and 6.4.62)

4.1.2 Functional Requirements

4.1.2.1 Separate sump intakes must be provided to serve each of the redundant trains of the ECCS and containment spray systems. The redundant sump intakes must be physically separated from each other. (References 6.1.34 and 6.2.2)

4.1.2.2 The sump intakes must be designed such that vortexing and the ingestion of air in the sump intake line will not occur, which could reduce NPSH for the RHR and containment spray pumps below acceptable limits. (References 6.1.34, 6.1.36, 6.3.2.14 and 6.2.2)

4.1.2.3 Each sump intake must be protected by trash racks and screens or equivalent component(s) to prevent solid material larger than the smallest containment spray nozzle orifice from entering the pumps. (References 6.1.36 and 6.2.2)

4.1.2.4 The sump must be designed to yield low fluid velocities in the vicinity of the pump intakes to promote settling of debris and to minimize pressure drops through the protective screens. (References 6.1.34 and 6.2.2)

4.1.2.5 The protective screens and associated structures must be designed to withstand seismic events without loss of function. (References 6.1.34 and 6.2.2)

4.1.3 Environmental Qualification Requirements

The level transmitters are required to be environmentally qualified as detailed in the Master List of Environmental Qualified Equipment and EQ Package 16A to ensure they can perform their post-accident functions of providing sump level indication. (References 6.7.28, 6.7.29, and 6.7.60)

4.1.4 I&C Requirements

4.1.4.1 The level transmitters shall be environmentally qualified in accordance with Regulatory Guide 1.97. (References 6.7.16 and 6.7.45)

4.1.4.2 The redundant level indication channels shall be independent, and powered from un-interruptible or standby electrical buses. (References 6.7.45 and 6.7.46)

4.1.4.3 The LT-3594A loop receives power from AC Pnl l(2)J (Bkr 10), which is powered from the station batteries through an inverter, or from a backup diesel generator-backed AC bus. Selection of source is controlled by a mechanical transfer switch. The LT-3594B loop receives power from AC Pnl l(2)K (Bkr 10), which is similarly powered from an independent train. (References 6.7.45 and 6.4.28)

4.2 SUMP INTAKE LINE

4.2.1 Basic Functions

Each RHR pump is equipped with an intake line from its associated recirculation sump intake. These lines are designed to ensure minimum pressure drop through the piping to support NPSH requirements for the pumps as well as incorporating features to preserve containment integrity. (Reference 6.7.31)

4.2.2 Functional Requirements

4.2.2.1 Each pump suction line must be installed with a continuous slope from the sump to the pump intake to ensure free venting of air. (Reference 6.1.34)

4.2.2.2 The suction lines shall be as direct as possible and contain a minimum number of elbows to ensure adequate NPSH for the RHR pumps. (Reference 6.2.2)

4.2.2.3 Suction lines shall be shielded with walls to permit access to the room for maintenance after a LOCA while the redundant pumps are operating in the post-LOCA condition. (Reference 6.4.66, 6.4.67, and 6.7.74)

4.2.2.4 Encapsulation vessels shall completely encapsulate the sump isolation valves closest to containment. Encapsulation vessels and suction line guard piping shall be designed to meet Seismic Category I requirements. This is necessary to mitigate the consequences of postulated accidents. The function of these components is only to contain post-LOCA leakage from a credible passive failure in the sump suction line up to and including the first isolation valves. (References 6.7.40, 6.7.41, and 6.4.27)

4.2.2.5 The sump suction line must be welded to the containment liner to ensure containment integrity.

4.2.2.6 Encapsulation vessels and suction line guard piping are located outside containment and are not credited as part of the containment boundary; therefore, containment leakage testing is not required for encapsulation vessels and suction line guard piping. (References 6.4.68, 6.4.69, 6.4.70, 6.4.71 and 6.1.36)

4.3 MISSILE PROTECTION FEATURES

Structures, systems, and components important to safety shall be appropriately protected against the effects of missiles that may result from equipment failures and from events and conditions outside the nuclear power unit.

The RHRS components are located to take advantage of the structural shielding capability of the plant. The RHRS components are located to provide train separation. Each RHR pump is in a separate room such that a hazard will not disable both pumps. (References 6.1.7, 6.1.16 and 6.7.32)

3.1.7.2 The CSS pumps and room coolers (QE16H002A, B) shall be interlocked to operate simultaneously when the switch is on "AUTO" (Reference 6.4.009).

3.1.7.3 The ESFAS shall initiate actuation of the CSS pumps on a "P" signal (Reference 6.2.001).

3.2 DELETED

3.3 DELETED

3.4 DELETED

3.5 SPRAY NOZZLES

3.5.1 Basic Functions

The spray nozzles shall provide a large surface area of water to decrease containment pressure and remove fission products from the containment atmosphere by creating water droplets (References 6.7.003, 6.2.001).

3.5.2 Functional Requirements

3.5.2.1 The spray nozzles shall be of a hollow cone design that is not subject to clogging by particles less than or equal to 1/4 inch (Reference 6.2.001).

3.5.2.2 The spray nozzles shall produce a drop size spectrum with a mean diameter of less than 700 microns at a 40 psi differential pressure (References 6.2.001, 6.7.014).

3.5.2.3 System design is based on 160 nozzles per train with a minimum spray flow rate of 2,450 gpm to the spray rings to maintain a 40 psi pressure differential across each nozzle. Design tolerance allows for an as-built condition between 160 and 163 nozzles per train (References 6.3.004, 6.3.003, 6.7.030).

For purposes of computing the lower bound containment pressure during a LOCA, the maximum containment spray pump flow is 3,400 gpm per pump, with two pumps operating (References 6.1.006, 6.7.035, 6.7.036).

3.5.2.4 The spray nozzles shall be oriented to maximize coverage of the containment volume (Reference 6.2.001).

CONTAINMENT SPRAY AND COOLING

Component Design Bases

Containment Spray Pumps

The two identical pumps installed in the system each provide sufficient capacity to perform the necessary containment spray function. Electric motors drive the horizontal centrifugal pumps. The pump motors receive power from 4160V emergency buses F and G and are located on the rad side 77-foot elevation. The design head of the pumps results in a delivered flow at a rated capacity of 2600 gpm with a minimum level in the RWST and against a head equivalent to the sum of:

a) the design pressure of the containment

b) the head to the uppermost spray nozzles

c) piping and spray nozzle pressure losses

Spray Nozzles

The spray nozzles, which are of the hollow cone design, are not subject to clogging by particles less than 1/4 inch in size and produce a small drop size that will maximize the total cooling and iodine removal surface area when operating at the design pressure differential of 40 psi. The stainless steel spray nozzles have a 3/8-inch diameter orifice, which is larger than the 3/32-inch screen mesh covering the containment suction piping. Therefore, all particles large enough to clog the nozzles will be screened out before entering the recirculation piping.

Baskets Containing Trisodium Phosphate

Three baskets containing TSP crystals comprise the ECCS recirculation sump pH control system and are mounted on elevation 105 foot outside the bioshield. Their locations enhance the crystals being dissolved while protecting the crystals from inadvertent water leakage or spray. Wire mesh keeps the crystals within the baskets.

The three baskets add about 750 ft^2 of steel to containment, which is considered insignificant to the total. Therefore, peak fuel clad temperatures calculated under 10CFR50.46 are expected to increase less than 1°F due to the effect of additional metal.

1. CS&COOL-40302D02 005 026K4.01

What prevents clogging of the containment spray nozzles following a design base loss of coolant accident?

A. A vortex breaker creates a centrifugal force to keep large particles and debris from entering the sump suctions.

B. Duplex filters on the discharge of the pumps remove particles large enough to clog the spray nozzles.

C.✓ The containment sump suction screens will block any particles big enough to clog the nozzles.

D. Post outage containment verifies there will be no particles or debris loose in containment that will be larger than the spray nozzle openings.

REFERENCES: **RHR FSD A-181002**

4.1.2.3 Each sump intake must be protected by trash racks and screens to prevent solid material larger than the smallest containment spray nozzle orifice from entering the pumps. (Reference 6.2.2)

CS FSD A-181008

3.5.2.1 The spray nozzles shall be of a hollow cone design that is not subject to clogging by particles less than or equal to 1/4 inch (Reference 6.2.001).

A. Incorrect, anti-vortex blades are present in the sump suction to improve flow conditions to the pumps, thus minimizing the potential for cavitation.

B. Incorrect, there are no filters on the discharge of the pumps.

C. Correct, screens on the recirc sumps have openings sized such that particles and debris large enough to clog the spray nozzles can not get past the screens.

D. Incorrect, accident analysis assumes that particles and debris will be blocked from entering the spray pump suctions by the sump screens.

24. 027AK2.03 024/BANK/RO/C/A 2.6/2.8/027AK2.03/N///A

Unit 1 is at 75% power with the following conditions:

- PK-444A, PRZR PRESS REFERENCE controller, is failed such that it senses a constant input pressure equivalent to 2219 psig.

Which one of the following describes the automatic response of the Pressurizer pressure control system?

A.✓ PCV-445A, PRZR PORV, will cycle to control pressure.

B. The variable heaters will cycle on and off at a higher setpoint.

C. The spray valves will open to control pressure at a higher value.

D. PCV-444B, PRZR PORV, will open and remain open until 2000 psig.

With PK444A in Auto and sensing an input pressure of 2219 psig, the automatic control system will turn on heaters and close spray valves to try to raise pressure back to 2235 psig. PORV 444B will not operate to lower pressure because it is controlled from PK-444A (the failed controller). As pressure continues to rise, PORV 445A will open as required to maintain pressure at <2335 psig since it is controlled from a different transmitter/contol loop. Candidate must have detailed knowledge of the control loops and how the control system operates to determine the correct answer.

A. Correct - PORV 445A will open to control pressure, since it is controlled from a different control loop.

B. Incorrect - Variable heaters receive a signal from the master pressure controller and will be on **continuously.** The master pressure controller will see 2219 psig and the controller will slowly raise the indicated demand signal to 100% at which time the BU heaters and the Variable heaters will be on. The variable heaters will not cycle, but will receive a 100% demand signal to stay on.

C. Incorrect - Spray valves are controlled by control signal from the master pressure controller. The actual PZR pressure will increase due to all heaters demanded on, but the master controller indicated demand and error signal will continue to increase due to the integral function and try to raise pressure. Spray valves will never get a demand signal.

D. Incorrect - PORV-444B receives its control signal form the master pressure controller. This scenario will provide a close signal from the master pressure controller even though actual PZR pressure is increasing due to B/U & Variable heater operation. PORV 444B will never get a demand signal.

027AK2.03

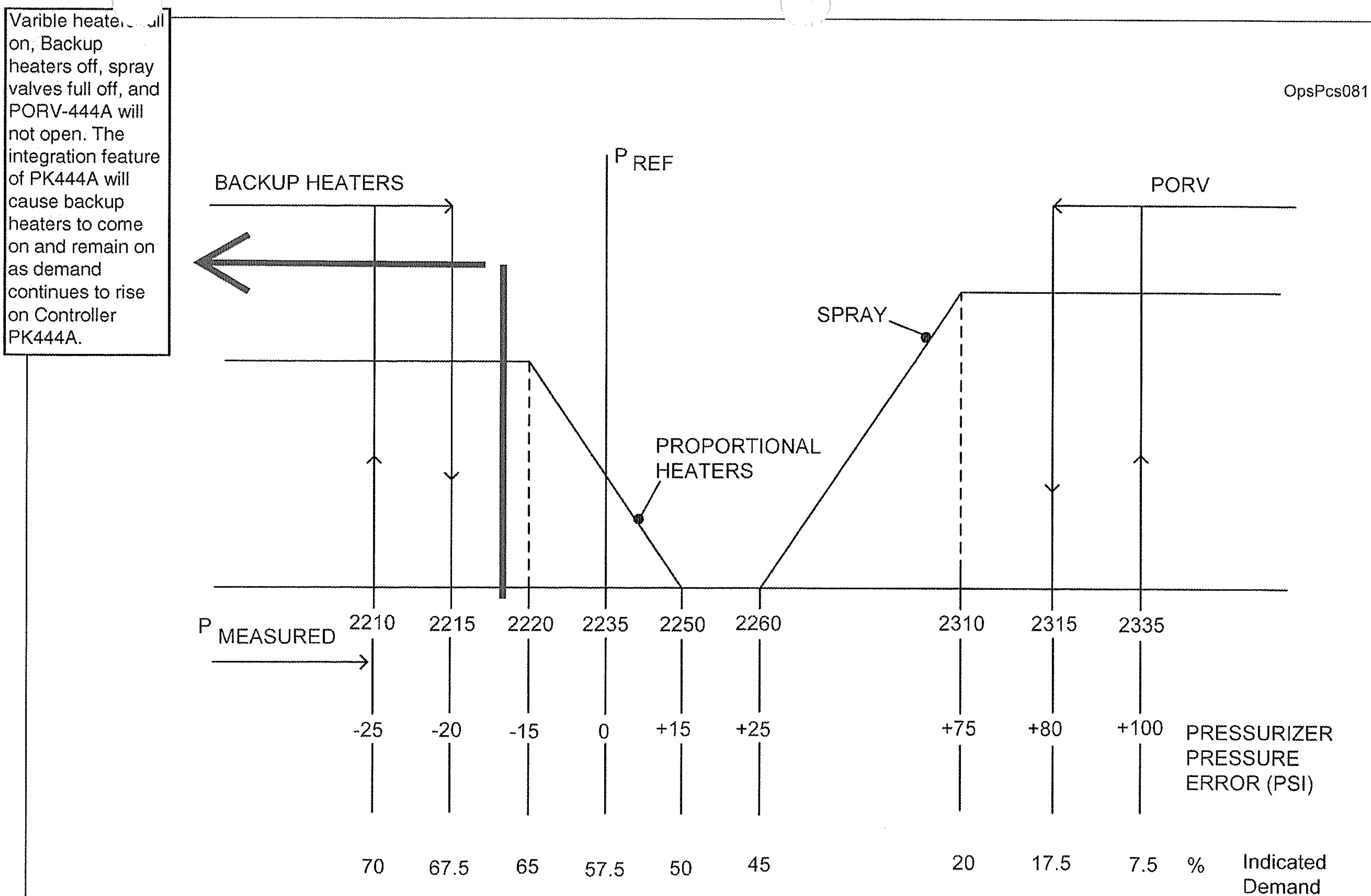
APE: 027 Pressurizer Pressure Control System (PZR PCS) Malfunction

Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following:

(CFR 41.7 / 45.7)

AK2.03 Controllers and positioners 2.6 2.8

Importance Rating:	2.6 / 2.8
Technical Reference:	None
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of abnormal plant or equipment conditions associated with the operation of the Pressurizer Pressure and Level Control System components and equipment to include the following (OPS-52201H07): Normal Control Methods Abnormal and Emergency Control Methods Automatic actuation including setpoint, if applicable Protective Interlocks Actions needed to mitigate the consequence of the abnormality
Question origin:	Modified FNP Bank PZR PRS/LVL-52201H08 06. 2005 FNP NRC Exam.
Basis for meeting K/A:	K/A is met by evaluation of the knowledge of a candidate related to operation of Pressurizer Pressure controllers. A malfunction has occurred in the controller circut and candidate must have detailed knowledge of the Pressurizer controller PK-444A operation to determine how the system will respond.
SRO justification:	N/A



Pressurizer Pressure Control Program

Figure 4

25. ~~028K2.01 025/BANK/RO/MEM 2.5/2.8/028K2.01/N///C~~

Unit 1 has just lost power to 600V Motor Control Center (MCC) 1A.

Which one of the following components will **NOT** have power?

A. 1A Spent Fuel Pool pump

B. 1A Containment Cooler Fan - Fast speed

C.✓ 1A Post LOCA Hydrogen Recombiner

D. MOV-8808A, 1A Accumulator Discharge Isolation Valve

1A 600V Motor Control Center is an A Train safety related power supply. All distracters are plausible because they are a "1A" component.

A. Incorrect - This is actually a B Train component. Plausible because its title is 1A Spent Fuel Pool pump. It is powered from 1C 600V LCC.

B. Incorrect - This component is powered from 1A 600V LCC, not MCC.

C. Correct - this is correct for the listed component that does not have power.

D. Incorrect - This component is powered from 1U 600V MCC.

028K2.01

028 Hydrogen Recombiner and Purge Control System (HRPS)
Knowledge of bus power supplies to the following:
(CFR: 41.7)
K2.01 Hydrogen recombiners 2.5* 2.8*

Importance Rating:	2.5 / 2.8
Technical Reference:	FNP-1-SOP-10.0A v5
References provided:	None
Learning Objective:	NAME AND IDENTIFY the Bus power supplies, for those electrical components associated with the Post LOCA Atmospheric Control System, to include those items in Table 3- Power Supplies (OPS-40302E04).
Question origin:	FNP BANK POST LOCA-40302E04 03 - FNP 2007 NRC Exam
Basis for meeting K/A:	K/A is met by evaluating candidate's knowledge of the power supply to the 1A Post LOCA Hydrogen Recombiner. Knowledge is tested by stating that 1A MCC is de-energized and having candidate choose the correct component that no longer has power.
SRO justification:	N/A

Step: 1.20 ==> 600V LC 1C - U1-AB-N/R-121`-Switchgear Room

Equipment:	Description/Instruction:	Location:	Required Config:	Actual Config:	Verif:	Initials	
Q1R16BKREC09	SPENT FUEL POOL PUMP 1A 52-EC09	1C 600V LC - U1 121` NON-RAD SWITCHGEAR RM 229	RACKED IN		NV		

Notes:

1

Step: 1.20 ==> 600V MCC 1A, U1-AB-RAD-139`-Hallway

Equipment:	Description/Instruction:	Location:	Required Config:	Actual Config:	Verif:	Initials	
Q1R17BKRFAI5	1D CTMT POST ACCIDENT AIR MIXING FAN Q1E19M001D-A	1A MCC - Q1R17B001-A, UNIT 1, 139`RAD HALLWAY	CLOSED		IV		
Notes:							
Q1R17BKRFAJ5	1C CTMT POST ACCIDENT AIR MIXING FAN Q1E19M001C-A	1A MCC - Q1R17B001-A, UNIT 1, 139`RAD HALLWAY	CLOSED		IV		
Notes:							
Q1R17BKRFAK2L	A TRAIN PAHA HEAT TRACING ALARM CIRCUITS Q1R37L004A-A	1A MCC - Q1R17B001-A, UNIT 1, 139`RAD HALLWAY	CLOSED		IV		
Notes:							
Q1R17BKRFAL3L	1A CTMT H2 RECOMBINER HTR Q1E17G001A	1A MCC - Q1R17B001-A, UNIT 1, 139`RAD HALLWAY	CLOSED		IV		
Notes:							

Step: 1.00 ==> MCC 1U - U1 AB-RAD-139` - Elec Pene Room

Equipment:	Description/Instruction:	Location:	Required Config:	Actual Config:	Verif:	Initials	
Q1R17BKRFUZ2	1A ACCUMULATOR DISCH ISO Q1E21MOV8808A	1U MCC - Q1R17B008-A, UNIT 1, 139`RAD ELEC.PENE.ROOM	CLOSED		IV		
Notes:							
Prints:							
Q1R17BKRFUZ3	1C ACCUMULATOR DISCH ISO Q1E21MOV8808C	1U MCC - Q1R17B008-A, UNIT 1, 139`RAD ELEC.PENE.ROOM	CLOSED		IV		
Notes:							
Prints:							

1

Step: 1.60 ==> 600V LC 1A - U1 AB-N/R-139` - Switchgear Room

Equipment:	Description/Instruction:	Location:	Required Config:	Actual Config:	Verif:	Initials	
Q1R16BKREA10	EA10 CNMT CLR FAN FAST SPEED 1A Q1E12M001A-A	1A 600V LC - U1 139` NON-RAD SWITCHGEAR RM 335	RACKED IN		IV		

Notes:

1

26. 029EK3.12 026/MOD/RO/M 4.4/4.7/029EK3.12/N///C

The following conditions exist on Unit 1:

- The crew is currently in FRP-S.1, Response to Nuclear Power Generation/ATWT.
- The crew is at the step to check Pressurizer pressure less than 2335 psig.

Which one of the following describes the reason why Pressurizer pressure is checked less than 2335 psig?

A. To verify Pressurizer Heaters are OFF.

B. To determine if Pressurizer Aux Spray should be placed in service.

C.✓ To ensure RCS pressure is low enough to allow sufficient charging flow for adequate boration flow.

D. To prevent the PRT from going solid (due to an open PORV or PRZR code safety valve) and blowing the rupture disc.

The check on RCS pressure is intended to alert the operator to a condition which would reduce charging or SI pump injection into the RCS and, therefore, boration. The PRZR PORV pressure setpoint is chosen as that pressure at which flow into the RCS is insufficient. The contingent action is a rapid depressurization to a pressure which would allow increased injection flow. When primary pressure drops 200 psi below the PORV pressure setpoint, the PORVs should be closed. The operator must verify successful closure of the PORVs, closing the isolation
valves, if necessary.

A. Incorrect - Plausible because other ERG procedures (i.e. ESP-0.1 step 10.2.2 RNO) will check Pressurizer pressure and determine if heaters should be off.

B. Incorrect - Plausible because other ERG procedures (i.e. ESP-0.1 step 10.2.2.3 RNO) will have steps to place Aux Spray in service if required. Under the given conditions, a candidate may determine that Aux Spray is required due to the high pressure.

C. Correct - FRP-S.1 step 4.5 provides guidance to open PORV's if RCS pressure is greater than 2335. S.1 background states that the reason is to ensure RCS pressure is low enough to allow sufficient Charging flow to ensure adequate boration flow.

D. Incorrect - Plausible because having a PORV open and potentially blowing the PRT rupture disc is a concern. But under these conditions, it is necessary to open PORV's. The candidate without detailed knowledge of the background for the step in FRP-S.1 providing the reason for opening the PORV's, may default to this distractor.

029EK3.12

EPE: 029 Anticipated Transient Without Scram (ATWS)

Knowledge of the reasons for the following responses as they apply to the ATWS:
(CFR 41.5 / 41.10 / 45.6 / 45.13)
EK3.12 Actions contained in EOP for ATWS 4.4 4.7

Importance Rating:	4.4 / 4.7
Technical Reference:	FNP-1-FRP-S.1, FNP-0-FRB-S.1
References provided:	None
Learning Objective:	STATE AND EXPLAIN the basis for all Cautions, Notes, and Actions associated with (1) FRP-S.1, Response to Nuclear Power Generation/ATWT; (2) FRP-S.2, Response to Loss of Core Shutdown. (OPS-52533A03)
Question origin:	Modified FNP Bank FRP-S-52533A03 10
Basis for meeting K/A:	K/A is met by placing candidate at a step in FRP-S.1, Response to Nuclear Power Generation/ATWT. Candidate must determine the reason for checking RCS pressure < 2335, an action in FRP-S.1. The answer can be found in the background documents for FRP-S.1.
SRO justification:	N/A

RESPONSE TO NUCLEAR POWER GENERATION/ATWT
Plant Specific Background Information

Section: Procedure

Unit 1 ERP Step: 4 **Unit 2 ERP Step:** 4 ***ERG Step No:*** *4*

ERP StepText: Initiate Emergency Boration of the RCS.

ERG StepText: *Initiate Emergency Boration of RCS*

Purpose: To add negative reactivity to bring the reactor core subcritical

Basis: After control rod trip and rod insertion functions, boration is the next most direct manner of adding negative reactivity to the core. The intended boration path here is the most direct one available, not requiring SI initiation, but using normal charging pump(s). Pump miniflow lines are assumed to be open to protect the pumps in the event of high RCS pressure. Several plant specific means are usually available for rapid boration and should be specified here in order of preference. Methods of rapid boration include emergency boration, injecting the BIT, and safety injection actuation. It should be noted that SI actuation will trip the main feedwater pumps. If this is undesirable, the operator can manually align the system for safety injection. However, the RWST valves to the suction of the SI pumps should be opened first before opening up the BIT valves. If a safety injection is already in progress but is having no effect on nuclear flux, then the BIT and RWST are not performing their intended function, perhaps due to blockage or leakage. In this case some other alignment using the BATs and/or non-safeguards charging pump(s) is required. The check on RCS pressure is intended to alert the operator to a condition which would reduce charging or SI pump injection into the RCS and, therefore, boration. The PRZR PORV pressure setpoint is chosen as that pressure at which flow into the RCS is insufficient. The contingent action is a rapid depressurization to a pressure which would allow increased injection flow. When primary pressure drops 200 psi below the PORV pressure setpoint, the PORVs should be closed. The operator must verify successful closure of the PORVs, closing the isolation valves, if necessary.

Knowledge: N/A

References:

Justification of Differences:

1 Changed to make plant specific.

1. FRP-S-52533A03 010 029 EK3.12

Given the following conditions on Unit 1:

- RCS pressure = 2335 psig
- RCS Tave = 588.3°F
- The reactor is not tripped.
- The crew is currently in FRP-S.1, Response to Nuclear Power Generation/ATWT, performing the step, "Initiate emergency boration of the RCS".

Which ONE of the following describes the reason why RCS pressure is checked less than 2335 psig?

A. Prevents the pressurizer relief tank from going solid (due to an open PORV or PRZR code safety valve) and blowing the rupture disc causing a LOCA inside containment.

B. To prevent the reactor from tripping on high RCS pressure.

C.✓ To ensure a sufficient amount of boric acid is injected into the core to reduce reactor power.

D. To ensure pressurizer spray valves won't short cycle when the PORVs open to lower RCS pressure.

FRP-S.1

A. Incorrect.

B. Incorrect.

C. Correct.
The check on RCS pressure is intended to alert the operator to a condition which would reduce charging or SI pump injection into the RCS and, therefore, boration. The PRZR PORV pressure setpoint is chosen as that pressure at which flow into the RCS is insufficient. The contingent action is a rapid depressurization to a pressure which would allow increased injection flow.

D. Incorrect.

27. 036AK3.02 027/MOD/RO/M-2.9/3.6/036AK3.02/N//A

Which one of the following describes the Fuel Transfer System's **Pit-Crane Interlock** and the reason for the interlock?

A.✓ Prevents the SFP lifting frame from being lowered while the SFP bridge crane is in the Transfer Canal area,

to prevent damage to a fuel assembly.

B. Prevents movement of the SFP Bridge Crane when the lifting frame is up,

to prevent damage to the SFP Bridge Crane Hoist.

C. Prevents the SFP lifting frame from being raised while the SFP bridge crane is in the Transfer Canal area,

to prevent damage to the lifting frame.

D. Prevents operation of the SFP Bridge Crane hoist when the lifting frame is down,

to prevent bumping a fuel assembly when the frame is raised.

<u>FNP-1-FHP- 5.11</u>

3.7 The Pit-Crane Interlock prevents lowering of the PIT lifting frame if the SFP Bridge crane is in the Transfer Canal area. This interlock is actuated by a limit switch on the Bridge Crane track and may be bypassed using a key operated switch on the PIT panel.

<u>Student text</u>

FUEL STORAGE, HANDLING, AND REFUELING (OPS-52108D OPS-40305B)

<u>Pit Crane Interlock</u> - prevents lowering the pit side frame if the SFP bridge crane is positioned over the transfer canal thus preventing interference between the lifting frame and anything suspended from the bridge crane. This interlock does not affect frame up operation and can be bypassed by placing the pit crane interlock switch to the bypass position.

Also:

The SFP lifting frame is interlocked with the SFP bridge crane in the down direction only. This prevents the frame from moving while the operator is depositing or removing a fuel assembly from the fuel container. The interlock is set when the SFP bridge crane is aligned such that anything suspended from the hoist would be inline with the movement of the lifting frame.

A. Correct - The SFP lifting frame can be raised, **<u>but not lowered</u>**, while the SFP Bridge Crane is in the Transfer Canal area. This prevents fuel damage while inserting or removing a fuel assembly.

B. Incorrect - Plausible because it would be logical to prevent the SFP Bridge Crane from moving while raising or lowering a fuel assembly with the lifting frame up, but this is not prevented by any interlock. Also, if the Crane were moved while the hoist was down, it could pull the Hoist off track.

C. Incorrect - Plausible because it would be logical to prevent raising the lifting frame while the SFP Bridge Crane is in the Transfer Canal area, thus preventing bumping a suspended load and possibly damaging the lifting frame. This action is not prevented by an interlock.

D. Incorrect - Plausible because it would be logical to prevent lowering the SFP Bridge Crane hoist while the lifting frame is down, thus preventing bumping a suspended fuel assembly on the lifting frame. This action is not prevented by an interlock.

036AK3.02

APE 036 Fuel Handling Incidents

AK3. Knowledge of the reasons for the following responses as they apply to the Fuel Handling Incidents:
(CFR 41.5,41.10 / 45.6 / 45.13)
AK3.02 Interlocks associated with fuel handling equipment 2.9 3.6

Importance Rating:	2.9 / 3.6
Technical Reference:	FNP-1-FHP-5.11 v32, FNP-2-FHP-5.11 v31
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the Fuel Storage, Handling and Refueling System components and equipment, to include the following (OPS-40305B07): Normal control methods Abnormal and Emergency Control Methods Automatic actuation including setpoint Protective interlocks Actions needed to mitigate the consequence of the abnormality
Question origin:	Modified FNP BANK REFUEL/STOR-40305B07 02
Basis for meeting K/A:	K/A is met by placing candidate in a fuel handling situation and testing the knowledge of fuel handling system interlocks and their function. Each answer choice is a two part statement, but as a whole is a complete statement of the reason for the interlock. The first part of each distracter is there to support plausibility of the second part.
SRO justification:	N/A

3.0 Precaution and Limitations

3.1 Key operated bypass switches will be used only when authorized by the Fuel Handling Supervisor.

3.2 If an overload condition is encountered on the CART, then a visual verification of cart/upender position should be performed to the maximum extent possible AND Fuel Handling Supervisor permission should be obtained prior to attempting continued cart movement. (CR 2002002413)

3.3 WHEN operating the system manually, THEN the limit switches and interlocks are inoperative. Proper care must be exercised to prevent equipment damage.

3.4 The Frame Interlock prevents CART movement unless both lifting frames are down. This interlock can be bypassed using a key operated switch on the PIT panel.

3.5 The Valve Open Interlock prevents CART movement unless the transfer canal gate is fully open. This interlock can be bypassed using a key operated switch on the PIT panel.

3.6 The Carriage Interlock prevents movement of the PIT lifting frame unless the CART is in the CARRIAGE AT PIT position. This interlock can be bypassed using a key operated switch on the PIT panel.

3.7 The Pit-Crane Interlock prevents lowering of the PIT lifting frame if the SFP Bridge crane is in the Transfer Canal area. This interlock is actuated by a limit switch on the Bridge Crane track and may be bypassed using a key operated switch on the PIT panel.

3.8 The CONVEYOR INTERLOCK prevents REACTOR lifting frame movement unless the CART is in the CONVEYOR AT REACTOR position. This interlock can be bypassed using a key operated switch on the REACTOR panel.

3.9 Upender frame movement can NOT occur once the M/C has entered the Bridge Trolley Permissive area (LS-12) unless the Upender Operator takes the CRANE INTERLOCK switch to ON, M/C is full up with a fuel assembly, or gripper up disengaged (GUD).

3.10 The status of the Spent Fuel Pool Ventilation System should be monitored on a periodic basis throughout all fuel movement. IF the SFP Ventilation System shuts down and/or the SFP EXH FAN SUCT DMPR Q1V43HV3990A(B) is found closed, THEN A-Train (B-Train) PRF shall be manually started.

3.11 Ensure any posted operator aides are updated, if required, when this procedure is revised. (Check cranes, breakers and gate valve for posting.)

1. REFUEL/STOR-40305B07 002 036AK3.02

In relation to the Fuel Transfer System, the Spent Fuel Pool (SFP) lifting frame is interlocked with the SFP Bridge Crane. This prevents which one of the following?

A.✓ The SFP lifting frame from being lowered while placing a fuel assembly into or removing a fuel assembly from the fuel basket.

B. Movement of the SFP Bridge Crane when the lifting frame is up.

C. The SFP lifting frame from being raised while the SFP bridge crane is in the Transfer Canal area.

D. Operation of the SFP Bridge Crane hoist when the lifting frame is down.

4 FHP- 5.11

3.7The Pit-Crane Interlock prevents lowering of the PIT lifting frame if the SFP Bridge crane is in the Transfer Canal area. This interlock is actuated by a limit switch on the Bridge Crane track and may be bypassed using a key operated switch on the PIT panel.

A. Correct per Student Text:
FUEL STORAGE, HANDLING, AND REFUELING (OPS-52108D OPS-40305B)

Pit Crane Interlock - prevents lowering the pit side frame if the SFP bridge crane is positioned over the transfer canal thus preventing interference between the lifting frame and anything suspended from the bridge crane. This interlock does not affect frame up operation and can be bypassed by placing the pit crane interlock switch to the bypass position.
Also:
The SFP lifting frame is interlocked with the SFP bridge crane in the down direction only. This prevents the frame from moving while the operator is depositing or removing a fuel assembly from the fuel container. The interlock is set when the SFP bridge crane is aligned such that anything suspended from the hoist would be inline with the movement of the lifting frame.

B. Incorrect. The transfer tube is manual operation and has no interlock to prevent open/close operation.

C. Incorrect. This interlock does not affect frame up operation .

D. Incorrect. The new fuel elevator is not interlocked with the lifting frame.

28. 037AK1.01 028/BANK/RO/C/A 2.9/3.3/037AK1.01/Y///A

The following conditions exist on Unit 1:

- AOP-2.0, Steam Generator Tube Leak, is in progress.
- The Control Room crew is preparing for an RCS cooldown.
- The affected SG pressure is 980 psig.
- Desired subcooling is 30-32°F.

1) Using steam tables provided, which one of the following is the temperature at which the RCS cooldown is required to be stopped?

2) Per AOP-2.0, what temperature indication is used?

	(1)	(2)
A.✔	513°F	Core exit T/C monitor
B.	544°F	Core exit T/C monitor
C.	513°F	RCS Hot Leg Temperature
D.	544°F	RCS Hot Leg Temperature

Calculations
Per chart on page 29 of AOP-2.0 for a leaking/ruptured SG pressure of 951-1000 psig, Required Core Exit Temp is 513°F. This calculates out to a subcooling range of 27-33°F for 951-1000 psig. With a given ruptured SG pressure of 980 psig, saturation temperature is 544°F. Per AOP-2.0 chart, cooldown should stop at 513°F, so actual subcooling for this condition is 31°F. In the stem of the question, the given conditions are 980 psig for ruptured SG pressure and subcooling 30-32°F to match the table.

A. Correct - 1) See calculation above.

2) Core Exit Temperatures are used to determine when the cooldown is complete.

B. Incorrect - 1) Plausible because 544°F is the saturation temperature associated with 980 psig. If candidate doesn't take the required subcooling into consideration, he may choose this as the correct answer.

2) correct see A.2

C. Incorrect - 1) First part is correct - see calculation above.

2) plausible because RCS Hot Leg Temperatures are used for other indications in the ERG procedures.

D. Incorrect - 1) Incorrect see B.1

2) incorrect see C.2

037AK1.01

APE: 037 Steam Generator (S/G) Tube Leak

AK1. Knowledge of the operational implications of the following concepts as they apply to Steam Generator Tube Leak:
CFR 41.8 / 41.10 / 45.3)
AK1.01 Use of steam tables 2.9* 3.3

Importance Rating:	2.9 / 3.3
Technical Reference:	FNP-1-AOP-2.0 v33
References provided:	Steam Tables
Learning Objective:	ANALYZE plant conditions and DETERMINE the successful completion of any step in AOP-2.0, SG Tube Leakage. (OPS-52520B07)
Question origin:	Modified FNP BANK EEP-3-52530D07 01
Basis for meeting K/A:	K/A is met by having candidate calculate required subcooling for an AOP-2 steam generator tube leak event. The calculation is operationally valid in that it matches the required subcooling per the chart in AOP-2. In addition, if the candidate doesn't fully understand the operational implications of the required subcooling, he may choose the incorrect answer which would put the RCS at saturation after the cooldown and depressurization is complete.
SRO justification:	N/A

Step	Action/Expected Response	Response Not Obtained

31.2 Determine required core exit temperatures for cooldown based on affected SG pressure.

AFFECTED SG PRESSURE (psig)	REQUIRED CORE EXIT TEMPERATURE
1151 - 1200	536°F
1101 - 1150	531°F
1051 - 1100	525°F
1001 - 1050	519°F
951 - 1000	513°F
901 - 950	507°F
851 - 900	500°F
801 - 850	494°F
751 - 800	487°F
701 - 750	479°F
651 - 700	471°F
601 - 650	463°F
551 - 600	454°F
501 - 550	445°F
451 - 500	434°F
401 - 450	423°F
351 - 400	411°F
301 - 350	398°F
251 - 300	383°F
- 250	365°F

Step 31 continued on next page

Page Completed

Step	Action/Expected Response	Response Not Obtained
31.3	Display the hottest core exit thermocouple.	
31.3.1	IF the plant computer is available, THEN perform the following. • Display SPDS page 3C1, CORE EXIT THERMOCOUPLE MAP. OR • DISPLAY SYSTEMS, ICCMS PAGE 1TC1, TC SUMMARY, HIGHEST TC'S, CORE EXIT - CHAN A/CHAN B (table - right side of page).	31.3.1 Perform the following. 31.3.1.1 Defeat upper head thermocouple inputs using CETC DISABLE/READOUT panel disconnect switches (BOP). A TRAIN ICCMS CABINET [ ] CETC-4 to DISCONNECT [ ] CETC-7 to DISCONNECT [ ] CETC-9 to DISCONNECT [ ] CETC-15 to DISCONNECT [ ] CETC-16 to DISCONNECT [ ] CETC-17 to DISCONNECT [ ] CETC-24 to DISCONNECT [ ] CETC-26 to DISCONNECT B TRAIN ICCMS CABINET [ ] CETC-2 to DISCONNECT [ ] CETC-3 to DISCONNECT [ ] CETC-6 to DISCONNECT [ ] CETC-12 to DISCONNECT 31.3.1.2 Depress the CET button on the CORE EXIT THERMOCOUPLE MONITOR(s) to backlight the CET button. 31.3.1.3 Depress the SUBMODE button on the CORE EXIT THERMOCOUPLE MONITOR(s) until ALL is displayed.

Step 31 continued on next page

Page Completed

Unit 1 is shutdown with the following conditions:

At 10:00:
- An SI was initiated due to a Small Break LOCA.
- ESP-1.2, Post LOCA Cooldown and Depressurization, is in progress.
- Normal charging has been established.
- All SG narrow range levels are 40% and stable.

At 10:15:
- 1A SG narrow range level is 48% and going up with no AFW flow to the SG.
- 1B and 1C SG narrow range levels are 40% and stable.
- Pressurizer level is 20% and trending down with maximum charging flow.

Which one of the following completes the statement below?

The foldout page of ESP-1.2 requires the crew to establish HHSI flow and ____ .

A. remain in ESP-1.2, Post LOCA Cooldown and Depressurization.

B. re-enter EEP-0, Reactor Trip or Safety Injection.

C. go to EEP-1, Loss of Reactor or Secondary Coolant.

D✓ go to EEP-3, Steam Generator Tube Rupture.

A. Incorrect - Plausible because ESP-1.2 foldout page does have criteria for establishing HHSI flow and remaining in the procedure. In addition, actions of ESP-1.2 are very similar to EEP-3 and a candidate may think it is acceptable to just perform ESP-1.2.

B. Incorrect - Plausible because EEP-0 is the normal entry point upon Reactor trip or actuation of SI, and has steps for diagnosis of the fault. For these conditions, SI flow is required, and the candidate without detailed procedural knowledge may default to EEP-0.

C. Incorrect - Plausible because ESP-1.1, SI Termination has recently been changed. It used to have a direct transition to EEP-3, but now transitions to EEP-1 when indication of a tube rupture are observed. Candidate may think this procedure will transition to EEP-1 and then to EEP-3 just like ESP-1.1 now does.

D. Correct - Foldout page criteria is met for transition to EEP-3. HHSI flow should be re-established and transition made to EEP-3.0.

038EG2.4.1

EPE: 038 Steam Generator Tube Rupture (SGTR)

2.4 Emergency Procedures / Plan

2.4.1 Knowledge of EOP entry conditions and immediate action steps.

(CFR: 41.10 / 43.5 / 45.13) |

IMPORTANCE RO 4.6 SRO 4.8

Importance Rating:	4.6 / 4.8
Technical Reference:	FNP-1-ESP-1.2 v23
References provided:	None
Learning Objective:	EVALUATE plant conditions and DETERMINE if entry into EEP-3, Steam Generator Tube Rupture is required. (OPS-52530D02)
Question origin:	NEW
Basis for meeting K/A:	K/A is met by giving candidate a set of conditions, and have him determine which procedure is required to be performed. A Steam Generator Tube Rupture has occurred, and since there are no Immediate Action steps associated with the SGTR procedure (EEP-3), candidate must choose entry into the SGTR recovery procedure out of several plausible distractors.
SRO justification:	N/A

Step	Action/Expected Response	Response NOT Obtained
1	**Monitor SI reinitiation criteria following HHSI isolation.**	
	1.1 Greater than 16°F{45°F} subcooled in CETC mode and PRZR level above 13%{43%}.	1.1 Establish HHSI flow, and start additional CHG PUMPs as required using ATTACHMENT 5, RE-ESTABLISHING HHSI FLOW.
2	**Monitor FNP-1-EEP-2 and FNP-1-EEP-3 branch criteria.**	
	2.1 No SG pressure falling in an uncontrolled manner or less than 50 psig.	2.1 IF affected SG NOT previously isolated, THEN go to FNP-1-EEP-2.
	2.2 No high secondary radiation or SG level rising uncontrolled.	2.2 Establish HHSI flow, and start additional CHG PUMPs as required using ATTACHMENT 5, RE-ESTABLISHING HHSI FLOW THEN go to FNP-1-EEP-3.
3	**Monitor switchover criteria.**	
	3.1 RWST level greater than 12.5 ft.	3.1 Go to FNP-1-ESP-1.3.
	3.2 CST level greater than 5.3 ft.	3.2 Align AFW pumps suction to SW using FNP-1-SOP-22.0.
4	**Monitor charging miniflow criteria (during SI).**	
	4.1 RCS pressure less than 1900 psig.	4.1 Verify miniflow valves open.
	4.2 RCS pressure greater than 1300 psig.	4.2 Verify miniflow valves closed.
5	**Monitor adverse containment criteria.**	
	5.1 CTMT pressure less than 4 psig and radiation less than 10^5 R/hr.	5.1 Utilize bracketed adverse CTMT condition numbers.

30. 039G2.1.20 030/NEW/RO/C/A 4.6/4.6/039G2.1.20/N//D

Unit 2 is performing the inital heatup of the RCS following a Refueling outage, with the following conditions:

- RCS temperature is 480°F.
- All MSIV's are closed.
- The Unit Operator is preparing to open the MSIV's per SOP-17.0, Main and Reheat Steam.
- ALL MSIV Bypass valves are open.
- The steam dumps are aligned in the STM PRESS mode per SOP-18.0, Steam Dump System.
- The operators are having difficulty opening the MSIV's due to pressure differential across the MSIV's.

Which one of the following completes the statements below?

1) Per SOP-17.0, it is permissible to cycle the __(1)__ to allow opening the MSIVs.

2) Steam header pressure should be monitored closely to prevent a Safety Injection due to __(2)__ .

	(1)	(2)
A.	Steam Dumps	Low Steam Line pressure
B.	Steam Dumps	Steam Line Differential pressure
C.	Atmospheric Reliefs	Low Steam Line pressure
D✓	Atmospheric Reliefs	Steam Line Differential pressure

CAUTIONS: • Watch for 100 psid on steam generators as steam is being bypassed to warmup the steam header.
step 4.3.5 aligns the stm dumps to STM PRESS mode after the 2C MSIV bypass valves are open. This lends credibility to stm dumps as a distracter even though they are not used in the process of opening the MSIVs.

NOTE: • In the following step, it may be necessary to open the atmospheric relief valves in order to sufficiently reduce the DP across the MSIVs. Monitor RCS temperature, pressure, and flux level, or core power (if critical) during this evolution.
When opening MSIV's, frequently the DP across the valve prevents opening. Upstream pressure is normally higher than downstream pressure. Procedural guidance provides actions for opening Atmospheric Relief valves on that Steam line to lower the DP. Any time pressure is lowered on one Steam line, the Steam Line Differential pressure Safety Injection is a concern. This actuation is not blockable. The Low Steam Line pressure SI is normally a concern, but at this RCS temp, it is blocked.

A. Incorrect - First part is incorrect. Plausible because Steam Dumps will change the differential pressure on the MSIV, but will raise the dp, not lower. With the Bypass valves open the candidate may believe the stm dumps would be used to control DP and the concern would be either the differential pressure or the low stm line pressure at NOT/NOP.

Second part is incorrect. Low Steam line pressure will cause an SI, and would be a concern at a higher RCS temperature, but at this RCS temp Low Steam Line pressure is blocked.

B. Incorrect - First part is incorrect - see A.

Second part is correct. Steam Line Differential Pressure is not blockable and is a concern when pressure is being changed on 1 Steam Generator, as in this situation. If stm dumps were chosen in the first part, then Steam Line Differential Pressure would be likely since there is only one manual bypass valve on one stm line and this would be a likely scenario.

C. Incorrect - First part is correct. Atmospheric reliefs can lower the differential pressure across the MSIV to allow opening.

Second part is incorrect - see A.

D. Correct - see above.

039G2.1.20

039 Main and Reheat Steam System (MRSS)

2.1 Conduct of Operations

2.1.20 Ability to interpret and execute procedure steps. (CFR: 41.10 / 43.5 / 45.12)

IMPORTANCE RO 4.6 SRO 4.6

Importance Rating:	4.6 / 4.6
Technical Reference:	FNP-1-SOP-17.0 v62
References provided:	None
Learning Objective:	RECALL AND DISCUSS the Precautions and Limitations (P&L), Notes and Cautions (applicable to the "Reactor Operator") found in SOP-17.0, Main and Reheat Steam. (OPS-52104A05)
Question origin:	NEW
Basis for meeting K/A:	K/A is met by evaluation of a candidate's ability to interpret and apply procedure steps, notes, and cautions for the Main Steam system. MSIV opening is frequently complicated by differential pressure across the valve, and procedural guidance is provided to assist in opening MSIV's. Candidate must understand and apply procedural actions based on the conditions given.
SRO justification:	N/A

4.3 Opening the MSIVs with RCS Temperature Above 300°F

NOTE:	**Main steam drain pot level control valves V904A,B,C&D receive a continuous open signal until the main turbine throttle valves are open. The following step isolates the LCV's to minimize heat loss. See section 4.5 for requirements for manually blowing down isolated main steam drain pots.**

4.3.1 Isolate main steam drain pot level control valves by performing the following:

- Close N2N11V905A 2A MS LINE DRN POT TO COND ISO
- Close N2N11V905B 2B MS LINE DRN POT TO COND ISO
- Close N2N11V905C 2C MS LINE DRN POT TO COND ISO
- Close N2N11V905D 2D MS LINE DRN POT TO COND ISO
- Initiate an administrative tracking item to document isolation of the LCV's, to ensure the drain pots are blown down per the requirements of section 4.5, and to ensure they are unisolated when plant conditions allow the additional heat load.

4.3.2 Drain the 2C main steam lines upstream of the MSIVs using section 4.1 of this SOP. Draining of 2A and 2B steam lines may also be commenced as desired to minimize delays in opening the 2A and 2B MSIV bypass valves.

4.3.3 Close the main steam isolation bypass warmup valve N2N11V019.

NOTE:	**While performing the following steps, maintain 2C SG level as close to 65% as possible.**

4.3.4 Open 2C SG MSIV bypass valves. DO NOT open any other MSIV bypass valves at this time.

- Q2N11HV3368C
- Q2N11HV3976C

4.3.5 IF the RCS is at OR near no-load T_{avg}, THEN verify the Steam Dumps lined up for the steam pressure mode of operation per FNP-2-SOP-18.0, STEAM DUMP SYSTEM, before OR during Main Steam System pressurization.

CAUTIONS:
- **Watch for 100 psid on steam generators as steam is being bypassed to warmup the steam header.**
- **IF a vacuum has been established in the main condenser, THEN the dangers of thermal stress and water hammer are more severe and extra caution should be used while warming the steam lines.**

4.3.6 Slowly open warmup valve N2N11V019 while monitoring RCS temperature, pressure, and core flux level. IF the reactor is critical, THEN also monitor power level.

4.3.7 WHEN steam header pressure is within approximately 25 psig of SG pressure, THEN fully open warmup valve N2N11V019.

4.3.8 Verify that **ALL** steam lines have been drained per section 4.1.

NOTES:
- **It may be necessary to open the atmospheric relief valves in order to sufficiently reduce the ΔP across the MSIVs.**
- **IF Unit 2 is supplying gland sealing steam, air ejectors OR Unit 1, THEN consideration should be given to securing these steam loads so ΔP can be sufficiently reduced to open the MSIVs.**

4.3.9 Open 2A and 2B SG MSIV bypass valves while monitoring RCS temperature, pressure and core flux level. IF the reactor is critical, THEN also monitor power level.

- Q2N11HV3368A
- Q2N11HV3976A
- Q2N11HV3368B
- Q2N11HV3976B

NOTE: The following note is N/A when Appendix 5, DEFEATING THE AUTO-CLOSURE OF MSIV BYPASS VALVES is in effect.

NOTE: When an MSIV is opened, its associated bypass valve will automatically close. The upstream and downstream MSIV for at least one loop must be opened before proceeding to the other loops to maintain the bypass flowpath.

4.3.10 WHEN steam header pressure AND individual steam generator pressures are approximately equal, THEN open the MSIVs.

- Q2N11HV3369A
- Q2N11HV3370A
- Q2N11HV3369B
- Q2N11HV3370B
- Q2N11HV3369C
- Q2N11HV3370C

NOTE: The following step is N/A when Appendix 5, DEFEATING THE AUTO-CLOSURE OF MSIV BYPASS VALVES is in effect.

4.3.11 WHEN the MSIVs reach the fully open position, THEN verify that the associated bypass valves automatically close.

- 2A SG MSIV, Q2N11HV3369A
- 2A SG MSIV, Q2N11HV3370A
- 2B SG MSIV, Q2N11HV3369B
- 2B SG MSIV, Q2N11HV3370B
- 2C SG MSIV, Q2N11HV3369C
- 2C SG MSIV, Q2N11HV3370C

4.3.12 WHEN desired, THEN unisolate main steam drain pot level control valves by performing the following:

- Open N2N11V905A 2A MS LINE DRN POT TO COND ISO
- Open N2N11V905B 2B MS LINE DRN POT TO COND ISO
- Open N2N11V905C 2C MS LINE DRN POT TO COND ISO
- Open N2N11V905D 2D MS LINE DRN POT TO COND ISO

4.3.12.1 Clear the admin tracking item initiated in step 4.3.1.

31. 041A3.03 031/BANK/RO/C/A 2.7/2.8/041A3.03/N//B

Unit 2 is at 12% power with the following conditions:

At 10:00:

- Tavg is 550°F and stable.
- Steam Dumps are in the STM PRESS mode.
- PK-464, STM HDR PRESS controller, is in AUTO.

At 10:05:

- PT-464, STM HDR PRESS, fails HIGH.

Which one of the following completes the statements below, with no operator action?

Steam flow will increase and then __(1)__ .

PK-464, STM HDR PRESS controller, will __(2)__ .

	(1)	(2)
A.	stabilize at 40% steam flow	remain in AUTO
B✓	decrease to zero	shift to MANUAL at 543°F
C.	decrease to zero	remain in AUTO
D.	stabilize at 40% steam flow	shift to MANUAL at 543°F

The Steam Dump system is in service and Steam Dumps are open to provide an artificial load for the Reactor. PT-464 fails high causing Steam Dumps to go full open. When this occurs, RCS temperature drops rapidly until at 543°, the P-12 interlock causes the Steam Dumps to go closed. Any time the controller PK-464 is in AUTO and temperature drops to the P-12 setpoint, PK-464 goes to MANUAL and minimum demand to prevent a further cooldown.

A. Incorrect - 1) incorrect. Plausible if the candidate doesn't take the permissive P-12 effect into account, causing steam dumps to close.
2) incorrect, candidate must know that PK-464 shifts to MANUAL when P-12 setpoint is reached.

B. Correct - Steam flow will go to zero due to closing of the Steam Dumps and PK-464 shifts to MANUAL.

C. Incorrect - 1) correct, Steam Dumps go closed.
2) incorrect, see A.2.

D. Incorrect - 1) incorrect, see A.1.
2) correct.

041A3.03
041 Steam Dump System (SDS)/Turbine Bypass Control
Ability to monitor automatic operation of the SDS, including:
(CFR: 41.7 / 45.5)
A3.03 Steam flow 2.7 2.8

Importance Rating: 2.7 / 2.8

Technical Reference: FNP-0-SOP-0.3 V43

References provided: None

Learning Objective: DEFINE AND EVALUATE the operational implications of abnormal plant or equipment conditions associated with the operation of the Steam Dump System components and equipment to include the following (OPS-52201G07):
Normal Control Methods (Steam dump valves)
Abnormal and Emergency Control Methods (Steam dump valves, Steam dump system solenoid-operated three-way valves)
Automatic actuation including setpoint (High-1 and High-2 trip bistables)
Protective isolations (Plant trip controller, Loss of load controller, C-7)
Protective Interlocks (Condenser available, C-9, Low-Low TAVG signal, P-12)
Actions needed to mitigate the consequence of the abnormality

Question origin: FNP BANK STM DUMP-52201G08 13

Basis for meeting K/A: K/A is met by evaluation of a candidate's ability to monitor Steam flow during automatic operation of the Steam Dump control system when an instrument failure has occurred.

SRO justification: N/A

strength varies in direct proportion to a temperature deviation between the output of the Tavg median signal selector and $T_{no\text{-}load}$. The same compensated; median T_{AVG} signal used in the loss-of-load submode is also used here. The $T_{no\text{-}load}$ signal (547°F) is a fixed signal. T_{AVG} and $T_{no\text{-}load}$ are inputs to a comparator whose output is converted to a positioning demand signal in the turbine trip/plant trip controller. The characteristics of this controller are also expressed in percent steam flow versus the deviation degrees between T_{AVG} and $T_{no\text{-}load}$ (refer to Figure 9). Failure of a T_{AVG} channel high would not affect the steam dumps due to the median signal selector, which would auctioneer out the high signal.

The plant trip controller provides the same process instrumentation to steam dump system link as the loss-of-load controller. The plant trip controller accomplishes this link for the T_{AVG}-turbine trip submode. Because the rod control system reactivity control is not available, the plant trip controller ensures that following the reactor trip, the steam generator code safety valves do not actuate, and T_{AVG} will trend toward its no-load value.

The plant trip controller temperature deviation band evaluation is a simple process. Without the rod control system, no dead band ΔT is required. The proportional band is 28°F ΔT.

The plant trip controller output controls the steam dump valve signal circuits. Therefore, the plant trip controller output operates the steam dump valve banks according to the temperature changes listed in the following table.

BANK -PLANT TRIP ΔT RESPONSE

Bank	Fully Closed	Fully Open
1	0°F	7°F
2	7°F	14°F
3	14°F	21°F
4	21°F	28°F

Steam Pressure

When the operator selects the STM PRESS position (Figure 10) on the steam dump mode selector switch, the positioning signal varies with a pressure difference between PT-464 and the setpoint. The pressure transmitter (PT-464) measures the actual main steam common header pressure, which is also used as an input to the control circuitry for the automatic steam generator feed pump speed control. The pressure setpoint can be adjusted by using the dial on the steam pressure controller manual/auto (M/A) station (PK-464) located on the MCB. The normal setpoint, 1005 psig, is lower than the steam generator atmospheric relief setpoint so that the atmospheric relief actuation does not normally occur during the steam pressure mode of operation. The 1005 psig setting also corresponds to the plant no-load T_{AVG} value of 547°F. When the T_{AVG} position is selected, this automatic pressure setpoint has no effect on the operation of the steam dump system. Caution should be observed, however, to note the proper pressure setpoint before selecting the STM PRESS position. If the STM PRESS position is selected while the T_{AVG} controller is controlling temperature (with the steam dumps open), then the steam dumps valves will close immediately. This is because PK-464 goes to minimum and manual after it is placed in the T_{AVG} position, regardless of whether the steam pressure controller was in manual or auto prior to selecting the T_{AVG} position. This will cause RCS Tavg to increase due to the loss of steam flow, Pzr level to rise and possible opening of the Atmospherics and Code Safeties.

The steam pressure controller (PC-464) converts the deviation signal between PT-464 and the setpoint to a valve positioning signal. The controller is of the proportional-integral (P+I) type. This terminology means that it proportionally amplifies the pressure deviation signal and simultaneously increases the signal as long as a deviation exists. This controller characteristic is expressed in percent steam flow versus the deviation between PT-464 and the setpoint. The steam pressure controller output controls the steam dump valve banks in the same manner as the turbine trip controller and the loss-of-load controller through the bank signal circuits. The controller output is continuously displayed on PK-464. The display is calibrated from 0 percent to 100 percent. Figure 11 represents the steam pressure controller characteristics.

It should be noted that the AUTO feature of PK-464 can be selected only under certain conditions. First, if the mode selector switch is in the T_{AVG} mode, PK-464 shifts to manual control. Secondly, if the low-low T_{AVG} signal (P-12) exists and the BYP INTLK position on both A and B Train STEAM DUMP INTERLOCK SWITCHES has not been selected, PK-464 will shift to manual control. By shifting to manual control, the output of the P+I portion of the controller is set to zero and thus prevents small pressure errors from being integrated into large controller output signals. This large controller output is also known as "controller windup."

With the STM PRESS position selected on the steam dump mode selector switch, the operator can manually adjust the steam dump valve position. The MAN push button for removing AUTO control, along with an ⇧ (INCREASE) push button and a ⇩(DECREASE) push button is located on the M/A station (PK-464).

Depressing the MAN push button replaces the output of PC-464 with the operator controlled push buttons. This operation is designed for a bumpless transfer. That is, the manual portion of the circuitry tracks the outputs of the controller (PC-464) when PK-464 is selected to AUTOMATIC. When MAN is selected, the positioning signal remains at its value existing just prior to the transfer. Depressing either the ⇧ (INCREASE) push button or the ⇩ (DECREASE) push button now changes the positioning signal to the I/P converters. When any signal greater than zero percent goes to the I/P converters, at least two of the condenser dump valves are continuously open because the automatic P+I type control is removed. The transfer operation from MAN to AUTOMATIC is also bumpless.

The selection of the STM PRESS position on the steam dump mode selector switch blocks the output of the turbine trip and loss-of-load controllers to the I/P converters and, at the same time, aligns the output of the steam pressure controller. If no blocking signals are present, the steam dump system now arms and responds to the pressure error in AUTOMATIC or to the operator demand in MAN. Plant cooldown is accomplished in the STM PRESS mode. In MAN, the operator directly controls the cooldown rate by manually adjusting the armed steam dump valve position.

Trip Bistables

In the T_{AVG} mode of operation, the steam dump valve opening is based on the magnitude of the temperature deviation (Figure 7). When this temperature deviation magnitude occurs faster than the normal modulation control can compensate, a rapid trip open of the steam dump valves takes place.

In the T_{AVG} loss-of-load submode, the deviation between T_{AVG} and T_{ref} feeds two bistables, in addition to supplying the modulation signals to the I/P converters. The bistable

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.

32. 045A1.06 032/NEW/RO/C/A 3.3/3.7/045A1.06/N//C

Unit 1 is at 32% power with the following conditions:

At 10:00:

- Steam dumps are Tagged Out to prevent operation, due to a maintenance test in progress.
- The control rods are in MANUAL.

At 10:05:

- A malfunction of the DEH control system results in a Main Turbine trip.

Which one of the following completes the statements below?

SG water levels will __(1)__ due to the Turbine trip.

The OATC is required to __(2)__ .

	(1)	(2)
A.	swell	reduce Reactor power to < 8%
B.	swell	trip the Reactor and enter EEP-0, Reactor Trip or Safety Injection
C.✓	shrink	reduce Reactor power to < 8%
D.	shrink	trip the Reactor and enter EEP-0, Reactor Trip or Safety Injection

The Main Turbine has tripped, resulting in an immediate SG level shrink. The SG level control system will restore level back to normal in a short period of time. Actions of AOP-3.0 require the operator to verify proper operation of the Steam Dumps. If Steam Dumps are not available, the operator is required to reduce Reactor power to <8% to get within the capacity of the Atmospheric Reliefs.

A. Incorrect - 1) incorrect. Plausible if the candidate doesn't understand the effects of shrink and swell. Candidate may think that upon a turbine trip, water level will go up because the turbine is no longer pulling steam from the Steam Generator and the SG temperature will go up causing swell.
2) correct, this is the action required by AOP-3.0, to get Reactor power to within the capacity of the Atmospheric Reliefs.

B. Incorrect - 1) incorrect, see A.1.
2) incorrect, but plausible if candidate thinks that without Steam Dumps, meeting an automatic Reactor trip setpoint (on Hi-Hi level at 82%) would occur. Our SGWLs are more likely to cause a Hi Hi level trip than a lo lo trip due to how close the program level is to 82%. it is not un common to come close to or trip at 82% on some SGWL malfunctions.

C. Correct - SG level will shrink and AOP-3.0 requires reducing power to < 8%.

D. Incorrect - 1) correct, SG level will shrink due to the Turbine trip.
2) incorrect, see B.2.

045A1.06

045 Main Turbine Generator (MT/G) System

Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the MT/G system controls including:
(CFR: 41.5 / 45.5)
A1.06 Expected response of secondary plant parameters following T/G trip 3.3 3.7

Importance Rating: 3.3 / 3.7

Technical Reference: FNP-1-AOP-3.0 v17

References provided: None

Learning Objective: DEFINE AND EVALUATE the operational implications of abnormal plant or equipment conditions associated with the operation of the Steam Generator Protection System components and equipment to include the following (OPS-52201K07):
Normal control methods
Abnormal and Emergency Control Methods
Automatic actuation including setpoint (example SI, Phase A, Phase B, MSLIAS, LOSP, SG level)
Protective isolations such as high flow, low pressure, low level including setpoint
Protective interlocks
Actions needed to mitigate the consequence of the abnormality

Question origin: NEW

Basis for meeting K/A: K/A is met by evaluation of a candidate's ability to monitor for proper operation, predict the plant response, and respond to the plant after a Main Turbine trip has occurred.

This question uses the terms "shrink" and "swell" like question 015/017AK1.04. This has been evaluated to ensure that there is no double jeopardy issues between the two questions and concepts. **<u>Each one is testing a different concept associated with SG level</u>**. This question is related to the effects from a Turbine trip and the other is related to the trip of an RCP. In this question shrink and swell was used to indicate the immediate effect due to the Turbine trip, in an effort to exclude the effects of the Feedwater control system on level. Validators have had trouble with the wording "immediate effect", so shrink and swell was chosen.

SRO justification: N/A

Step	Action/Expected Response	Response Not Obtained

NOTE:
- The main generator trip will be delayed by 30 seconds for non electrical faults with the exception of thrust bearing wear.
- 1A, 1B and 1C 4160 V busses should automatically transfer to the startup transformers.
- IF there is sufficient demand, THEN the steam dumps will arm in the TAVG mode, allowing the load rejection controller to modulate to bring TAVG to 551°F.
- Any reduction in RCS TAVG will cause reactor power to fall if a positive moderator temperature coefficient exists. Control rod movement, feedwater addition and steaming rate must be closely coordinated.

__ **1 Check turbine - TRIPPED.**

[ ] TSLB2 14-1 lit
[ ] TSLB2 14-2 lit
[ ] TSLB2 14-3 lit
[ ] TSLB2 14-4 lit

1 Place MAIN TURB EMERG TRIP switch to TRIP for at least 5 seconds.

****

CAUTION: While initial AUTO rod control response may be beneficial, depending on the pre-trip conditions sustained AUTO rod control may over respond and result in subcritical conditions.

****

__ **2 Stabilize reactor power.**

2.1 Verify Rod Control in MANUAL

2.2 Adjust control rods in MANUAL to control RCS TAVG.

Step 2 continued on next page

Step	Action/Expected Response	Response Not Obtained

****

CAUTION: A reactor trip will occur if either intermediate range high flux trip bistable does not reset before reactor power is reduced below 10%.

****

2.3 Verify steam dumps modulate to maintain reactor power less than 35%.

2.3 Perform the following.

2.3.1 Reduce reactor power to less than 8%.

2.3.2 Direct counting room to perform FNP-0-CCP-645, MAIN STEAM ABNORMAL ENVIRONMENTAL RELEASE.

2.3.3 Control atmospheric relief valves to maintain RCS TAVG at program value for existing power level.

1A(1B,1C) MS ATMOS REL VLV

[ ] PC 3371A adjusted
[ ] PC 3371B adjusted
[ ] PC 3371C adjusted

****

CAUTION: RCP busses will be deenergized if being supplied from the unit aux transformers when the generator output breakers are manually opened. Fast dead bus transfer will not be initiated.

****

__ 3 **<u>WHEN</u> at least 30 seconds have passed since turbine trip, <u>THEN</u> check main generator tripped.**

3 Perform the following.

3.1 Verify RCP busses energized from startup transformers.

[ ] 1A 4160 V bus
[ ] 1B 4160 V bus
[ ] 1C 4160 V bus

3.2 Place REVERSE POWER switch in BYPASS.

Step 3 continued on next page

Page Completed

C) normally operate to prevent operation of the safety valves during relatively mild transients. Following safety valve actuation, the atmospheric relief's act to assist the safety valves to positively reseat by reducing steam pressure to a value below the safety valve reseating pressure. The reliefs also provide the capability for the removal of reactor decay heat when the main condensers are not available. An AUTO/MANUAL SETPOINT STATION may control the atmospheric relief valves from the MCB or hot shutdown panel (HSP). The main steam line penetrations and associated valves will be discussed in detail in the Main and Reheat Steam lesson plan.

STEAM GENERATOR OPERATING CHARACTERISTICS

SHRINK AND SWELL

Shrink and swell are steam generator phenomena that are characterized by a change in water level following a change in steam flow. Shrink is a reduction in water level following a reduction in steam flow, while swell is just the opposite.

The rate of heat transfer across the tubes can be calculated using the following equation:

$$\dot{Q} = UA\,(T_{avg} - T_{stm}).$$

Where:

$$\dot{Q} = Rate\ of\ heat\ transfer, BTU\ /\ hr$$

$$U = Overall\ heat\ transfer\ coefficient, BTU\ /\ hr - ft^2 - {}^\circ F$$

$$A = Area\ of\ heat\ transfer\ surface, ft^2$$

$$T_{avg} = Avg.\ temperature\ of\ primary\ coolant = \frac{T_h + T_c}{2}$$

$$T_{stm} = Saturation\ temperature\ for\ the\ steam, {}^\circ F.$$

$\dot{Q}$ is proportional to the power level, or the energy being removed from the primary system to the steam generator. The heat transfer coefficient (U) remains relatively constant, and is determined by the composition and characteristics of the tubes. The area of heat transfer surface (A) is constant. If you have ever seen a pot of water boiling on a stove, you noticed that tiny bubbles of steam were formed at the hottest portions of the pot and then rose to the surface where they escaped as steam. The same thing takes place around each steam generator tube. The rate of heat transfer or the boiling rate bubbles being formed determined the quantity of the steam. A given boiling rate (power) water mixture will have a corresponding density and specific volume. Looking closely now at an increase in power level, the following events take place:

As steam flow to the main turbine is increased, more energy will be drawn from the steam generator, which tends to decrease the steam pressure. This decrease in steam pressure causes the number and size of the steam bubbles in the boiling region to increase, which increases the steam to water ratio and specific volume, with a subsequent decrease in density. Initially, the mass of water in the steam generator remains constant, so the decrease in density will be seen as an increased steam generator water level. This phenomenon is known as "swell." The steam generator water level control system will decrease the water level to the operating band causing the mass in the generator to decrease as power level increases.

The opposite effect will be observed in the steam generator when the power level is decreased. The lower heat transfer rate along with the higher steam pressure causes less boiling to occur and a contraction of the steam bubbles present. This decreases the steam-to-water ratio with a subsequent increase in density. Since the mass in the steam generator is initially constant, the increase in density will be seen as a decrease in steam generator water level. This phenomenon has been termed "shrink."

CIRCULATION AND RECIRCULATION RATIO

The moisture that is removed from the steam prior to the steam leaving the steam generator enters the downcomer region where it mixes with the incoming feedwater. Since this separated moisture, upon reaching the riser region, is making its second pass across the heat exchanging U-tubes; this moisture content is called recirculation flow. This recirculation flow mixes with and preheats the incoming makeup feedwater flow. This total flow entering the tube bundle section of the steam generator is called circulation flow.

Circulation flow aids in maintaining proper thermal hydraulic performance (increased steam generator efficiency) and allows for control of the inventory of corrosion products, erosion

33. 051AA2.02 033/BANK/RO/C/A 3.9/4.1/051AA2.02/N//B

Unit 2 is ramping up with the following condiitons:

At 10:00:

- KK1, TURB COND VAC LO, comes into alarm.
- Condenser vacuum is degrading.
- AOP-8, Partial Loss of Condenser Vacuum, actions are in progress.

At 10:15:

- KK2, TURB COND VAC LO-LO, comes into alarm.
- Main Turbine load is 225 MWe.
- Condenser vacuum is 2.1 psia and stable.

Which one of the following is/are the required action(s) per AOP-8.0?

A. Trip the reactor and perform EEP-0, Reactor Trip or Safety Injection.

B.✓ Trip the Main Turbine and perform AOP-3.0, Turbine Trip Below P-9 Setpoint.

C. Reduce load at the maximum controllable rate per AOP-17, Rapid Load Reduction.

D. Stop the ramp in progress and stabilize the plant. Continue to investigate the cause of the loss of vacuum.

During a degraded vacuum event, there are two setpoints for tripping the Main Turbine based on stall flutter concerns. In addition, there are two setpoints relating to whether the Reactor or Turbine should be tripped. Based on vacuum, if <30% Turbine power the setpoint for Turbine trip is 1.7 psia. If > than 30%, setpoint is 2.7 psia for Turbine trip. In addition if Reactor power is <35% only a Turbine trip is required, if >35% power a Reactor trip is required.
With Turbine load at 225 MW, actual Turbine power is 27.8% (225 MW / 900 MW = 25%). Candidate must determine Turbine power < 30% and know that a Turbine trip is required when vacuum is > 1.7 psia.

A. Incorrect - Plausible because a Reactor trip is required as described above for some situations based on Turbine and Reactor Power.

B. Correct - See above. A Turbine trip is required since rx/turbine power is less that 30%.

C. Incorrect - Plausible because there is guidance in AOP-8 for reducing Turbine load as required to maintain vacuum below setpoint.

D. Incorrect - Plausible because if vacuum was below setpoint and stable this would be the desired action.

Unit 1 just changed the entire AOP-8 procedure where it a graph has to be consulted to determine the trip criteria. see below

1 [CA] Monitor Condenser pressure

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

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

2 [CA] Monitor turbine trip criteria.

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

• 1.885 psia when < 25% turbine power
• 3.8 psia when > 55.9% turbine power
• Varies Linearly Between 25% (1.885 psia) and 55.9% (3.8 psia)

051AA2.02

APE: 051 Loss of Condenser Vacuum

AA2. Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum:
(CFR: 43.5 / 45.13)
AA2.02 Conditions requiring reactor and/or turbine trip 3.9 4.1

Importance Rating:	3.9 / 4.1
Technical Reference:	FNP-2-AOP-8.0 v20
References provided:	None
Learning Objective:	ANALYZE plant conditions and DETERMINE the successful completion of any step in AOP-8.0, Partial Loss of Condenser Vacuum. (OPS-52520H07).
Question origin:	FNP BANK AOP-8.0-52520H07 02
Basis for meeting K/A:	K/A is met by placing candidate in a situation with a loss of Condenser Vacuum in AOP-8.0. Candidate must evaluate conditions and determine actual Turbine power to be able to determine that a Turbine Trip is required. In addition, the turbine trip setpoint changes based on Turbine power which further complicates the evaluation.
SRO justification:	N/A

Step	Action/Expected Response	Response Not Obtained

NOTE:
- DEHC point CNDP1 displays condenser pressure in Hga absolute on the point detail page. On all other pages CNDP1 displays condenser pressure in psia.
- IPC points PT0214 and PT0215 display condenser pressure in psia.
- MCB recorder PR 4029 displays condenser pressure in psia.
- Main turbine trip will occur at 4.41 psia (9 in Hga)
- SGFP trip will occur at 5.9 psia (12 in Hga)

__ **1 Monitor Condenser pressure**

1.1 IF condenser pressure is at 2.3 psia, THEN increased monitoring of condenser pressure is required.

plausible distracter if candidate thought the Rx trip was at 1.7 psia for 30% power.

__ **2 Monitor turbine trip criteria.**

2.1 WHEN turbine power greater than or equal to 30% using MWe or PT-446/447, THEN verify condenser pressure less than 2.7 psia (5.5 inHga).

RESPONSE NOT OBTAINED:

2.1 Perform the following.

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

2.1.1.1 Go to FNP-2-EEP-0, REACTOR TRIP OR SAFETY INJECTION.

2.1.1.2 Perform the remainder of this procedure in conjunction with FNP-2-EEP-0, REACTOR TRIP OR SAFETY INJECTION.

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

2.1.2.1 Perform FNP-2-AOP-3.0, TURBINE TRIP BELOW P-9 SETPOINT in parallel with this procedure.

2.1.3 Proceed to step 3.

Step 2 continued on next page

Step	Action/Expected Response	Response Not Obtained
2.2	WHEN turbine power less than 30% using MWe or PT-446/447, THEN verify condenser pressure less than 1.7 psia (3.5 in Hga).	2.2 Perform the following.
	225 MWe is approx	2.2.1 Place MAIN TURB EMERG TRIP to TRIP for at least 5 seconds.
		2.2.2 Perform FNP-2-AOP-3.0, TURBINE TRIP BELOW P-9 SETPOINT in parallel with the remainder of this procedure.

NOTE:
- Loss of the 12Kv line will result in the loss of 16 cooling tower fans. See FIGURE 1.
- On a loss of cooling tower fans, condenser Circ Water inlet temperature should be monitored as a leading indicator for condenser vacuum impact. These points may be found on the Circ Water system mimic on the IPC.

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

3.1 IF the rate of condenser pressure increase is significant and approaching
2.3 psia (≥30% power)
1.3 psia (<30% power),
THEN reduce load prior to reaching
2.3 psia (≥30% power)
1.3 psia (<30% power).

3.2 IF Condenser pressure increases above
2.3 psia (≥30% power)
1.3 psia (<30% power),
THEN reduce turbine load as necessary to maintain pressure at or below
2.3 psia (≥30% power)
1.3 psia (<30% power).

3.3 IF available,
THEN start additional cooling tower fans.

Step 3 continued on next page

Page Completed

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

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

Step	Action/Expected Response	Response Not Obtained
3.6	Verify proper operation of on service SJAEs.	3.6 Swap SJAEs or place additional SJAE sections in service as required to obtain proper SJAE operation using FNP-2-SOP-28.5, CONDENSER AIR REMOVAL SYSTEM.
3.7	IF available, THEN start an additional CW PUMP.	
__ 4	**Dispatch personnel to check main turbine gland sealing steam pressures.**	
4.1	Check HP Gland seal header pressure maintained at ~125 psig. GS STM PRESS [ ] PI 4069B	4.1 Perform the following: 4.1.1 IF HP gland seal header pressure abnormal due to HP regulator malfunction, THEN transfer control to the HP regulator control valve bypass.

Step 4 continued on next page

34. ~~055EA2.06 034/NEW/RO/MEM~~ 3.7/4.1/~~055EA2.06/N///A~~

Unit 1 is shutdown with the following conditions:

At 10:00:

- There is a complete loss of all AC power.
- A Safety Injection has occurred.
- ECP-0.0, Loss of All AC Power, is in progress.
- 1B Diesel Generator (DG) is Tagged Out.
- 1-2A DG tripped on Low Lube Oil Pressure due to a clogged strainer.

At 10:15:

- 1-2A DG's on service lube oil strainer has been swapped.
- 1-2A DG will be started locally in Mode 4 per SOP-38.1, Emergency Starting of a Diesel Generator.
- After starting the 1-2A DG, the DB SO has been instructed to shift control of the DG back to the EPB.
- The Unit Operator will close the 1-2A DG output breaker per SOP-38.0-1-2A, 1-2A Diesel Generator and Auxiliaries.

Which one of the following completes the statements below?

Prior to starting the 1-2A DG in Mode 4, the __(1)__ must be depressed.

To close the 1-2A DG output breaker from the EPB, the 1-2A DG EPB Mode Selector Switch is required to be in the __(2)__ position per SOP-38.0-1-2A.

A✓ 1) 1-2A DG ENGINE RESET pushbutton on the Local Control Panel

2) Mode 2

B. 1) 1-2A DG ENGINE RESET pushbutton on the Local Control Panel

2) Mode 3

C. 1) SIAS RESET pushbutton on the B1F Sequencer

2) Mode 2

D. 1) SIAS RESET pushbutton on the B1F Sequencer

2) Mode 3

The 1-2A DG has tripped due to an Essential Engine trip (low oil pressure). The Engine Reset pushbutton must be depressed to clear the lockout prior to restarting the DG and energizing the bus. When starting a DG in Mode 4 locally, the EPB (Emergency Power Board) Mode selector switch position makes no difference. It does make a difference when closing the output breaker on the DG. The DG output breaker can only be closed in Mode 2 from the EPB. There is plausibility for placing the Mode selector switch in Mode 3 because SOP-38.0-1-2A step 4.3.6 has the operator place the switch in Mode 3 if starting the DG from the Local Control Panel. The intent of this step is for maintenance starts, not for mode 4 starts. There is no control of voltage or speed, or ability to close the output breaker from the EPB if the Mode switch is in mode 3.

A. Correct - 1) correct. Engine Reset pushbutton must be depressed to reset the Essential Engine lockout of low lube oil pressure.
2) correct, the output breaker can only be closed from the EPB while in Mode 2.

B. Incorrect - 1) correct, see A.1.
2) incorrect, the DG output breaker can only be closed from the EPB while in Mode 2.

C. Incorrect - 1) incorrect, the SIAS RESET pushbutton on the Sequencer does not have to be reset, and in fact should not be reset. Plausible because there is guidance in ECP-0.0, Loss of all AC Power, for resetting the SI signal on the B1F Sequencer (SIAS RESET pushbutton) if the 1C DG is being used to restore power to the A train 4160V ESF busses. This is to clear the lockout of breaker DF13, that ties the 1H 4160V bus (where 1C DG ties on) to the 1F 4160V bus. Under the given conditions, reset of the B1F sequencer is not required because the 1-2A DG is being used to power the busses.
2) correct, see A.2.

D. Incorrect - 1) incorrect, see C.1.
2) incorrect, see B.2.

055EA2.06

EPE: 055 Loss of Offsite and Onsite Power (Station Blackout)
Ability to determine or interpret the following as they apply to a Station Blackout:
(CFR 43.5 / 45.13)
EA2.06 Faults and lockouts that must be cleared prior to re- energizing buses . . 3.7 4.1

Importance Rating:	3.7 / 4.1
Technical Reference:	FNP-0-SOP-38.1 v15
References provided:	None
Learning Objective:	EVALUATE plant conditions and DETERMINE if any system components need to be operated while performing (1) ECP-0.0, Loss of All AC Power; (2) ECP-0.1, Loss of All AC Power Recovery, Without SI Required; (3) ECP-0.2, Loss of All AC Power Recovery, With SI Required. (OPS-52532A06)
Question origin:	NEW
Basis for meeting K/A:	K/A is met by giving candidate a set of conditions with a Station Blackout, and have him determine what lockouts or blocks have to be cleared to be able to restore power to an ESF bus. The 1-2A DG must be started and tied to the 1F 4160V bus to restore power. The DG has an essential engine shutdown that must be reset to be able to start the DG and power the bus. Candidate must first determine that an Essential engine shutdown has occurred to know that it must be reset.
SRO justification:	N/A

4.0 INSTRUCTIONS

4.1 **Check** engine for any apparent damage caused during starting attempts. ☐

4.2 **Verify** adequate air reservoir pressure for DG start: ☐

- 2850 kW DG - at least one receiver greater than 90 psig
- 4075 kW DG - at least one receiver greater than 150 psig

4.3 **Prime** fuel oil system using hand pump. ☐

4.4 **Position** Mode 4 selector switch to Mode 4 position. ☐

4.5 **Verify** the following for 4160V bus to be supplied by diesel generator (on EPB or locally at switchgear):

4.5.1 4160V bus is de-energized ☐

4.5.2 Supply breaker(s) to 4160V bus are open ☐

4.6 **Verify** Essential Protection Auxiliary Relay (86A) is reset. (on diesel local relay panel) ☐

4.7 **Depress** Engine Reset pushbutton (on diesel local control panel). ☐

CAUTIONS

- After resetting all engine shutdown signals, the Ready for Auto Start light is delayed for:
  - ☐ 100 seconds for 2850 kW DG
  - ☐ 140 seconds for 4075 kW DG
- Attempting to start an engine prior to completion of the time delay will result in the engine trying to start with fuel racks closed, causing a loss of starting air.

4.8 WHEN appropriate time delay has elapsed since all engine shutdown signals have been reset (86A and Engine Reset):

- at least 100 seconds for 2850 kW DG
- at least 140 seconds for 4075 kW DG

THEN **check** Ready for Auto Start light illuminated on diesel local control panel. ☐

4.9 IF Ready for Auto Start light is NOT illuminated, THEN **verify** barring device is NOT inserted (annunciator 54 NOT illuminated). ☐

supply breakers from the startup transformer for a two-second duration. When emergency bus LOSP UV conditions are sensed on two out of three phases, the LOSP actuation signal will be generated. LOSP signals exist for two seconds and perform the following:

1. Starts the 1B diesel
2. Sheds loads on the bus
3. Trips the emergency bus supply breakers from the startup transformers (if not already open). If the diesel was paralleled to the grid then the output breaker for the diesel would trip as soon as both startup supply breakers are open, this would make the diesel ready to reenergize the bus. Three seconds after the LOSP actuation signal is generated, a signal will close the diesel generator output breaker if the emergency bus supply breakers have been open for three seconds and the diesel generator has started and attained rated frequency and voltage. A third signal generated at the same time as the LOSP actuation signal allows for closing of the diesel generator output breaker locally as long as the LOSP condition exists.

A diesel generator (86A) or bus differential lockout will block auto closure of the 1B output breaker. The operator cannot close or trip the diesel generator output breaker manually with the MSS in the MODE 1 position.

With the MSS in the MODE 2 position and the Mode 4 selector switch in OFF, the sequencer will function to close the output breaker as it did when in MODE 1. However, in MODE 2, the operator has the capability of manually operating the breaker remotely from the EPB. With the 1B diesel generator breaker synchronizing selector switch in MANUAL, placing the 1B diesel generator output breaker remote handswitch to CLOSE will close DG08-1. A diesel generator (86A) or bus differential lockout will block manual closure. When in MODE 2, the 1B diesel generator breaker will be tripped by depressing the REMOTE DG STOP push button or placing the 1B diesel generator output breaker remote handswitch to the TRIP position. If the diesel generator is shut down manually, it cannot be started again manually until the time delay in the shutdown circuitry is clear (approximately 140 seconds). The diesel generator will emergency start if required during this 140-second time delay.

In no case should the Engine Trouble shutdown relay be reset locally at the diesel control panel (by depressing the Engine Shutdown Reset pushbutton) following an essential engine shutdown with an emergency start signal present. If an emergency start signal was present, this

Table 8 - Summary of DG Startup And Shutdown Capabilities

EMERGENCY DIESELS (1-2A, 1C, 1B, AND 2B)							
MODE	AUTO START	MAN START EPB PB	MAN STOP EPB PB	MAN START DLCP PB	MAN STOP DLCP PB	(NOTE 1) NON-ESS ENGINE PROTECTION AVAILABLE	EPB VOLTAGE AND SPEED CONTROL
1 (NOTE 2)	Yes	No	No	No	No	No (NOTE 3)	Yes
2 (NOTE 2)	Yes	Yes	Yes (NOTE 4)	No	No	Yes (NOTE 4)	Yes
3 (NOTE 2)	No	No	No	Yes	Yes (NOTE 4)	Yes (NOTE 4)	No
4	No	No	No	Yes	Yes (NOTE 4)	No	No

Big diesels can always be started by overriding main air start valves on diesel - shutdowns depend on mode.

All diesels can be shutdown at diesel using over-speed device.

Note 1: Essential engine protection always available

Note 2: Assumes Mode 4 selector switch is off

Note 3: Assumes Emergency Start (ES) relay energized

Note 4: Assumes Emergency Start (ES) relay de-energized

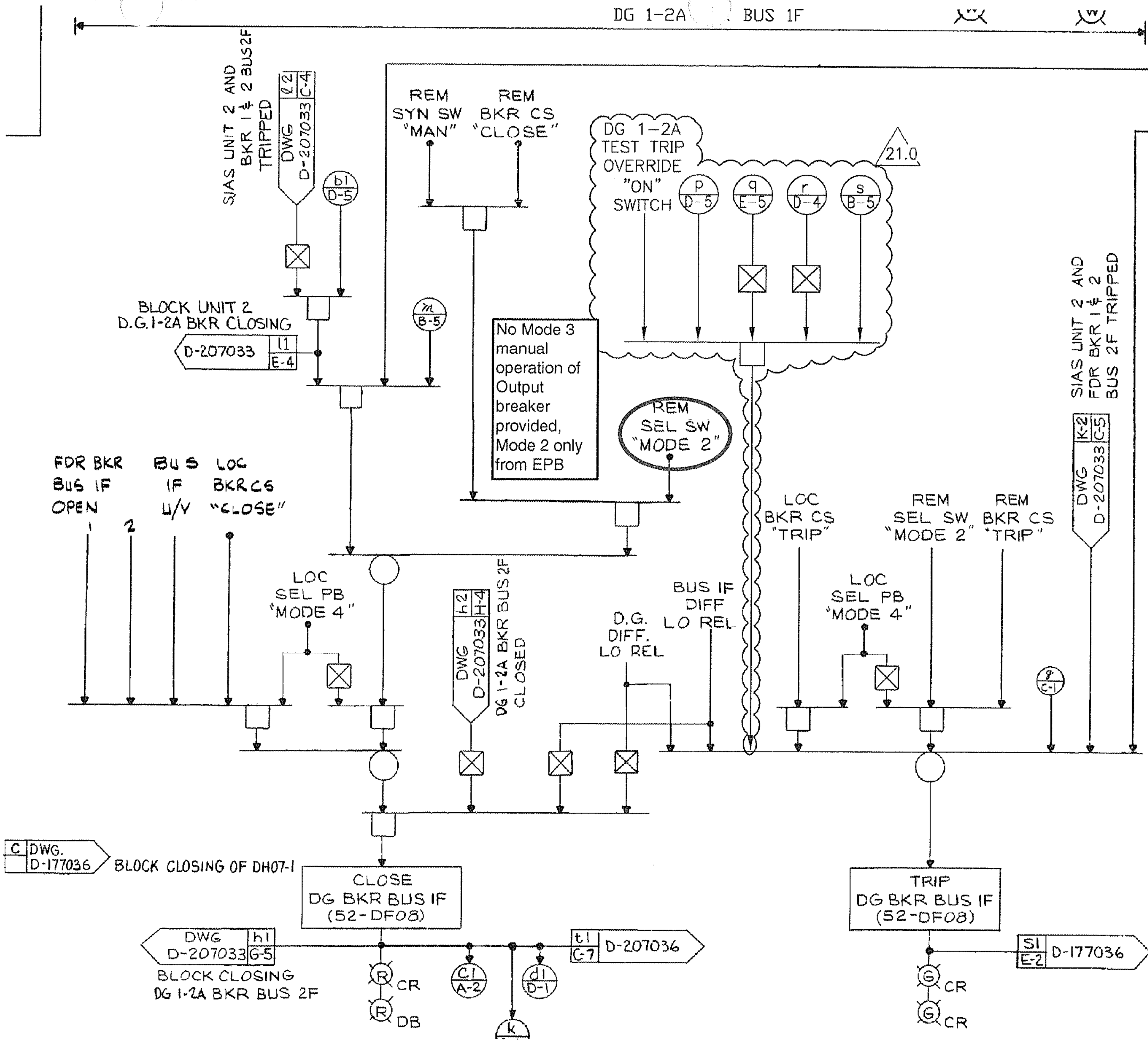


TABLE 1: LOAD S

BUS	BKR № (TRAIN 'A')	DE
4160V 1F	52-DF02	4160V SWGR
	03	STA SERV T
	04	COMP COOL
	05	COMP COOL
	06	CHARGING/H
	07	CHARGING/H
	09	RHR/LHSI
	10	AUX FEED W
	11	CTMT SPRA
	12	STA SERV T
	13	4160V SWGR
4160V 1K	52-DK02	STA SERV T
	03	SERV W PU
	04	SERV W PU
	05	SERV W PU
600V LC 1D	52-ED02	FROM STA S
	03	CRDM MG S
	04	BATTERY CH
	09	BATTERY CHA
	05	MCC 1F
	06	REACTOR CAV. H
	08	LOAD CENTER
	10	MCC 1A
	11	CRDM COOLE
	12	FROM LOAD
	13	MCC 1S
	14	MCC 1U
	15	CTMT COOLE
	16	CTMT COOL
600V LC 1K	52-EK02	FROM STA S
	03	MCC 1K
	05	BUS TIE BK
MCC 1A	FA-F7	REACTOR CAV

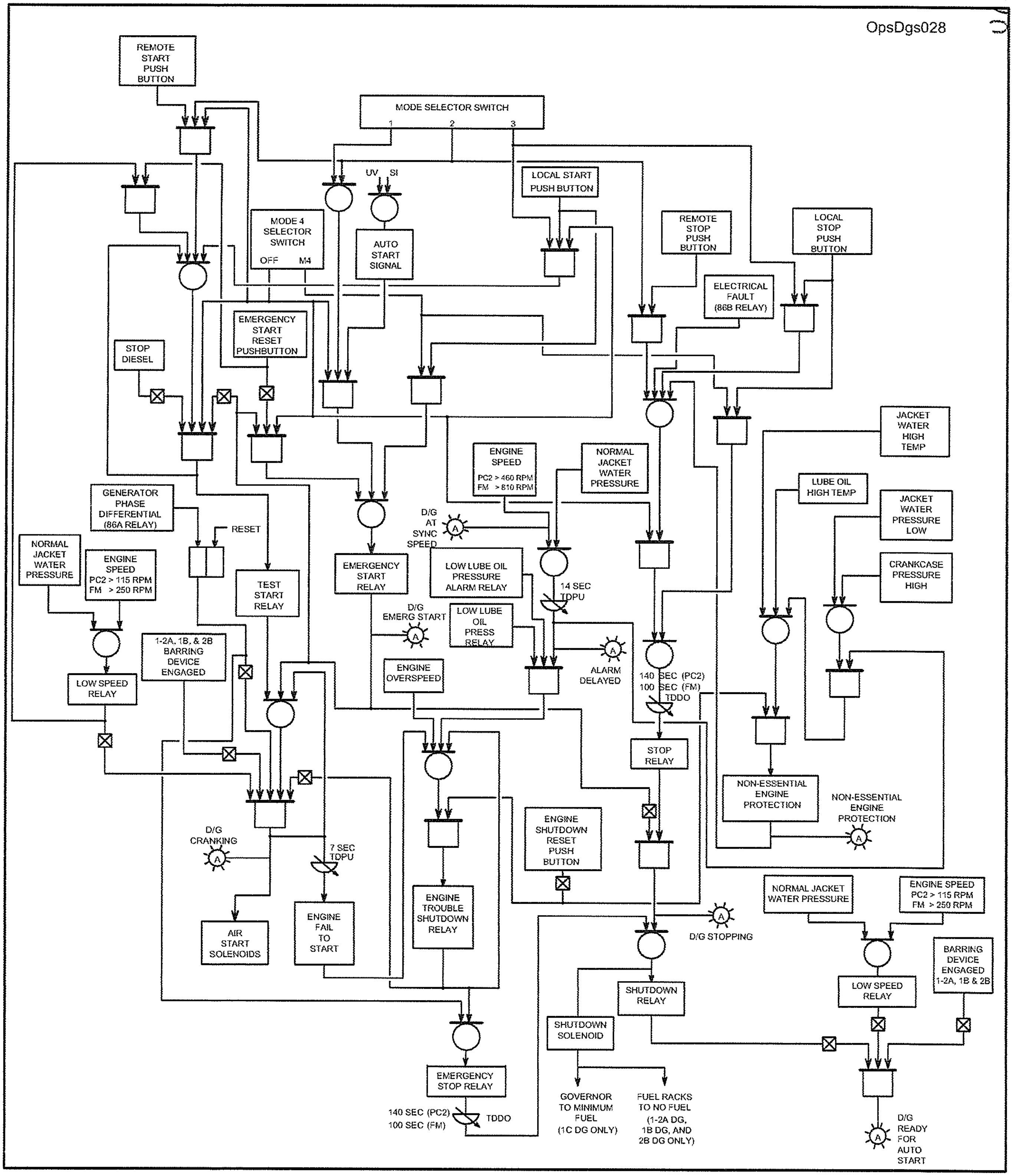


FIGURE 18 - Mode Selector Switch For Emergency Diesels

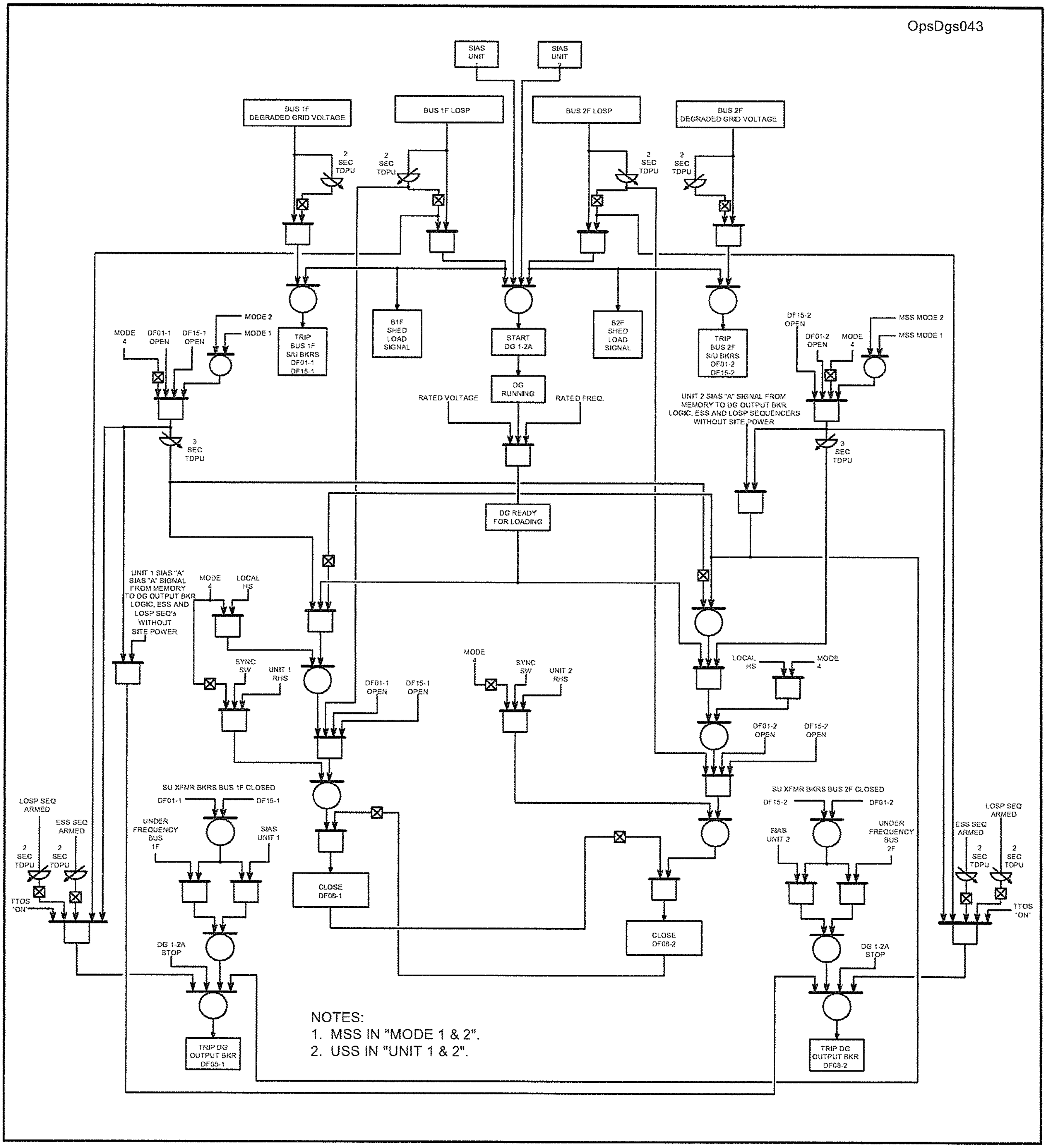


FIGURE 16 - DG 1-2A Output Breaker Logic

35. 055K1.06 035/NEW/RO/MEM 2.6/2.6/055K1.06/N///D

Unit 1 is at 70% power with the following conditions:

- R-15A, SJAE EXH, is in alarm.
- AOP-2.0, Steam Generator Tube Leakage, is in progress.
- The Turbine Building SO has placed the SJAE Filtration System in service.

Which one of the following completes the statement below?

After the SJAE Filtration is placed in service, the reading on R-15A will __(1)__ and the SJAE Filtration system will __(2)__ .

	(1)	(2)
A.	decrease	be aligned in a recirc alignment
B.	remain the same	be aligned in a recirc alignment
C.	decrease	discharge to the Turbine Bldg roof
D.✓	remain the same	discharge to the Turbine Bldg roof

The flowpath for Condenser exhaust is through the Steam Jet Air Ejector (SJAE), through R-15, either through the filter or bypassing the filter, and then discharging to the TB Exhaust HVAC. The SJAE Filtration system is normally bypassed. The Filtration system is placed in service when Steam Generator tube leakage is occurring. The location of R-15 is significant because if it were downstream of the filtration system, R-15 readings would change when filtration was placed in service.

The alignment continues to discharge to the TB roof. There is an alignment that can be performed for maintenance or testing to allow discharge into the Turbine Building similar to a recirc alignment. Recirc would seem plausible to minimize the release to the atmosphere. Also other HVAC systems shift to a recirc alignment such as the TSC HVAC and the PRF system.

There is an R-15B and C that is on the downstream side of the filter, located on the turbine deck that will respond differently than R-15A.

A. Incorrect - First part is incorrect. Due to the location of R-15 before the filter the reading on R-15 will not change due to placing the filter on service like PRF will do. If R-15 were in the line AFTER the filter the reading would decrease when the SJAE filtration was placed on service.

Second part is incorrect, but plausible. HVAC systems at Farley can be aligned in a recirc alignment like PRF, CR ventilation, TSC ventilation.

B. Incorrect - First part is correct. see D.1

Second part is incorrect. see A.2

C. Incorrect - First part is incorrect. see A.1
second part is correct - see D.2.

D. Incorrect - First part is correct. Due to the location of R-15 before the filter the reading on R-15 <u>will not change</u> due to placing the filter on service like PRF will do.

Second part is correct. the alignment remains as it was priort o placing the SJAE filtration unit on service.

055K1.06

055 Condenser Air Removal System (CARS)

Knowledge of the physical connections and/or cause-effect relationships between the CARS and the following systems:
(CFR: 41.2 to 41.9 / 45.7 to 45.8)
K1.06 PRM system 2.6 2.6

Importance Rating: 2.6 / 2.6

Technical Reference:

References provided: None

Learning Objective: LABEL, DRAW AND ILLUSTRATE the Condensate and Feedwater System flow paths, to include the components on the following figures (OPS-40201B05, Part A):
Figure 2, Condensate System
Figure 3, Condenser Air Removal System
Figure 5, Main Feed System

Question origin: NEW

Basis for meeting K/A: K/A is met by testing candidate's knowledge of the physical connections between the Steam Jet Air Ejector Filtration System and Radiation Monitor R-15. Candidate must know that the flowpath is from the SJAE, to R-15, to the SJAE Filtration, and then discharging to the TB HVAC. This information is significant because if SJAE Filtration was before R-15, then R-15 readings would change once SJAE Filtration was placed in service. Candidate must also know that this system does not realign to a recirc alignment when placed on service.

SRO justification: N/A

4.3 Air Ejector Filter Operation

NOTE: The SJAE discharge line drain trap drains to the Turbine Building Sump. IF the filtration unit is being placed in service due to a tube leak, THEN consideration should be given to EITHER isolating the drain trap OR routing the drainage to a poly bottle with a filtered vent.

4.3.1 To place SJAE filter in operation, at LCS SJAE FILTRATION, N1U41G529-N place local control handswitch for SJAE filtration unit valves in FILTER and perform the following:

4.3.1.1 Verify open SJAE FILTER SUCT DMPR, N1U41HV3677B.

4.3.1.2 Verify closed SJAE FILTER BYP DMPR, N1U41HV3677A.

4.3.1.3 Close SJAE FILTER BYP MAN ISO, N1U41V018.

4.3.2 To bypass SJAE filter, perform the following:

4.3.2.1 Verify open SJAE FILTER BYP MAN ISO, N1U41V018.

4.3.2.2 At LCS SJAE FILTRATION, N1U41G529-N place local control handswitch for SJAE filtration unit valves in BYPASS.

4.3.2.3 Verify closed SJAE FILTER SUCT DMPR, N1U41HV3677B.

4.3.2.4 Verify open SJAE FILTER BYP DMPR, N1U41HV3677A.

4.3.3 Direct SJAE discharge directly to TB 155' elevation for maintenance or testing by performing the following:

NOTE:	**The intent of this section is to allow the filtration unit to be shutdown for maintenance or testing, while maintaining flow through R-15 so that it remains operable. The discharge path will be through make-up damper N1U41HV3827. If power will be removed from the filtration unit, the makeup damper will fail closed rendering this lineup unusable.**

4.3.3.1 Verify open SJAE FILTRATION UNIT MAKE-UP AIR DMPR, N1U41HV3827.

4.3.3.2 At LCS SJAE FILTRATION, N1U41G529-N, verify control switch for SJAE filtration unit valves in BYPASS.

4.3.3.3 Stop the SJAE filtration unit.

4.3.3.4 Close SJAE FILTER BYP MAN ISO, N1U41V018.

4.3.3.5 Stop the R-28 pump.

4.3.3.6 <u>WHEN</u> desired to restart the filtration unit, <u>THEN</u> continue with this section.

4.3.3.7 Verify open SJAE FILTER BYP MAN ISO, N1U41V018.

4.3.3.8 At LCS SJAE FILTRATION, N1U41G529-N, place control switch for SJAE filtration unit valves in BYPASS.

4.3.3.9 At LCS SJAE FILTRATION, N1U41G529-N, depress the start pushbutton to start the SJAE filtration unit.

4.3.3.10 Verify open SJAE FILTER BYP DMPR, N1U41HV3677A.

4.3.3.11 Verify closed SJAE FILTER SUCT DMPR, N1U41HV3677B.

4.3.3.12 Verify open SJAE FILTRATION UNIT DISCH DAMPER, N1U41HV3826.

4.3.3.13 Start the R-28 pump.

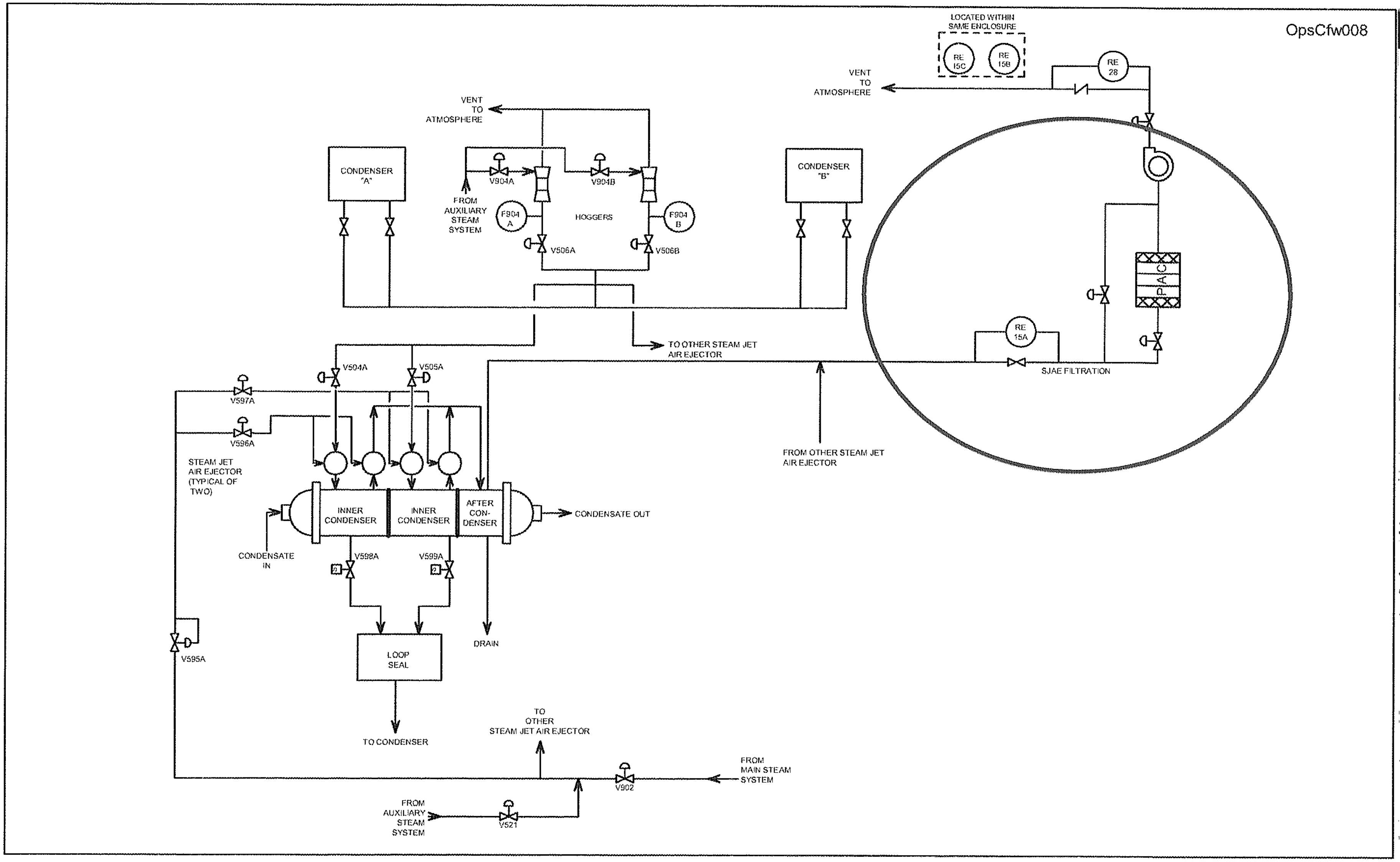


FIGURE 3 - Condenser Air Removal System

36. 056A2.04 036/MOD/RO/C/A 2.6/2.8/056A2.04/N///B

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

At 10:00:

- 1A and 1C Condensate pumps are running.
- 1B Condensate pump is in standby.

At 10:05:

- 1C Condensate Pump trips.
- KB4, SGFP SUCT PRESS LO, comes into alarm and then clears 10 seconds later.
- PR-4039, SGFP Suction Pressure recorder, indication drops to 274 psig for 5 seconds and then starts rising rapidly.

Which one of the following completes the statements below?

The 1B Condensate Pump started due to __(1)__ .

The Control Room Crew is required to __(2)__ per AOP-13, Condensate and Feedwater Malfunction.

A. 1) 1C Condensate pump tripping

2) trip the Reactor

B✓ 1) 1C Condensate pump tripping

2) stabilize Steam Generator levels

C. 1) SGFP low suction pressure

2) trip the Reactor

D. 1) SGFP low suction pressure

2) stabilize Steam Generator levels

The Condensate Pumps have 2 auto starts, 1) the standby pump starts when one of the two running pumps trip, or 2) if SGFP suction pressure <275 psig for >10 seconds the standby pump will start. In this question the auto start due to low suction pressure is not met, and the autostart of the standby pump is due to the trip of the running pump. Candidate must also know that AOP-13 actions are performed for response to trip of the Condensate pump. Since the standby Condensate pump started, Steam Generator levels will have decreased, but should not get low enough to meet criteria for a Reactor trip. Levels will have to be stabilized per the guidance of AOP-13. It is plausible that a candidate, with inadequate knowledge of auto setpoints, could conclude that both SGFP's tripped on low suction pressure (actual setpoint is < 275 psig for 30 seconds), and in that situation, a Reactor trip would be required.

A. Incorrect - 1) correct, The standby Condensate Pump will start automatically when one of the running Condensate Pumps trip.
2) incorrect, plausible if candidate has inadequate knowledge of SGFP suction pressure trip criteria - see above.

B. Correct - 1) correct, see A.1.
2) correct, AOP-13 actions are required to stabilize SG levels.

C. Incorrect - 1) incorrect, plausible because candidate may think that the SGFPs trip at 275 psig suction pressure (actually they do, but only if < 275 psig for 30 seconds).
2) incorrect, see A.2.

D. Incorrect - 1) incorrect, see C.1.
2) correct, see B.2.

056A2.04

056 Condensate System

Ability to (a) predict the impacts of the following malfunctions or operations on the Condensate System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:
(CFR: 41.5 / 43.5 / 45.3 / 45.13)
A2.04 Loss of condensate pumps 2.6 2.8*

Importance Rating:	2.6 / 2.8
Technical Reference:	FNP-1-AOP-13.0 v30
References provided:	None
Learning Objective:	EVALUATE plant conditions and DETERMINE if entry into AOP-13, Loss of Main Feedwater is required. (OPS-52520M02)
Question origin:	Modified FNP BANK AOP-13.0-52520M02 08, 2007 FNP NRC Exam
Basis for meeting K/A:	K/A is met by testing candidate's ability to determine the effects of a trip of a running Condensate Pump, and subsequent response of the standby Condensate Pump. In addition, candidate must choose appropriate procedural actions to mitigate the consequences of the perturbation on the SG level control system.
SRO justification:	N/A

During normal operation, two condensate pumps are required to supply the necessary flow for the two SGFPs. The start of the second condensate pump is dictated by a minimum SGFP suction pressure value or a maximum amperage limit on the running pump being reached. In all cases, a second condensate pump is started prior to the start of the second SGFP. The third condensate pump is placed in the auto mode and will start if either of the operating condensate pumps trips, or a feed pump low suction pressure (< 275 psig) exists for >10 seconds. If the SGFP suction pressure remains < 275 psig for > 30 seconds, the SGFP will trip. All three condensate pumps are controlled from the MCB.

When starting up the condensate system, hotwell level is verified adequate and the discharge valve of the first condensate pump to be started must be partially opened (approximately a 2" stem rise). This action limits initial flow from the pump, and thus limits the time that starting current is present and prevents water hammer of the downstream piping and heater strings. After the pump is running, the discharge valve should be slowly opened to fully pressurize the condensate system. Prior to the start of the pump the SGFP oil system is verified to be running, since the SGFPs may spin on condensate flow. The condensate pump miniflow valve is also verified in service.

Pump shaft sealing water from either the condensate pump discharge or from the demineralized water system supplies the pump stuffing box with approximately 2 gpm at 15 to 20 psig. Condensate pump discharge is the normal supply of water to the shaft sealing system and taps off the condensate pump discharge line. The demineralized water system supplies the pump during startup conditions and serves as a backup to the pump discharge and is normally isolated. The motor lower bearing cooler normally receives cooling water from the service water (SW) system at 2 gpm with 5 to 10 psig. The motor oil cooler receives 13 gpm cooling water at a maximum of 100 psig from the SW system. Each of these cooling lines is provided with two parallel strainers such that one can be isolated and cleaned while the other maintains cooling flow to the pumps. This arrangement prevents having to stop the pumps based on strainer clogging. These strainers are also periodically blown down to minimize accumulation of debris in the strainers. Although normally isolated, demin water can be aligned to the cooling water supply line to the motor lower bearing and motor oil coolers (this is called backup cooling to the condensate pumps). Demin water is aligned during certain emergency conditions, such as a safety injection, when SW to the turbine building is isolated. A PCV is unisolated and controls DW flow to the condensate pumps to keep the motor cool since SW is isolated or flow reduced during the emergency condition. Unit 1 backup cooling to the condensate pump PCV is located in the overhead just off the elevator and above the phone booth in on the 137' level of the Turbine Building. Unit 2 1 backup cooling to the condensate pump

Step	Action/Expected Response	Response Not Obtained
__ 6	**Check SGFP suction pressure - ABNORMAL.**	6 Proceed to step 7.
6.1	Check SGFP suction pressure stabilizes above 275 psig.	6.1 Perform the following

****

CAUTION: IF all condensate pumps are tripped and a standby condensate pump is not immediately started, THEN a condensate pump should NOT be started due to water hammer concerns.

****

Step	Action/Expected Response	Response Not Obtained
		6.1.1 Verify standby condensate pump started.
		6.1.2 IF suction pressure still falling, THEN reduce turbine load rapidly using FNP-1-AOP-17.0, RAPID LOAD REDUCTION.
		6.1.3 IF SGFP(s) trip occurs, THEN return to step 1.
		6.1.4 If SGFP speed is elevated return to step 3 OBSERVE CAUTION prior to step 3.
6.2	Check required number of heater drain pumps running.	6.2 IF a heater drain pump tripped, THEN perform the following:
		6.2.1 Reduce turbine load at ≤5 MW/min to restore reactor power within limits as required.
		6.2.2 Dispatch operator to investigate affected heater drain tank (Turbine Building 155' elevation)

Step 6 continued on next page

Page Completed

Step	Action/Expected Response	Response Not Obtained
		6.2.3 IF heater drain tank dump valve failed open, THEN restore tank level. • N1N26V915A(B) - affected heater drain pump dump valve jacked closed • Verify heater drain tank level restored • Start affected heater drain pump • Verify level control - normal
6.3	Check required number of condensate pumps running.	6.3 IF a condensate pump tripped, THEN perform the following 6.3.1 Dispatch operator to investigate affected condensate pump (Turbine Building basement).
6.4	Verify proper position of condensate and feedwater system valves. [ ] CNDS MINIMUM FLOW FCV N1N21V908 [ ] 1A SGFP RECIRC FCV N1N21V909A [ ] 1B SGFP RECIRC FCV N1N21V909B [ ] SJAE BYP - N1N21V901 [ ] GS COND BYP FCV - N1N21V902 (normally jacked open)	6.4 Manually position affected valve(s)

NOTE: Operation with three condensate pumps will affect reactor power due to effects from colder feedwater temperature.

Step	Action/Expected Response	Response Not Obtained
6.5	Check LESS THAN three condensate pumps running.	6.5 Perform the following: 6.5.1 IF required to allow operation with two condensate pumps, THEN reduce turbine load to ≤840 MW.

Step 6 continued on next page

Page Completed

Step	Action/Expected Response	Response Not Obtained
		6.5.2 WHEN operation with two condensate pumps acceptable, THEN stop one condensate pump and place in AUTO.
6.6	Check SGFP suction pressure stabilizes GREATER THAN - 300 psig.	6.6 IF required to maintain SGFP suction pressure, THEN reduce turbine load.
__ 7	**Verify plant conditions stable**	
7.1	Verify Reactor power within limits [ ] ΔTs < the 100% value (Computer points TC0429, TC0449, TC0469 [ ] Thermal Power < 2775 MWt (Computer point QC4621) [ ] NI's less than 100%	7.1 Reduce turbine load to restore reactor power within limits
7.2	Stabilize TAVG by adjusting rod position and/or boron concentration. • Manual Rod Control • Manual boration per FNP-1-SOP-2.3, CHEMICAL AND VOLUME CONTROL SYSTEM REACTOR MAKEUP CONTROL SYSTEM. • Emergency boration per FNP-1-SOP-2.3, CHEMICAL AND VOLUME CONTROL SYSTEM REACTOR MAKEUP CONTROL SYSTEM Figure 6.	

Step 7 continued on next page

Page Completed

Step	Action/Expected Response	Response Not Obtained
7.3	Verify automatic operation of the feedwater regulating valves. [ ] 1A SG FW FLOW FK 478 [ ] 1B SG FW FLOW FK 478 [ ] 1C SG FW FLOW FK 498	7.3 Control affected SG level using manual feedwater control. [ ] 1A SG FW FLOW FK-478 [ ] 1B SG FW FLOW FK-488 [ ] 1C SG FW FLOW FK-498 <u>OR</u> [ ] 1A SG BYPASS FLOW FK-479 [ ] 1B SG BYPASS FLOW FK-489 [ ] 1C SG BYPASS FLOW FK-499
7.4	Verify SG narrow range levels maintained approximately 65%.	7.4 <u>IF</u> SG narrow range levels <u>NOT</u> maintained greater than 28%, <u>THEN</u> trip the reactor and go to FNP-1-EEP-0, REACTOR TRIP OR SAFETY INJECTION.
7.5	Monitor feedwater flow and steam flow.	
7.6	Verify that feedwater and steam flow trend to approximately equal values for the target, turbine load.	

****

<u>CAUTION:</u> The LOSS OF LOAD INTERLOCK C 7A should not be reset in the event of a failure of PT-447 which actuates C-7A without consultation with the Operations manager.

****

Step	Action/Expected Response	Response Not Obtained
7.7	Check LOSS OF LOAD INTERLOCK C-7A on the BYP & PERMISSIVES panel <u>NOT</u> illuminated.	7.7 <u>IF</u> C-7A is to be reset, <u>THEN</u> perform the following 7.7.1 Verify that all steam dump valves indicate closed. 7.7.2 Verify 0 demand on STM HDR PRESS controller PK 464 and STM DUMP DEMAND TI408

Step 7 continued on next page

Page Completed

LOCATION KB4

SETPOINT: 300 PSIG Decreasing

ORIGIN: PS4X Relay from Pressure Switch N1N21PS690

B4
SGFP SUCT PRESS LO

PROBABLE CAUSE

1. 1A or 1B heater drain pump tripped.
2. A malfunction of SGWLC causing SGFP speed to rise.
3. A malfunction of one or more of the following valves, due to a failure of L & N power supply, instrument air problem, or mechanical problem:
   a) CNDS MINIMUM FLOW FCV - NlN2lV908
   b) 1A SGFP RECIRC FCV - NlN2lV909A
   c) 1B SGFP RECIRC FCV - NlN2lV909B
   d) SJAE BYP - NlN2lV90l
   e) GS COND BYP FCV - NlN2lV902

AUTOMATIC ACTION

At 275 psig falling the standby condensate pump will start after 10 sec. IF suction pressure is NOT greater than 275 psig within 30 sec, THEN the SGFP's will trip. This could result in a reactor trip.

OPERATOR ACTION

1. WHEN low pressure alarm comes in, THEN observe suction pressure on MCB recorder PR-4039 or plant computer.
2. IF a malfunction of SGWLC has raised SGFP speed, THEN take manual control of appropriate SGFP speed controller and adjust, as required
3. IF a feedwater heater malfunction is indicated, THEN go to FNP-1-AOP-13.0, CONDENSATE AND FEEDWATER MALFUNCTION
4. IF pressure continues to decrease below 300 PSIG, THEN verify both heater drain pumps are running.
5. IF a heater drain pump has tripped, THEN perform the following:
   4.1 Check the MCB level indication for the appropriate heater drain tank.
   4.2 Dispatch personnel to turbine building to check the heater drain tank dump valve and jack it closed if necessary.
   4.3 Restart the heater drain pump if there is sufficient level in the heater drain tank.
6. IF a heater drain pump has not tripped, THEN check the power supply breakers in the L & N Racks AND reset if necessary.
7. IF suction pressure continues to decrease, THEN start the standby condensate pump prior to reaching 275 PSIG.
8. IF the standby condensate pump is not available, THEN begin reducing load rapidly.
9. IF operation with three condensate pumps is required, THEN carefully monitor Tave, reactor power, pressurizer level and pressure, and S/G level due to effects of colder feedwater.
10 IF a valve failure caused the low suction pressure, THEN isolate and/or bypass the valve as appropriate in order to stop the third condensate pump as soon as possible.

References: D-172886, Sh. 1; D-173198; D-170124, Sh. 3, 4; D-170117, Sh. 1, 2, 4

1. AOP-13.0-52520M02 008 056A2.04

Given the following:

- Unit 2 is at 80% power ramping to 100%.
- 2C Condensate Pump has tripped.
- Annunciator KB4, SGFP SUCT PRESS LO, came into alarm 35 seconds ago.
- PR-4039, SGFP Suction PRESS recorder, indicates SGFP pressure is 280 psig and is decreasing.

Which ONE of the following is the expected result of this condition and action required per AOP-13.0, Condensate and Feedwater Malfunction?

A. • The standby condensate pump **should** have AUTO started;

• Trip the reactor and enter EEP-0, Reactor Trip or Safety Injection.

B.✓ • The standby condensate pump **should** have AUTO started;

• Verify the standby condensate pump started and if suction pressure is still falling, then reduce load rapidly IAW AOP-17, Rapid Load Reduction.

C. • The standby condensate pump **should NOT** have AUTO started;

• Trip the reactor and enter EEP-0, Reactor Trip or Safety Injection.

D. • The standby condensate pump **should NOT** have AUTO started;

• Verify the standby condensate pump started and if suction pressure is still falling, then reduce load rapidly IAW AOP-17, Rapid Load Reduction.

The condensate pumps have 2 auto starts, one on the trip of the other pump and one for suction pressure <275 psig for >10 sec. In this question the auto start for suction pressure is not met but the other one is. This has been a high miss question since most do not think of the autostart for the tripped pump.

A - Incorrect; The stby condensate pump should start immediately when the other condensate pump trips (if the stby pump is in AUTO, which is the normal alignment at 80% power). Plausible because the low suction pressure auto start of < 275 psig for > 10 seconds has not yet been met. Tripping the reactor is not required unless approaching trip criteria or if BOTH SGFPs are tripped and this has not happened.

B - Correct; The standby condensate pump SHOULD auto start immediately when the other condensate pump trips. With suction pressure dropping, AOP-13 directs verifying stby pump started prior to 275 psig decreasing, If pressure continues to drop, rapidly ramp down IAW AOP-17, Rapid Load Reduction.

C - Incorrect; first part is NOT true: condensate pump should have auto started on the trip of the other pump.
second part is not correct for this situation. It is plausible in that if the candidate thought both SGFPs tripped due to the alarm being in for >275 psig, then this would be correct.

D - Incorrect; first part is NOT true: condensate pump should have auto started on the trip of the other pump.

Second part is incorrect for this condition also, but plausible because the ramp at ≤ 5 MW/MIN is incorrect for a condensate pump but plausible since it is correct for a HDT pump trip also covered by AOP-13.

At 275 psig falling the standby condensate pump will start after 10 sec. IF suction pressure is NOT greater than 275 psig within 30 sec, THEN the SGFP's will trip. This could result in a reactor trip.

37. 056AG2.2.12 037/NEW/RO/C/A 3.7/4.1/056AG2.2.12/N///C

Unit 2 is in Mode 3 with the following conditions:

- A Grid disturbance caused a dual unit LOSP.
- The following 230KV High Voltage lines are **out of service**:
  - Sinai Cemetery
  - Bainbridge
  - Webb
- #2 Auto Bank Transformer is **out of service**.
- The Shift Manager has directed performance of STP-27.1, A.C. Source Verification, on Unit 2.

Which one of the following completes the statements below?

The Unit 2 Startup Transformers are powered from the __(1)__ side of the High Voltage Switchyard.

Per STP-27.1, __(2)__ available to supply power to the Unit 2 Startup Transformers.

	(1)	(2)
A.	230KV	one off-site circuit is
B.	500KV	one off-site circuit is
C.✓	230KV	two off-site circuits are
D.	500KV	two off-site circuits are

Both Unit 1 and Unit 2 Startup Transformers are powered from the 230 KV side of the High Voltage Switchyard, but it is plausible for a candidate to choose the 500KV side since the Unit 2 Main Generator output is to the 500KV side of the Switchyard.

For the given conditions, there is one 230KV line in service and two 500KV lines in service. There is normally two Auto bank transformers that will allow flow between the 230KV and 500KV sides of the High Voltage Switchyard, but for this situation there is only one Auto bank transformer available. To be able to take credit for both 500KV lines, two Auto bank transformers must be available. When only one Auto bank transformer is available, only one 500KV line can be used as an off-site source. Therefore, two off-site sources are available, one from the 230KV side and one from the 500KV side.

A. Incorrect - 1) correct, Unit 2 Startup Transformers are powered from the 230KV side of the Switchyard.
2) incorrect, plausible if candidate does not know that the 500KV lines can be a source through the #1 Auto bank transformer.

B. Incorrect - 1) incorrect, Unit 2 Startup Transformers are powered from the 230KV side of the Switchyard. See paragraph 1 above in the explanation.
2) incorrect, see A.2.

C. Correct - 1) correct, see A.1.
2) correct, see paragraph 2 above in the explanation.

D. Incorrect - 1) incorrect, see B.1.
2) correct, see paragraph 2 above in the explanation.

056AG2.2.22

APE: 056 Loss of Offsite Power

2.2 Equipment Control

2.2.12 **Knowledge of surveillance procedures.**

(CFR: 41.10 / 45.13)

IMPORTANCE RO 3.7 SRO 4.1

Importance Rating:	3.7 / 4.1
Technical Reference:	FNP-2-STP-27.1 v36
References provided:	None
Learning Objective:	RECALL AND APPLY the LCO and APPLICABILITY for Technical Specifications (TS) or TRM requirements, and the REQUIRED ACTIONS for 1 HR or less TS or TRM requirements, and the relevant portions of BASES that DEFINE the OPERABILITY and APPLICABILITY of the LCO associated with the Off-Site Power System components and attendant equipment alignment, to include the following (OPS-52103A01): 3.8.1, AC Sources - Operating 3.8.2, AC Sources - Shutdown
Question origin:	NEW
Basis for meeting K/A:	K/A is met by placing candidate in a situation with a Loss of Offsite Power and have him assess and determine the number of off-site sources available as defined by Surveillance procedure FNP-2-STP-27.1, A.C. Source Verification.
SRO justification:	N/A

A.C. SOURCE VERIFICATION

PROCEDURE USAGE REQUIREMENTS		SECTIONS
Continuous Use:	Procedure must be open and readily available at the work location. Follow procedure step by step unless otherwise directed by the procedure.	ALL
Reference Use:	Procedure or applicable section(s) available at the work location for ready reference by person performing steps.	
Information Use:	Available on site for reference as needed.	

Approved By: David Reed (for)
Operations Manager

Date Approved: April 1, 2010

Version Number	Version Description
34.0	New Procedure format per NMP-OS-008.
35.0	Added precaution 2.1.4
36.0	Reformatted Step 5.5.

SURVEILLANCE TEST REVIEW SHEET

SURVEILLANCE TEST NO. FNP-1-STP-27.1	TECHNICAL SPECIFICATION REFERENCE SR 3.8.1.1; SR 3.8.2.1
	MODE(S) REQUIRING TEST: 1, 2, 3, 4, 5, 6

TEST RESULTS (TO BE COMPLETED BY TEST PERFORMER)

PERFORMED BY ____________________ / ____________________ DATE/TIME ____________
(Print) (Signature)

COMPONENT OR TRAIN TESTED (if applicable) ____________________

[ ] ENTIRE STP PERFORMED [ ] FOR SURVEILLANCE CREDIT

[ ] PARTIAL STP PERFORMED [ ] NOT FOR SURVEILLANCE CREDIT

REASON FOR PARTIAL: ____________________

TEST COMPLETED: [ ] Satisfactory [ ] Unsatisfactory

[ ] The following deficiencies occurred:

____

____

[ ] Corrective action taken or initiated:

____

SHIFT SUPERVISOR/ SHIFT SUPPORT SUPERVISOR

REVIEWED BY ____________________ / ____________________ DATE ____________
(Print) (Signature)

[ ] Procedure properly completed and satisfactory per FNP-0-AP-5

[ ] Comments: ____________________

____

*Reviewer must be AP-31 Level II certified & cannot be the Performing Individual

ENGINEERING SUPPORT GROUP SCREENING (IF APPLICABLE)

SCREENED BY ____________________ DATE ____________

REVIEWED BY ____________________ DATE ____________

[ ] Satisfactory and Approved

[ ] Comments: ____________________

____

TABLE OF CONTENTS

1.0 PURPOSE

To verify the alignment, energization, and availability of the A.C. off-site power sources to the switchyard, and the A.C. power to the on-site distribution system.

2.0 PRECAUTION AND LIMITATIONS

2.1 PRECAUTIONS

2.1.1 ACC should be contacted when any of the indicated 230kV line amps is less than 500 amps to verify the source is available. Per Technical Services, the current indication for the 230kV offsite lines is not designed to accurately indicate current below 500 amps.

2.1.2 ACC should be contacted when any of the indicated 500kV line megawatts is indicating zero (0) to verify the source is available.

2.1.3 The SS/SM will be notified immediately if the "As Found" condition is out of tolerance when the "As Found" condition is evaluated against the acceptance / functional criteria.

2.1.4 Should access to substation explorer be unavailable in the Control Room, consider rebooting the substation explorer computer located at the Switch house. Power should be verified available to the computer located in the Switch house. Reboot can be accomplished by powering down and powering back up the computer. Further guidance for the Substation explorer computer located at the Switch House is available in FNP-0-SOP-0.3 App J. **{CR 2009114471}**

2.2 LIMITATIONS

2.2.1 Conditions can exist where an off-site circuit would indicate normal voltage, and not be available as an off-site supply. An energized circuit from the off-site transmission network should only be counted if amps, or megawatts are indicated on the line. ACC should be contacted if there are any questions on the indicated line amps, or megawatts.

2.2.2 The 500kV line megawatt indication can be negative if the line is supplying power through the Farley substation.

2.2.3 If the following conditions are met, the 500kV switchyard provides two circuits of off-site power to the 230kV switchyard:

Both of these conditions are not met - one Auto Bank Transformer is out of service, so only one circuit from the 500 KV side can be counted as available.

- Both Auto Bank transformers are operable.
- Each 500kV off-site transmission circuit is connected to the 500kV switchyard and aligned by an independent circuit to an independent Auto Bank transformer connected to the 230kV switchyard.

2.2.4 A transmission planning study was performed following a concern about the offsite source capability from the INPO Transformer, Switchyard, and Grid Review visit. The results of the transmission planning study found that the availability of at least one of the Auto Bank Transformers, and a 500 kV line is important to the offsite source capability for Farley. This has been added to enhance the acceptance criteria for the AC Source Verification, but it is not Tech Spec related. **{AI 2007202087}**

3.0 INITIAL CONDITIONS

3.1 **Verify** the version of this procedure is the current version. **{OR 1-98-498}** ______

3.2 **Verify** the version of this procedure is for the correct unit for the task. **{OR 1-98-498}** ______

3.3 **Verify** the required auxiliary transformer(s) is (are) energized per FNP-1-SOP-36.1, STARTUP, UNIT AUXILIARY, AND MAIN TRANSFORMERS PREPARATION FOR OPERATION ______

4.0 ACCEPTANCE CRITERIA

4.1 Two circuits from the off-site transmission network to the switchyard and two circuits from the switchyard to the on-site distribution system are operable during modes 1, 2, 3, and 4.

4.2 One circuit from the off-site transmission network to the switchyard and one circuit from the switchyard to the on-site distribution system are operable during modes 5 and 6.

4.3 Two diesel generator sets capable of supplying the on-site distribution subsystem(s) are operable during modes 1, 2, 3, and 4.

4.4 One diesel generator set capable of supplying one train of the on-site distribution subsystem(s) is operable during modes 5 and 6.

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

5.0 INSTRUCTIONS

NOTE
Steps 5.2 and 5.3 may be performed in any order.

5.1 **Perform** FNP-0-SOP-0.3 APPENDIX J, OBTAINING CIRCUIT BREAKER AND DISCONNECT POSITIONS, LINE VOLTAGES AND AMPS / MEGAWATTS ______

5.2 **Use** FNP-0-SOP-0.3 APPENDIX J, OBTAINING CIRCUIT BREAKER AND DISCONNECT POSITIONS, LINE VOLTAGES AND AMPS / MEGAWATTS TO COMPLETE THE FOLLOWING:

5.2.1 **Circle** any open circuit breaker or disconnect switch on FIGURE 1. ______

5.2.2 **Record** the following voltages and amps, or MWs:

Snowdoun	________kilovolts	______MW
#2 Auto Bank High Side	________kilovolts	
#2 Auto Bank Low Side	________kilovolts	
Raccoon Creek	________kilovolts	______MW
#1 Auto Bank High Side	________kilovolts	
#1 Auto Bank Low Side	________kilovolts	
Webb	________kilovolts	______MW / amps
Bainbridge	________kilovolts	______MW / amps
Pinckard	________kilovolts	______MW / amps
Sinai Cemetery	________kilovolts	______MW / amps
S/U Transformer 1A	________kilovolts	
S/U Transformer 1B	________kilovolts	

5.2.3 **Contact** the ACC to verify that source is available WHEN any of the above indicated 230kV line amps is less than 500 amps, OR zero (0) megawatts. ______

5.2.4 **Contact** the ACC to verify that source is available WHEN any of the above indicated 500kV line megawatts is zero (0). ______

5.3 **Determine** from Figure 1, and the above voltage, amp, and megawatt readings, the number of energized circuits from the off-site transmission network to the switchyard, the number of energized circuits from the switchyard to the on-site distribution system, the number of Auto Bank Transformers available, and the number of 500kV transmission lines available. **{AI 2007202087}**

Number of off-site sources available____________

Number of sources to on-site distribution_________

Number of Auto Bank Transformers available _____

Number of 500kV transmission lines available ____

5.3.1 IF in Mode 1, 2, 3, or 4, THEN two circuits from the off-site transmission network to the switchyard and two circuits from the switchyard to the on-site distribution system are operable.**(*)** ______

ACCEPTANCE CRITERIA:
Two energized circuits from the off-site transmission network and two energized circuits from the SWYD to the on-site distribution system are operable.

5.3.2 IF in Mode 1, 2, 3, or 4, THEN at least one Auto Bank Transformer AND one 500kV transmission line available**. {AI 2007202087}** ______

5.3.3 IF in Mode 5 or 6, THEN one circuit from the off-site transmission network to the switchyard and one circuit from the switchyard to the on-site distribution system are operable. **(*)** ______

ACCEPTANCE CRITERIA:
One energized circuit from the off-site transmission network and one energized circuit from the SWYD to the on-site distribution system are operable.

5.3.4 IF in Mode 5 or 6, THEN at least one Auto Bank Transformer AND one 500kV transmission line available. **{AI 2007202087}** ______

5.4 **Determine** using Table 1 the number of diesel generator sets capable of supplying the on-site distribution subsystem(s).

Number of diesel sets generators available_____________

NOTE
IF this surveillance is being performed ONLY to satisfy Tech Spec LCO 3.8.1 for having a Diesel Generator inoperable THEN the acceptance criteria of 4.3 and 4.4 does not apply AND steps 5.4.1 and 5.4.2 are N/A.

5.4.1 IF in Mode 1, 2, 3, or 4, THEN two diesel generator sets capable of supplying the on-site distribution subsystem(s) are operable. **(*)** ______

ACCEPTANCE CRITERIA:
Breakers racked in and control power on as indicated by the EPB breakers indicating lights being on.

5.4.2 IF in Mode 5 or 6, THEN one diesel generator set capable of supplying one Train of the on-site distribution subsystem(s) is operable. **(*)** ______

ACCEPTANCE CRITERIA:
Breakers racked in and control power on as indicated by the EPB breakers indicating lights being on.

5.5 IF this surveillance was performed to satisfy Tech Spec LCO 3.8.1 for having a Diesel Generator inoperable, THEN;

5.5.1 **Record** the time the STP is to be performed again to meet the Completion Time specified (once per 8 hours thereafter);

Time surveillance due again ______________

5.5.2 **Verify** next time due is correct. ______
SS

5.5.3 **Initiate** the appropriate administrative reminder ______
SS

6.0 REFERENCES

6.1 FSAR Section 8.2.

6.2 D-169970, 230 KV Switchyard Single line.

6.3 D-198434, 500 KV Switchyard Single line.

6.4 REA 94-0525, High Voltage Switchyard Upgrade.

6.5 DCP 98-1-9437, 230 KV Capacitor Bank Addition.

6.6 DCP 99-1-9472, Sinai Cemetery Line Addition.

6.7 DCP 99-1-9794, Raccoon Creek Substation Addition.

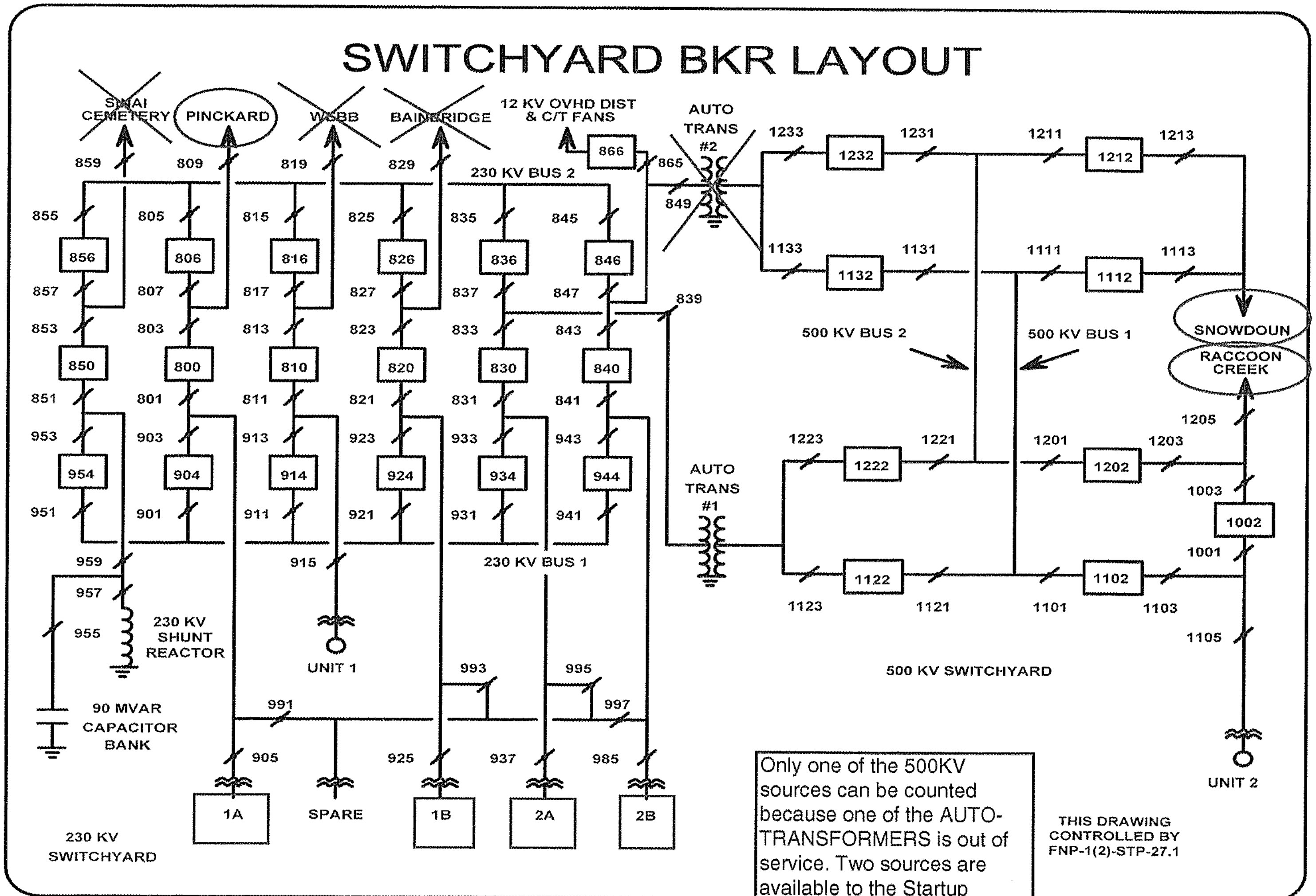
6.8 DCP 2050701701, HVSWYD 500kV Breaker Replacement – 2007

TABLE 1

BUS	D/G OUTPUT BREAKER	*EPB BKR INDICATING LIGHT ON	INITIALS
A TRAIN DG SET			
1H	DH07	________	________
1F	DF08	________	________
B TRAIN DG SET			
BUS 1G	DG08	________	________
ADMING TRACKING OF 2C DG STATUS			
BUS 1J	DJ06	________	________

*Breaker racked in and control power on are indicated by the EPB breaker indicating lights being on.

FIGURE 1



Only one of the 500KV sources can be counted because one of the AUTO-TRANSFORMERS is out of service. Two sources are available to the Startup Transformers.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.1 AC Sources — Operating

BASES

BACKGROUND

The unit Class 1E AC Electrical Power Distribution System AC sources consist of the offsite power sources (preferred power sources, normal and alternate), and the onsite standby power sources (Train A and Train B diesel generators (DGs)). As required by 10 CFR 50, Appendix A, GDC 17 (Ref. 1), the design of the AC electrical power system provides independence and redundancy to ensure an available source of power to the Engineered Safety Feature (ESF) systems.

The onsite Class 1E AC Distribution System is divided into redundant load groups (trains) so that the loss of any one group does not prevent the minimum safety functions from being performed. Each train has connections to two preferred offsite power sources and a single DG set. DG set A consists of the 1-2A and 1C DGs. DG set B consists of the 1B DG (Unit 1) and the 2B DG (Unit 2).

Offsite power is supplied to the 230 kV and 500 kV switchyard(s) from the transmission network by six transmission lines. From the 230 kV switchyard, two electrically and physically separated circuits provide AC power, through startup auxiliary transformers, to the 4.16 kV ESF buses. A detailed description of the offsite power network and the circuits to the Class 1E ESF buses is found in the FSAR, Chapter 8 (Ref. 2).

An offsite circuit consists of all breakers, transformers, switches, interrupting devices, cabling, and controls required to transmit power from the offsite transmission network to the onsite Class 1E ESF bus(es).

In addition to providing a pre-determined sequence of loading the DGs, the train A and train B automatic load sequencers also function to actuate the required ESF loads on the offsite circuits. When offsite power is available, the automatic load sequencers function to simultaneously start the required ESF loads upon receipt of an SI actuation signal.

The onsite standby power source is provided from 4 DGs (1-2A, 1B, 2B, and 1C). The DGs are of two different sizes. The 1B, 2B, and

(continued)

BASES

BACKGROUND (continued)

1-2A DGs are rated at 4075 kW and the 1C DG is rated at 2850 kW. DG 1-2A and 1-C are assigned to the redundant load group train A. The train A load group is supplied from 4160V emergency Buses, F, H, and K. The 4160V H bus does not supply any design basis required loads by itself but is required to support the operation of DG 1C to supply the emergency Buses F and K which in turn supply design basis required loads. DGs 1B and 2B are assigned to the redundant load group train B. The train B load group is supplied from 4160V emergency Buses G, J, and L. The 4160V bus J does not supply any design basis required loads and is only required for the response to a station blackout which is not a design basis accident.

DGs 1B and 2B are dedicated to train B of Unit 1 and Unit 2, respectively, and each DG comprises a required DG set for its associated unit. DGs 1-2A and 1C are dedicated to train A but are shared between both units and together comprise a required DG set for both units. However, there are no design basis events in which DG 1-2A or 1C are required to supply power to the safety loads of both units simultaneously. In all events, DG 1-2A and 1C are assigned to only one of the two units depending on the event.

The 4.16 kV emergency busses required to supply equipment essential for safe shutdown of the plant at F, G, H, J, K, and L for each unit. These are supplied by two startup transformers on each unit connected to the offsite source during normal and emergency operating conditions. In the event one startup transformer on a unit fails, three of the emergency busses on that unit will be de-energized with their loss annunciated in the Main Control Room. The respective busses Diesel Generators will start and LOSP loads will be sequenced on to those busses. In the event Diesels fail, manual action will be required to re-energize the affected busses from the other startup transformer for that unit.

A DG starts automatically on a safety injection (SI) signal (i.e., low pressurizer pressure or high containment pressure signals) or on an ESF bus degraded voltage or undervoltage signal (refer to LCO 3.3.5, "Loss of Power (LOP) Diesel Generator (DG) Start Instrumentation"). After the DG has started, it will automatically tie to its respective bus after offsite power is tripped as a consequence of ESF bus undervoltage or degraded voltage, independent of or coincident with an SI signal. The DGs will also start and operate in the standby mode without tying to the ESF bus on an SI signal alone. Following the trip of offsite power, a sequencer strips nonpermanent loads from the ESF

(continued)

BASES

BACKGROUND (continued)

bus. When the DG is tied to the ESF bus, loads are then sequentially connected to its respective ESF bus by the automatic load sequencer. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading the DG by automatic load application.

In the event of a loss of preferred power, the ESF electrical loads are automatically connected to the DGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA) such as a loss of coolant accident (LOCA).

Certain required unit loads are returned to service in a predetermined sequence in order to prevent overloading the DG in the process. Within 1 minute after the initiating signal is received, all loads needed to recover the unit or maintain it in a safe condition are returned to service.

Ratings for Train A and Train B DGs satisfy the requirements of Regulatory Guide 1.9 (Ref. 3). The continuous service rating of each DG is 2850 kW for DG 1C and 4075 kW for DGs 1-2A, 1B, and 2B. DG 1C has a 2000 hour rating of 3100 kW and overload permissible up to 3250 kW for 300 hours per year. DGs 1-2A, 1B, and 2B have a 2000 hour rating of 4353 kW and overload permissible up to 4474 kW for 2 hours in any 24 hour period with a maximum of 300 hours cumulative per year. The ESF loads that are powered from the 4.16 kV ESF buses are listed in Reference 2.

Each diesel generator (DG) is connected to a shared fuel oil storage and transfer system. The shared fuel oil storage system consists of five underground storage tanks interconnected with piping, valves and redundant capacity fuel transfer pumps. This configuration allows for pumping diesel fuel oil from any DG fuel oil storage tank to any DG day tank or to any other DG fuel oil storage tank. The deliverable capacity of four tanks is sufficient to operate the required DGs for a period of 7 days while the DGs are supplying maximum single train, post loss of coolant accident load demands discussed in the FSAR. The diversity and 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.

BASES

APPLICABLE SAFETY ANALYSES

The initial conditions of DBA and transient analyses in the FSAR, Chapter 6 (Ref. 4) and Chapter 15 (Ref. 5), assume ESF systems are OPERABLE. The AC electrical power sources are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System (RCS), and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the AC electrical power sources is consistent with the initial assumptions of the Accident analyses and is based upon meeting the design basis of the unit. This results in maintaining at least one train of the onsite or offsite AC sources OPERABLE during Accident conditions in the event of:

a. An assumed loss of all offsite power or all onsite AC power; and

b. A worst case single failure.

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

LCO

Two qualified circuits (i.e., consistent with the requirements of GDC 17) consisting of two physically independent transmission lines from the offsite transmission network to the switchyard and two independent circuits between the switchyard and the onsite Class 1E Electrical Power System along with separate and independent DG sets for each train ensure availability of the required power to shut down the reactor and maintain it in a safe shutdown condition after an anticipated operational occurrence (AOO) or a postulated DBA.

Qualified offsite circuits are those that are described in the FSAR and are part of the licensing basis for the unit.

In addition, one automatic load sequencer per train must be OPERABLE (B1F, B2F, B1G, and B2G).

Each offsite circuit must be capable of maintaining rated frequency and voltage, and accepting required loads during an accident, while connected to the ESF buses.

(continued)

BASES

LCO (continued)

Two physically independent circuits between the transmission network and the onsite system may consist of any combination that includes two of the six transmission lines normally supplying the 230 and 500 kV switchyards and both independent circuits from the 230 kV switchyard to the Class 1E buses via Startup Auxiliary Transformers 1A (2A) and 1B (2B). The two of six combination of transmission lines may be shared between Unit 1 and 2. If either of the transmission lines are 500 kV, one 500/230 kV Autotransformer connecting the 500 and 230 kV switchyards is available. If both of the transmission lines are 500 kV, both 500/230 kV Autotransformers 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:

(continued)

38. 057AA1.04 038/MOD/RO/C/A 3.5/3.6/057AA1.04/N//D

The following conditions exist on Unit 1:

At 10:00:

- Reactor power is 80% and stable.
- Rod control is in AUTO with Bank D rods at 184 steps.
- LT-115, VCT LEVEL, is failed LOW.
- N-43, POWER RANGE NUCLEAR INSTRUMENT, has failed HIGH.
- All actions of AOP-100, Instrument Malfunction, have been completed for N-43.

At 10:15:

- Power is lost to the 1C 120V AC Vital Panel due to an Inverter malfunction.

Which one of the following conditions will occur due to 1C 120V AC Vital Panel being de-energized?

A. A reactor trip will occur.

B. An Auto makeup will commence and continue until secured by the Plant Operator.

C. Automatic rod withdrawal is blocked but the operator can still insert rods in MANUAL.

D✓ LCV-115B and D, RWST to CHG PUMP, will open.

A. Incorrect - Plausible because a reactor trip would occur on unit 2 for this power level due to SLLOF RCP trip indication. Also if another Power Range NI channel, other than N-43, had already been placed in a tripped condition a reactor trip would occur since the 120v vital panel C powers N-43.

The SLLOF RCP trip indication was removed from Unit 1 during this class. It was taught during the systems portion of the class and changed during the outage after the systems portion of the class was complete.

B. Incorrect - Plausible because upon a loss of the 120V vital panel 1A, FCV113A and 114B open and the BAT & RMW pumps start, but the discharge path to the VCT, valves FCV114A or 113B do not open. It looks like an Auto makeup, but one is not actually occurring.

C. Incorrect - Auto rod control is not affected by the loss of the Vital Panel when the conditions of AOP-100 have been completed for N-43. Auto rod control would be a factor if N-43 were not already failed and placed in the trip condition. If the rod block was in effect, rods could not be withdrawn in Auto or Manual, but could be inserted, which makes this a plausible distracter.

D. Correct - The RWST to Charging Pump suction valves open and the VCT outlet valves will close. A boration of the RCS will result.

057AA1.04

APE: 057 Loss of Vital AC Electrical Instrument Bus

Ability to operate and / or monitor the following as they apply to the Loss of Vital AC Instrument Bus:
(CFR 41.7 / 45.5 / 45.6)
AA1.04 RWST and VCT valves 3.5 3.6

Importance Rating:	3.5 / 3.6
Technical Reference:	FNP-0-ARP-2.1 v30
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the 120 Volt AC Distribution System components and equipment, to include the following (OPS-40204F09): Normal control methods Abnormal and Emergency Control Methods Automatic actuation including setpoint Protective isolations Protective interlocks Actions needed to mitigate the consequence of the abnormality
Question origin:	Modified FNP Bank 120 VAC-40204F09 24. Originally from FNP August 2004 NRC exam.
Basis for meeting K/A:	K/A is met by placing candidate in a situation with some prior instrument failures and a subsequent loss of a 120V Vital AC Instrument panel. Candidate must assess and integrate prior conditions with the new failure. Due to the conditions and failure of the 120V Vital Panel, the RWST to Charging pump suction valves open and the VCT Outlet valves close, resulting in a boration of the RCS.
SRO justification:	N/A

LOCATION VD1

D1
1C INV FAULT

SETPOINT:
1. Battery near exhaustion 107V DC.
2. Inverter output undervoltage 108V AC

ORIGIN:
1. Battery near exhaustion X7 Voltage sense board
2. Inverter current limit A3 Ammerter Relay
3. Inverter output undervoltage K3 Relay via X8 voltage sense board
4. Inverter overheating X10 relay board
5. Out of sync X12 relay board
6. Fan failure
7. Bypass source supplying load

PROBABLE CAUSE

1. Bypass source carrying load.
2. Inverter out of sync with bypass supply.

AUTOMATIC ACTION

1. IF DC input voltage drops to 103 V DC, THEN inverter transfers to bypass source.
2. IF inverter fails, THEN the bypass source should carry the load.
3. An inverter fault when the bypass source is not available resulting in a loss of power to 120VAC VITAL INSTRUMENT PANEL 1C will be indicated by the following:
   A. Annunciators FD3 AND FD4 will alarm.
   B. Annunciators HC4 AND HD1 will be OFF.

CAUTION: Outward rod motion is blocked by the High Power Rod Stop Bistable being tripped.

   C. Loss of power to NI-43 with associated alarms, bistable trip status lights and indication.
   D. No amperage on 1C Inverter ammeter.
   E. IF RCP breaker indication is lost > 35% power, the reactor will trip.

LOCATION VD1

OPERATOR ACTION

1. IF 120VAC VITAL INSTRUMENT PANEL 1C is de-energized, THEN immediately perform the following:

   A. IF reactor trip occurred, THEN refer to FNP-1-EEP-0, REACTOR TRIP OR SAFETY INJECTION.

   B. Attempt to restore power from the bypass source by performing the following:

      1. IF the “BYPASS SOURCE AVAILABLE” lamp is illuminated on the inverter, THEN transfer 1C INVERTER MANUAL BYPASS SWITCH to the “BYPASS SOURCE TO LOAD” position.

      2. IF the “BYPASS SOURCE AVAILABLE” lamp is NOT illuminated on the inverter, THEN perform the following:

         a) Verify 1B MCC energized

         b) Verify closed Breaker Q1R17BKRFBJ5L - Supply to 1 H 208V/120V REGULATED AC DISTRIBUTION PANEL

         c) Verify closed Breaker #7 in 1H REGULATED AC DISTRIBUTION PANEL (1B Battery Charger Room)

         d) Transfer 1C INVERTER MANUAL BYPASS SWITCH to the “BYPASS SOURCE TO LOAD” position

   C. Notify appropriate personnel to determine the cause and correct.

NOTE **In addition to items listed under Automatic Action, the following controls and indications may be affected if 1C Vital Instrument Panel is De-energized.**

- **PRZR PORV - Q1B31PCV445A will not open on high przr pressure signal.**
- **RWST TO CHG PUMP - Q1E21LCV115B and D will open if LT 115 is inoperable.**
- **Annunciator KG4, TURB TV closed alert, will be in alarm and TSLB2, 14-3 will be lit**
- **Annunciator KH5, TURB Auto/Stop oil press low, will be in alarm and TSLB2, 13-3 will be lit.**
- **Excess Letdown Hx Disch valve HIK-137 fails closed on loss of 1C Vital Panel.**

LOCATION VD1

OPERATOR ACTION (cont'd.)

D. IF Excess Letdown was in service AND HIK-137 failed closed due to a loss of 1C Vital Instrument Panel, THEN secure Excess Letdown using FNP-1-SOP-2.7, CHEMICAL AND VOLUME CONTROL EXCESS LETDOWN

NOTE:	**Per Table 3 of FNP-0-ACP-52.1, Guidelines for Scheduling of On-Line Maintenance, A, B, C, D or F Inverters on bypass source are considered to be unavailable due to being status A1 for the Maintenance Rule. This unavailability should be logged for tracking purposes.**

2. Refer to Technical Specifications 3.8.7, 3.8.8, 3.8.9 and 3.8.10.
3. IF 120VAC VITAL INSTRUMENT PANEL 1C was de-energized, THEN perform the following when re-energized:

   A. Verify that VCT OUTLET ISO valves - Q1E21LCV115C and E are open and can remain open.
   B. Verify that RWST TO CHG PUMP valves - Q1E21LCV115B and D are closed.
   C. Verify PRZR PORV - Q1B31PCV445A is closed.
   D. IF necessary, THEN reset the positive rate trip on NI-43 and verify proper operation on NI-43.
   E. Verify all other MCB controls and indications returned to normal.

4. Have inspection of areas outside control room conducted to verify all controls and indications outside of the control room are returned to normal.

5. WHEN cause of fault has been corrected, THEN return 1C INVERTER to service.

{CMT 009705} {CMT 0005094} applies to entire annunciator.

References: U-210676; PCN B87-1-2899; D-177212; D-177218, Sh.2; DCP 93-2-8551 (Bit Deletion); **{CMT 009705} {CMT 0005094}**

SECTION 1.12

NUCLEAR INSTRUMENTATION – POWER RANGE CHANNEL

NOTE: Step 1 is an IMMEDIATE OPERATOR ACTION.

__	1	**<u>IF</u> N-44 has failed,** **<u>THEN</u> place rods in manual.**		
__	2	**STOP any load change in progress.**		
__	3	**Within one hour, check P-10 interlock in the required state for existing unit conditions. (TS 3.3.1 Function 17t)**	3	Be in Mode 3 within 7 hours of the LCO entry.
__	4	**Within one hour, check the following interlocks are in the required state for existing unit conditions: (TS 3.3.1 Function 17b, c, d)** • P-7 • P-8 • P-9	4	Be in Mode 2 within 7 hours.
__	5	**Check THERMAL POWER -** **GREATER THAN <u>OR</u> EQUAL TO 75%.**	5	Go to step 7.
__	6	**Perform FNP-1-STP-7.0, QUADRANT POWER TILT RATIO CALCULATION as required by Tech Spec SR 3.2.4.2 within 12 hours** <u>OR</u> Reduce power to <75% thermal power within 12 hours.	6	Be in Mode 3 within 78 hours

SECTION 1.12

NUCLEAR INSTRUMENTATION – POWER RANGE CHANNEL

NOTE: **Annunciator FC5 PR CH DEV should clear when the comparator channel defeat switch is selected to the failed NI.**

__ 7 **Perform the following:**

a) Select the affected channel on:

- ROD STOP BYPASS switch (Misc Control and Indication Panel)
- COMPARATOR CHANNEL DEFEAT switch (Comparator and Rate Drawer)
- UPPER SECTION switch (Detector Current Comparator Drawer)
- LOWER SECTION switch (Detector Current Comparator Drawer)

b) Reset rate trip on the 'A' drawer for the affected channel.

__ 8 **Restore Tavg to program as necessary:**

- Adjust turbine load
- Use of control rods
- Dilution/Boration

__ 9 **IF N-44 is NOT failed,**
THEN place rods in AUTO if desired.

__ 10 **IF N-43 has failed AND it is desired to use the R-70's to determine the presence of elevated activity in the Steam Generators, THEN have Counting Room personnel place the R-70's in the "ME" mode per FNP-0-CCP-31, LEAK RATE DETERMINATION.**

SECTION 1.12

NUCLEAR INSTRUMENTATION – POWER RANGE CHANNEL

__ **11 Monitor operable Power Range Channels on NR-45B.**

__ **12 Submit a condition report on the failed instrument channel, and notify the Work Week Coordinator (Maintenance ATL on backshifts) of the condition report.**

__ **13 Within 72 hours, place the inoperable Power Range Channel in trip by performing the following: (TS 3.3.1)**

13 Be in Mode 3 within 78 hours

NOTE: Removing control power fuses will cause annunciators FC1 and FC3 to alarm.

---

a) Remove the AC Control Power Fuses on the 'A' drawer for the affected channel.

b) Trip overtemperature delta-T bistables for affected channel:

CHANNEL	TEST SWITCH	CARD LOCATION	STATUS LIGHT	ANNUNCIATOR
N41	TS/412 C-1	C1-421	TSLB2, 7.1	FD4 EG1
	TS/412 C-2	C1-421	TSLB1, 8.1	FD4 EG1
N42	TS/422 C-1	C2-421	TSLB2, 7.2	FD4 EG1
	TS/422 C-2	C2-421	TSLB1, 8.2	FD4 EG1
N43	TS/432 C-1	C3-721	TSLB2, 7.3	FD4 EG1
	TS/432 C-2	C3-721	TSLB1, 8.3	FD4 EG1

__ **14 <u>IF</u> the plant computer is inoperable <u>OR</u> annunciator FC4 is otherwise inoperable, <u>THEN</u> within one hour perform FNP-1-STP-37.0, POWER DISTRIBUTION SURVEILLANCE.**

SECTION 1.12

NUCLEAR INSTRUMENTATION – POWER RANGE CHANNEL

__ 15 **Notify the Shift Manager.**

__ 16 **Initiate the applicable actions of the following Technical Specifications:**

- Table 3.3.1-1 Function 2
- Table 3.3.1-1 Function 3
- Table 3.3.1-1 Function 6
- Table 3.3.1-1 Function 17 b, c, d, e, t

__ 17 **WHEN repairs and surveillances are complete, RESTORE the failed instrument using applicable sections of FNP-1-SOP-39.0, NUCLEAR INSTRUMENTATION SYSTEM.**

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

-END-

1. 120 VAC-40204F09 024 057AK1.04

Given the following plant conditions:

- Unit 1 is holding at 25% power due to problems with DEH during a plant startup.
- Rod control is in AUTO, with Bank D rods at 174 steps.
- VCT level transmitter, LT-115, failed low 30 minutes ago.
- I&C is troubleshooting Power Range Nuclear Instrument N-43 because of a blown fuse and all actions required by ARP FC3, Power Range High Flux Rate Alert, have been completed.

Which ONE of the following conditions will occur if power is lost to the 1C 120V AC Vital Bus?

A. A reactor trip will occur.

B. An Auto makeup will commence and continue until secured by the Plant Operator.

C. Automatic rod withdrawal is blocked but the operator can still insert rods in MANUAL.

D.✓ A boration of the RCS will begin due to LCV-115B and D, RWST to CHG PUMP, opening.

see figure 5 of 120 VAC lesson plan ops52103D
This describes what happens to LT-115 if LT-112 was failed low and then 120v AC bus A is lost. The exact same event occurs if 120v AC were to be lost to cabinet 7 and LT-115 was failed low. LCV-115B/D would roll open and LCV-115 C/E would go closed.

A - Incorrect; A reactor trip would occur if another PRNI channel, other than N-43, had already been placed in a tripped condition. 120v vital panel C powers N-43.

B - Incorrect; This almost happens if 120v vital panel A were lost. FCV-113A and 114B opens and the BAT & RMW pumps start, but neither FCV-114A or 113B opens so the flow path is not complete.

C - Incorrect; Auto rod control is not affected by N-43 when the conditions of FC3 have been completed. Auto rod control would be a factor if it were not already failed and placed in the trip condition. If the rod block was in affect, rods could not be withdrawn in Auto or Manual, but could be inserted, which makes this a plausible distracter.

D - Correct; **A boration of the RCS will begin due to LCV-115B and D, RWST to CHG PUMP, opening.**
A boration of the RCS will occur since power was lost to 1C 120V AC Vital Bus with LT-115 failed low causing LCV-115B, RWST to CHG PUMP, to open and LCV-115C, VCT Outlet ISO, to close. (Aux Safeguards Cabinet B)
Valves LCVs 115D and E are powered from Aux Safeguards Cabinet B.

Prints referenced:D177603, 7377D81, 7378D38, D177303, D177604D177631, D177602

The 7300 cabinets (7300 racks) are fed power as shown below:

7300 Cabinet	**Normal Power**	**Alternate Power**
7300 Cabinet 1 and 5	120V Vital AC Instrumentation Panel A	120V Regulated AC Panel C
7300 Cabinet 2 and 6	120V Vital AC Instrumentation Panel B	120V Regulated AC Panel D
7300 Cabinet 3 and 7	120V Vital AC Instrumentation Panel C	120V Regulated AC Panel E
7300 Cabinet 4 and 8	120V Vital AC Instrumentation Panel D	120V Regulated AC Panel F

39. 058AK3.01 039/NEW/RO/C/A 3.4/3.7/058AK3.01/N///A

The following conditions exist on Unit 2:

At 10:00:

- LB18, 2B BATTERY SUPPLY BREAKER, is open and Tagged Out for Battery cell replacement.

At 10:05:

- An LOSP occurs.

Which one of the following completes the statement below?

_(1)_ Diesel Generator can be started **and** used to supply power to the Unit 2 B Train 4160V ESF busses because it has a(n) _(2)_ .

	(1)	(2)
A.✓	2C	power seeking ABT (Automatic Bus Transfer) switch
B.	2C	emergency Air Start Solenoid
C.	2B	power seeking ABT (Automatic Bus Transfer) switch
D.	2B	emergency Air Start Solenoid

The 2C DG (shared between U-1 & U-2) uses B train DC for starting, field flash on the generator, and DG control. 2C DG has a power seeking ABT (Automatic Bus Transfer) switch that will align control power from either U-1 or U-2 B train DC. In this situation there is no DC on U-2 B train, so all functions for 2C DG will still work, but will be supplied from U-1 DC power.
Both C and D distracters are correct in the first part. The 2B DG **<u>can be started</u>** from the emergency start solenoids. The second part is not correct. Since there is no U-2 B Train DC power, there is no control power or field flash capability for the 2B DG. It remains unavailable.

A. Correct - see above.

B. Incorrect - 1) correct, 2C DG is available.
2) incorrect, plausible because it does have an Air Start Solenoid which enables it to start, but it does not have a manual override on the Air Start Solenoid allowing an emergency start like the 2B DG does. The ABT is what allows it to have power to start and field flash on the generator to be able to supply power to the emergency busses.

C. Incorrect - 1) incorrect, 2B DG is not available because it does not have DC power for field flashing and control.
2) incorrect, 2B DG does not have an ABT, but 2C does.

D. Incorrect - 1) incorrect, see C.1.
2) incorrect, 2B DG does have emergency Air Start Solenoids, but it has no DC power for generator field flash because it has no ABT.

058AK3.01

APE: 058 Loss of DC Power

Knowledge of the reasons for the following responses as they apply to the Loss of DC Power:

(CFR 41.5,41.10 / 45.6 / 45.1)

AK3.01 Use of dc control power by D/Gs 3.4* 3.7

Importance Rating: 3.4 / 3.7

Technical Reference: FSD (Functional System Description) A-181004

References provided: None

Learning Objective: DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the DC Distribution System components and equipment, to include the following (OPS-40204E07):

Normal control methods
Abnormal and Emergency Control Methods
Automatic actuation including setpoint
Protective isolations
Protective interlocks
Actions needed to mitigate the consequence of the abnormality

Question origin: NEW

Basis for meeting K/A: K/A is met by evaluation of the knowledge of a candidate related to Diesel Generators that have control power available during a loss of DC event. The loss of DC is on B train, and the candidate has to have detailed knowledge of DC control power that is available to some DG's as a result of an ABT (Automatic Bus Transfer) switch. This is a power seeking DC supply that can be powered from either U-1 or U-2. 2B DG would normally supply power to the B train 4160V ESF busses, but it does not have DC control power. 2C DG must be used since it does have control power due to the ABT. The reason is the second part of the question as to why the appropriate DG can be started **and** supply power to the bus.

SRO justification: N/A

DC DISTRIBUTION

Under normal conditions, each 125V DC battery has adequate storage capacity to carry the following types of vital loads without battery charger support for a period of two hours. These types of vital loads are listed as:

1. Instrumentation inverters
2. Engineered safety features controls
3. Emergency lights
4. Circuit breaker tripping and closing
5. Diesel generator field flashing and control
6. DC solenoids for air-operated valves
7. Miscellaneous controls and alarms
8. Reactor trip switchgear

The equipment design and layout provides two complete independent and redundant DC systems. The batteries are installed in separate rooms on the non-rad side 121 foot elevation with a class A fire rating to prevent simultaneous damage to both batteries. Each battery room is ventilated to the roof through separate exhaust fans. Fire dampers in the supply and exhaust ducts of each battery room localize the effects of a fire to the battery room that has a fire. The battery chargers are in separate rooms outside the battery rooms. The swing battery charger is located in a room adjacent to and separated from the other battery charger rooms.

As mentioned before, the DC buses supply the auxiliary building DC loads. Direct current bus A supplies primary power for static inverters A, B, and F, while DC bus B supplies primary power for inverters C, D, and G.

Bus 1A and 2A supply power to diesel generator control panels 1C and 1-2A through separate power seeking automatic transfer switches (ATSs). Bus 1B and 2B supply power to diesel generator control panel 2C through a similar ATS. Diesel generator control panels 1B and 2B receive their power from bus 1B and 2B respectively. Control panels 1B and 2B do not need ATS devices. The ATSs are located in their respective diesel generator room. The ATSs have a designated normal and emergency unit. Unit 1 is designated as the NORMAL supply and Unit 2 is designated as the EMERGENCY supply. The ATSs automatically switch to the emergency source of DC control power if the normal supply voltage drops below 90 percent of rated voltage. If power to the DC bus the ATS is selected to is lost, the ATS will switch to the DC bus on the unaffected unit. If power to the affected unit's DC bus is restored, the ATS will not

E3.6 DIESEL GENERATOR CONTROL PANEL AUTOMATIC TRANSFER SWITCHES

TPNS Nos. QSR43L001A-A
QSR43L001C-A
QSR43L002C-B 2C Diesel Generator

E3.6.1 Basic Functions

The diesel generator control panel automatic transfer switches (ATSs) shall be capable of providing dc control power to the shared/swing diesel generator local control panels from either Unit 1 or Unit 2 125 V dc buses. If voltage at the bus to which an ATS is aligned falls below the preset limit, the ATS shall transfer the load (diesel generator control panel) to the opposite unit bus, to which the ATS shall remain aligned while the voltage stays above the preset limit (References E6.4.019, E6.4.020, E6.4.023, E6.4.024, E6.7.017, E6.1.004).

E3.6.2 Functional Requirements

E3.6.2.1 The diesel generator control panel ATSs shall be nonselective, two-pole, 125 V dc, 150 A (References E6.4.019, E6.4.020, E6.4.023, E6.4.024, E6.7.016).

E3.6.2.2 The diesel generator control panel ATSs shall consist of a power transfer module and a control module interconnected to provide complete automatic operation (Reference E6.4.017).

E3.6.2.3 The control module shall initiate the transfer when the source voltage falls below 90 percent of nominal (125 V dc) voltage (References E6.4.019, E6.4.020, E6.4.023, E6.4.024). (See Open Item Observation EDS-E-FSD-008.)

E3.6.3 Design Transients

The diesel generator control panel ATSs will not encounter the dc system transients other than anticipated load transients, such as diesel generator field flashing (References E6.3.001, E6.3.004, E6.7.019).

E3.6.4 Codes and Standards Requirements

E3.6.4.1 Design, manufacture, and testing of diesel generator control panel ATSs shall be in accordance with the following codes and standards listed below (Reference E6.5.005):

ANSI

C33.8 - 1967	Safety Standard for Grounding and Bonding Equipment
C37.30 - 1970	Definitions and Requirements for H.V. Air Switches, Insulators and Bus Supports
C37.32 - 1965	Schedules of Preferred Ratings, Manufacturing Specifications and Application Guide for H.V. Air Switches, Bus Supports, and Switch Accessories
C37.19 - 1963	Safety Requirements for Low-Voltage AC Power Circuit Breakers and Switchgear Assemblies
C37.20 - 1969	Switchgear Assemblies Including Metal-Enclosed Bus
C37.34 - 1970	Test Code for H.V. Air Switches
C59.48 - 1968	Methods of Test for Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies

NEMA

SG5 - 1967	Power Switchgear Assemblies
20.2.3	NEMA AB1-1969 Molded Case Circuit Breakers

IEEE

344-1971	Guide for Seismic Qualification of Class I Electric Equipment for Nuclear Power Generating Stations

E3.6.4.2 The diesel generator control panel ATS shall be classified as Safety Class 1E (Reference E6.5.005).

E3.6.5 Seismic Requirements

The diesel generator control panel ATSs are designated as Seismic Category I and shall be designed to withstand, without exceeding normal allowable working stresses and without loss of function, the forces resulting from the OBE caused by a horizontal ground acceleration of 0.05 g and a vertical ground acceleration of 0.033 g. They shall also be designed to withstand, without exceeding 90 percent of the yield stresses and without loss of function, the forces resulting from the SSE caused by a horizontal ground acceleration of 0.10 g and a vertical ground acceleration of 0.067 g (Reference E6.5.005). In addition, the diesel generator control panel ATSs shall comply with the requirements of the OBE and SSE seismic response spectra applicable to the location of ATSs at the plant, as specified.

E3.6.6 I&C Requirements

E3.6.6.1 The diesel generator control panel ATS control module shall be equipped with a dc undervoltage monitor with adjustable pickup and dropout settings and with a time delay unit to discriminate between a transient condition and a sustained power outage (References E6.7.016, E6.4.017). (See Open Item Observation EDS-E-FSD-008.)

E3.6.6.2 The diesel generator control panel ATSs shall be equipped with two pilot lights to indicate switch alignment to a particular dc bus for operator information (References E6.7.016, E6.4.017).

E3.6.7 Equipment Protection Features

The diesel generator control panel ATSs shall be used exclusively as switching devices to provide dc power to the shared/swing diesel generator control panels from either Unit 1 or Unit 2 125 V dc buses to allow operation of the diesel generators from either unit's dc buses (References E6.1.004, E6.4.019, E6.4.020, E6.4.023, E6.4.024).

E3.6.8 Interface Requirements

E3.6.8.1 The continuous current and withstand current ratings of the diesel generator control panel ATSs shall be compatible with the requirements of the dc system (Reference E6.3.001).

E3.6.8.2 The HVAC system serving the area associated with the diesel generator control panel ATSs is required to maintain the ambient temperature in the range of 0 °C to 45 °C (32 °F to 113 °F) (References E6.7.016, E6.7.028). Operation above an ambient temperature of 113 °F would require further evaluation of the equipment on a case-by-case basis.

The 1-2A diesel does not have an air dryer or an after-cooler. Care must be taken in the vicinity of the 1-2A diesel air compressor discharge lines to avoid receiving a burn from contact with a hot pipe. This is especially true after the compressors repressurize an empty receiver after maintenance. In this case, the entire receiver becomes very warm to touch. As the air in the 1-2Aair receivers cool to ambient temperature, a considerable amount of condensation occurs requiring increased attention to performing receiver and air line blow-downs to remove the moisture.

The air receivers are sized to allow approximately five diesel starts without using the air compressors.

The two air compressors and receivers are isolated from each other, with each supplying one-half of a diesel's cylinders. However, starting air to only half of the cylinders will start the diesel.

For the little diesels, the two air-start solenoid valves admit air to the air-start header and to the air-start distributors. For the big diesels, the air-start solenoid valves open the air-operated main starting air valves, which, in turn, admit air to the air-start headers and the air-start distributors.

The air-start solenoid valves are electrically operated whenever a start signal is received from the diesel local control panel (DLCP) or from the emergency power board (EPB).

To ensure debris from the air receivers or other sources does not become lodged in any equipment downstream of the air-start solenoid valves, a filter is installed just upstream of each air-start solenoid valve. This prevents foreign material from causing the pilot valves to stick open and discharging all the air in the air receiver for that header.

The air-start distributor includes one pilot air valve for each cylinder. These valves are arranged radially and in the cylinder firing order around an air-start distributor camshaft, which rotates with the crankshaft. A spring holds each valve normally out of contact with the cam. As air enters the air-start distributor from the main starting air valve, air pressure overcomes the spring tension and forces each pilot valve plunger down into contact with the cam.

Regardless of where the camshaft previously stopped, one pilot valve will be on the low point of the cam and will be open. Two pilot valves, one on each side of the open pilot valve, will be partially open. When open, each of the pilot air valves admits air to an individual cylinder air-start check valve. The air, which is under pressure, opens the air-start check valve.

The actual starting air then rushes into the cylinder from the air header. The starting air forces the pistons to move and causes the crankshafts to rotate.

The engine should begin to rotate and start a few seconds after starting air is admitted. Then, an auxiliary relay automatically opens a contact to remove power from the air-start solenoid valves, shutting off pressure to the distributors. Air in the distributors escapes through vents in the pilot valves and in the air-start valves. As the air pressure drops, the distributor valve springs raise the distributor valves to their normal position, which is out of contact with the cam.

The air-start solenoids are powered from auxiliary building direct current (DC) power. If this power is lost, the air-start solenoids can not be energized to open, and there are no manual overrides on the solenoids. However, the main starting air valve on either end of the big diesels can be manually overridden. This allows the big diesels to be started without DC power available to the air-start solenoid valves. In the event a complete loss of DC power has occurred to a diesel generator, starting the engine should not be performed by overriding the main air start valves. When the diesel generator is secured, the generator field is shorted. DC power to the starting circuitry is required to remove the short in the field. With no DC power to the governor, the diesel would start and engine speed would be limited by the mechanical portion of the governor at a speed greater than the 60Hz equivalent speed. If the diesel was started with no DC power available, there would be no protective relaying to trip the diesel, and the STOP pushbuttons would not function to secure the diesel. In that case the only way to stop the diesel would be to trip the fuel racks.

For the big diesels, there is a small shuttle valve on the air supply line to the shutdown air tank. The purpose of the shuttle valve is to permit flow from either of the two air-start headers to pressurize the shutdown air tank. Air is used to shutdown the big diesels and will be discussed later in the operations section. The valve is designed such that it prevents an open or unchecked flow path from existing between the two air-start headers.

Service Water Cooling System

The heat generated by the diesel engine is removed by the service water system. There are three heat exchangers that are used to remove this heat: the intercooler heat exchanger, the lube oil heat exchanger, and the jacket water heat exchanger. Service water flows through the

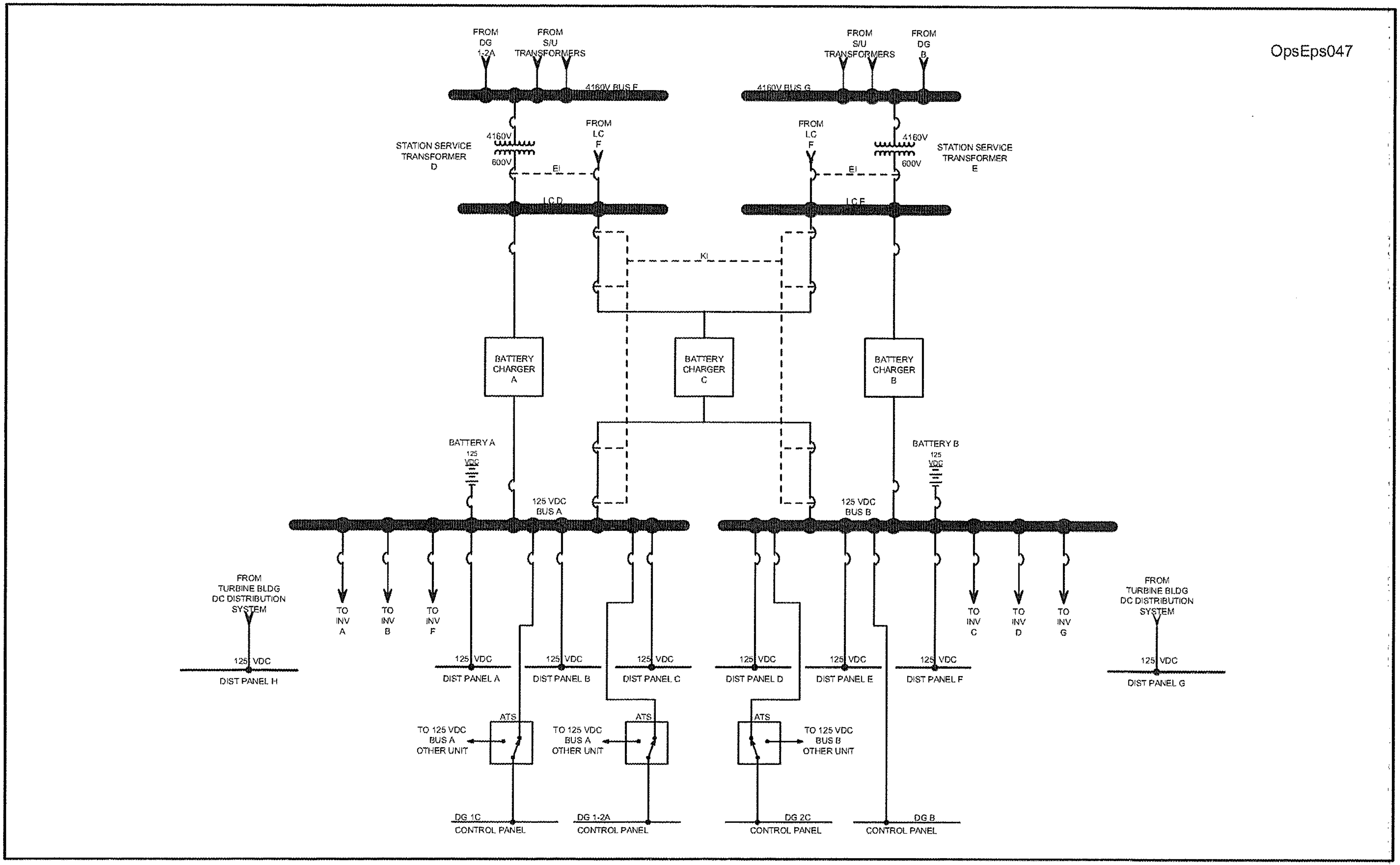


FIGURE 3 - AUXILIARY BUILDING DC DISTRIBUTION

40. ~~059A2.12 040/NEW/RO/C/A 3.1/3.4/059A2.12/N///C~~

Unit 1 is at 13% power with the following conditions:

- The Main Generator output breakers have been closed.
- JF1, 1A SG LVL DEV, is in alarm.
- A Systems Operator in the Main Steam Valve Room reports that the air supply line to FCV-479, 1A SG FW BYP FLOW, has blown off.

Which one of the following completes the statements below?

FCV-479 will fail __(1)__ .

Per AOP-13.0, Condensate and Feedwater Malfunctions, the operator is required to trip the __(2)__ if Steam Generator level can NOT be maintained.

	(1)	(2)
A.	open	Main Turbine
B.	open	Reactor
C.✓	closed	Reactor
D.	closed	Main Turbine

~~Candidate must determine FCV-479 fail position to correctly answer~~ this question. Main Feed Regulating and Bypass valves **fail closed on a loss of air.** AOP-13.0 requires a Reactor trip if Steam Generator level cannot be maintained >28%. At 12% power, and no feed flow available to the 1A Steam Generator, level will trend down and a Reactor trip is required.

A. Incorrect - First part is incorrect. see above.

Second part is incorrect, but plausible. The Main Turbine trip is plausible because if FCV479 did fail open, a High Steam Generator level would cause a Main Turbine trip, not a Reactor trip. Recent procedural changes have been made to trip the reactor vs the Main Turbine when >5% power.

Also if the candidate only considers this a Secondary system problem, then the Main Turbine could be considered the solution. It is tripped for a number of Secondary system problems when < 35% power.

B. Incorrect - First part is incorrect. see above.

Second part is correct.

C. Correct - First part is correct. see above

Second part is correct.

D. Incorrect - First part is correct.

Second part- incorrect -

059A2.12

059 Main Feedwater (MFW) System

Ability to (a) predict the impacts of the following malfunctions or operations on the MFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:
(CFR: 41.5 / 43.5 / 45.3 / 45.13)
A2.12 Failure of feedwater regulating valves 3.1* 3.4*

Importance Rating:	3.1 / 3.4
Technical Reference:	FNP-1-AOP-13 v30
References provided:	None
Learning Objective:	EVALUATE plant conditions and DETERMINE if any system components need to be operated while performing AOP-13, Loss of Main Feedwater. (OPS-52520M06).
Question origin:	NEW
Basis for meeting K/A:	K/A is met by having candidate evaluate the impact of a loss of air on a Main Feed Regulating Bypass valve, and then based on procedural guidance, determine what actions are required due to the failure.
SRO justification:	N/A

TABLE 1

COMPONENT NUMBER	NAME	MANUAL OPERATOR	FAILED POSITON	OPERATOR DRAWING
1B13V019 (1-RC-HV-8032)	REACTOR VESSEL LEAKOFF	NO	OPEN	U-199000
Q1B13V042 (1-RC-HV-8034)	PRT N2 PRESS REG	NO	CLOSED	U-259958
Q1B13V056 (1-RC-HV-444C)	PRZR SPRAY VALVE	NO	CLOSED	U-166862
Q1B13V060 (1-RC-PCV-444D)	PRZR SPRAY VALVE	NO	CLOSED	U-166862
N1B31V002 (1-RC-HV-8031)	PRZR RELIEF TANK DRAIN	NO	CLOSED	U-176718
N1B31V005 (1-RC-HV-8030)	RMW TO PRT ISO	NO	CLOSED	U-176716
Q1B31V037 (1-RC-HV-8047)	PRT N2 SUPPLY	NO	CLOSED	U-259762
Q1B31V039 (1-RC-HV-8033)	PRZR RELIEF TANK N2 SUPPLY	NO	CLOSED	U-259762
Q1B31V040 (1-RC-HV-8028)	RMW TO PRT ISO	NO	CLOSED	U-176717
Q1B31V053 (1-RC-HV-445A)	PRZR PORV	NO	CLOSED	U-166862
Q1B31V061 (1-RC-PCV-444B)	PRZR PORV	NO	CLOSED	U-166862
Q1C22FCV478 (1-CFW-FCV-478)	SG 1A FEED FLOW FK-478	YES	CLOSED	
Q1C22FCV479 (1-CFW-FCV-479)	SG 1A FEED FLOW BYPASS FK-479	NO	CLOSED	
Q1C22FCV488 (1-CFW-FCV-488)	SG 1B FEED FLOW FK-488	YES	CLOSED	
Q1C22FCV489 (1-CFW-FCV-489)	SG 1B FEED FLOW BYPASS FK-489	NO	CLOSED	

Step	Action/Expected Response	Response Not Obtained
__ 4	**Check main feed regulating valve(s) automatic control inadequate.**	4 Proceed to step 5.

4.1 Take manual control of the affected main feedwater regulating valves or bypass valves as necessary to control SG level.

[ ] 1A SG FW FLOW FK-478
[ ] 1B SG FW FLOW FK-488
[ ] 1C SG FW FLOW FK-498

OR

[ ] 1A SG BYPASS FLOW FK-479
[ ] 1B SG BYPASS FLOW FK-489
[ ] 1C SG BYPASS FLOW FK-499

4.2 Maintain SG narrow range level approximately 65%.

4.2 IF SG narrow range levels NOT maintained greater than 28%, THEN trip the reactor and go to FNP-1-EEP-0, REACTOR TRIP OR SAFETY INJECTION.

4.3 Check main feedwater regulating valve control instrumentation - NORMAL

4.3 Go to FNP-1-AOP-100, INSTRUMENTATION MALFUNCTION

S/G	CH I	CH II	CH III
A S/G	LI-474	LI-475	LI-476
B S/G	LI-484	LI-485	LI-486
C S/G	LI-494	LI-495	LI-496

SG	CH III		CH IV	
	SG PRESS	SG STM FLOW	SG PRESS	SG STM FLOW
1A	PT475	FT474	PT476	FT475
1B	PT485	FT484	PT486	FT485
1C	PT495	FT494	PT496	FT495

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41. 059K1.02 041/NEW/RO/C/A 3.4/3.4/059K1.02/N//A

Which one of the following completes the statements below?

The purpose of TRSH-2293, AFW CHECK VALVE TEMPERATURE RECORDER, is to monitor the temperature on the discharge line of __(1)__ .

Temperatures are trended for indication of __(2)__ .

	(1)	(2)
A.✓	ALL AFW pumps	Main FW back-leakage
B.	ALL AFW pumps	inadequate recirc flow
C.	ONLY the TDAFW pump	Main FW back-leakage
D.	ONLY the TDAFW pump	inadequate recirc flow

The AFW Check Valve Temperature Recorder is a retrofit system used to "monitor for check valve leakage to protect against water hammer or steam binding". The Recorder has temperature instruments on all AFW discharge lines to monitor for back-leakage from the main feed system into the AFW lines. If back-leakage was allowed to occur unchecked while at power, the AFW discharge line would eventually void and the pump would be steam bound as the leakage flowed back into the CST. Due to problems with the TDAFW system in the past, a system that is unrelated the AFW Check Valve Temperature Recorder is installed in the Lower Equipment Room to monitor other aspects of the TDAFW pump operation. This gives plausibility to the distracters that state that the AFW temp recorder is used by the TDAFW pump only.

A. Correct - see above.

B. Incorrect - 1) correct, see above.
2) incorrect, plausible because inadequate recirc flow can cause higher temperatures on the pump recirc/discharge. A candidate with inadequate knowledge may choose this distractor because of those temperature concerns. The real purpose is to monitor for back-leakage from the main feed system or Steam Generators.

C. Incorrect - 1) incorrect, temperature monitoring is provided for all AFW pumps. See above.
2) correct, see above.

D. Incorrect - 1) incorrect, see C.1.
2) incorrect, see B.2.

059A2.12

059 Main Feedwater (MFW) System

Knowledge of the physical connections and/or cause-effect relationships between the MFW and the following systems:
(CFR: 41.2 to 41.9 / 45.7 to 45.8)
K1.02 AFW system . . . . 3.4* 3 .4

Importance Rating:	3.4 / 3.4
Technical Reference:	FNP-1-SOP-22 v65 / FNP-1-ARP-1.10 v69 for KE2 / Drawing D175007 sh.1
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of AFW System components and equipment to include the following (OPS-40201D07): Normal Control Methods Abnormal and Emergency Control Methods Automatic actuation including setpoints (examples - SI, Phase A, Phase B, MSLIAS, LOSP or SG level) Actions needed to mitigate the consequence of the abnormality.
Question origin:	NEW
Basis for meeting K/A:	K/A is met by testing candidates knowledge of the cause/effect of leakage past the AFW check valves and his understanding of how the AFW system ties into the Main FW system.
SRO justification:	N/A

AUXILIARY FEEDWATER SYSTEM

Temperature elements are installed to monitor for backleakage from Main feedwater through the AFW check valves and into the AFW system, possibly into the AFW pump itself. This could create a steam binding condition in the pump. There are numerous temperature elements associated with the AFW discharge check valves for the Turbine driven and Motor driven AFW pumps.

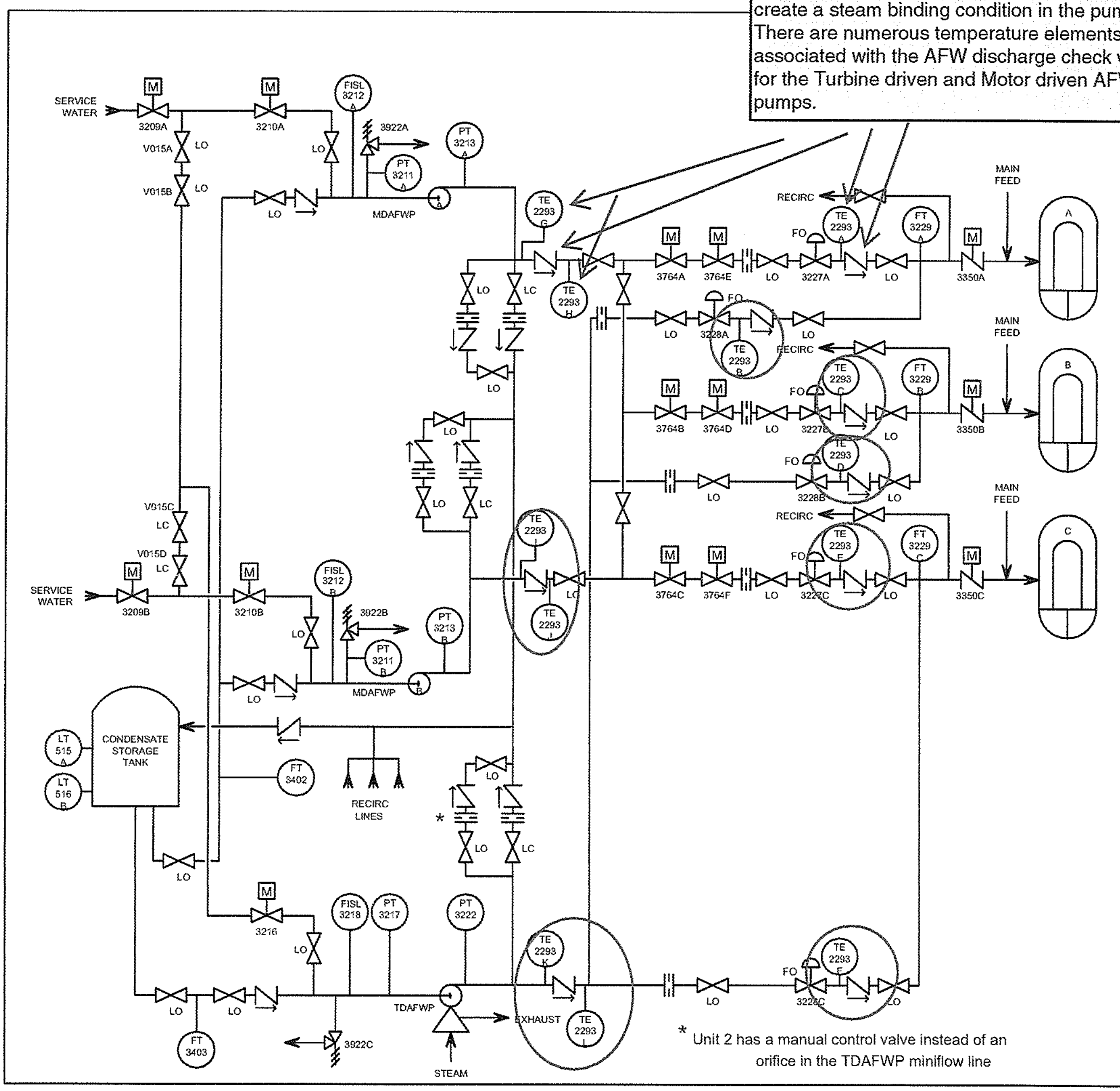

FIGURE 2 - Auxiliary Feedwater System

5.11 MDAFW/TDAFW DISCHARGE CHECK VALVE LEAKAGE TEMPERATURE MONITORING

Service	TPNS No.
Temperature Elements	TE-2293A, B, C, D, E, F, G, H, I,J, K, L
High Temperature Recorder	TRSH-2293
High Temperature Alarm	TAH-2293

5.11.1 Basic Function

5.11.1.1 These temperature instruments monitor for check valve leakage to protect against water hammer or steam binding (References 6.4.027, 6.7.056, 6.7.057, 6.7.058).

5.11.1.2 The temperature alarm is field set and shall provide indication of steam binding and alarm on panel NH25L040C-N (Reference 6.4.104).

5.11.2 Functional Requirements

These temperature instruments shall be strap-on surface type and shall not penetrate the pressure boundary (Reference 6.4.027).

5.12 MDAFW/TDAFW PUMP SUCTION FLOW INSTRUMENTATION

Service	TPNS No.
MDAFW Flow Element	FE-3402
MDAFW Flow Transmitter	FT-3402

LOCATION KE2

E2
AFW TEMP PANEL ALARM

SETPOINT: (1-6) 170°F AFW to Steam Generators Inlet Check Valves
(7-12) 120°F AFW Pumps Disch Check Valves

ORIGIN: AFW to SG Inlet Check Valves

1. N1N23TE2293A MD Inlet to SG 1A
2. N1N23TE2293B TD Inlet to SG 1A
3. N1N23TE2293C MD Inlet to SG 1B
4. N1N23TE2293D TD Inlet to SG 1B
5. N1N23TE2293E MD Inlet to SG 1C
6. N1N23TE2293F TD Inlet to SG 1C

AFW Pumps Disch Check Valves

7. N1N23TE2293G 1A MD Disch Chk Vlv Inlet
8. N1N23TE2293H 1A MD Disch Chk Vlv Outlet
9. N1N23TE2293I 1B MD Disch Chk Vlv Inlet
10. N1N23TE2293J 1B MD Disch Chk Vlv Outlet
11. N1N23TE2293K TD Disch Chk Vlv Outlet
12. N1N23TE2293L TD Disch Chk Vlv Inlet

PROBABLE CAUSE

A. AFW to Steam Generators check valves seat leakage.
B. AFW pump disch check valves seat leakage.

AUTOMATIC ACTION

NONE

OPERATOR ACTION

1. Dispatch operator to local alarm panel to determine alarming channel. Reference Appendix A of FNP-1-SOP-22.0, AUXILIARY FEEDWATER SYSTEM, for recorder operation.
2. Investigate AFW pump casing, disch piping and AFW to steam generators piping for excessive temperatures.
3. IF pump steam binding is indicated, THEN terminate steam binding in accordance with FNP-1-SOP-22.0.
4. IF pump steam binding is NOT indicated and pump casing temperature is elevated, THEN start the appropriate AFW pump to cool the discharge piping to prevent steam binding.
5. IF pump steam binding is not an immediate concern based on near normal pump casing temperature, THEN continue to closely monitor pump discharge line and pump casing temperature and start the appropriate auxiliary feedwater pump WHEN deemed necessary.

References: D-175007, PCN B84-1-2518; A-177100, Sh. 467

42. 061K4.06 042/NEW/RO/C/A 4.0/4.2/061K4.06/N///D

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

At 10:00:
- Unit 1 trips due to a Loss of Site Power (LOSP).

At 10:20:
- The 1A Steam Generator narrow range water level is 25%.
- The 1B and 1C Steam Generator narrow range water levels are 31%.
- The Rover reports that smoke is coming from the 1A MDAFW pump.
- The UO takes the handswitch for the 1A MDAFW pump to stop.

Which one of the following completes the statement below?

When the 1A MDAFW pump handswitch is taken to stop and released, the 1A MDAFW pump will __(1)__ because the __(2)__ signal is present.

	(1)	(2)
A.	NOT stop	SG LO-LO level
B.	stop and then restart	SG LO-LO level
C.	stop and then restart	LOSP
D✓	stop and remain stopped	LOSP

Candidate must determine, first of all, if the pump can be secured, and secondly the reason why it can or cannot be secured. This indicates candidate's knowledge of the LOSP autostart interlock. Normally, if one Steam Generator level is <28%, the AFW pump can be stopped by the handswitch, but will restart when the handswitch is released. The LOSP signal blocks autostart of the MDAFW pump from any signal other than the LOSP sequencer. Therefore the pump will be started initially at 10:00 by the LOSP sequencer, but can be secured at any time by taking the handswitch to STOP.

A. Incorrect - both parts are incorrect. Plausible because candidate may think that the SG low level will maintain a hard start signal to the MDAFW pump, and prevent it from stopping.

B. Incorrect - both parts are incorrect. Plausible because this is what would happen if the LOSP signal was not present.

C. Incorrect - Plausible because the candidate may think that the pump can be stopped, but since the Startup Transformer supply breakers are open (creating the LOSP signal), the pump will restart when the handswitch is released.

D. Correct - See above.

061K4.06

061 Auxiliary / Emergency Feedwater (AFW) System

Knowledge of AFW design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)

K4.06 AFW startup permissives 4.0* 4.2*

Importance Rating: 4.0 / 4.2

Technical Reference:

References provided: None

Learning Objective: RELATE AND IDENTIFY the operational characteristics including design features, capacities and protective interlocks for the components associated with the AFW System to include the components found on Figure 2, Auxiliary Feedwater System, Figure 3, TDAFWP Steam Supply, and Figure 4, Air Supply to TDAFWP Steam Admission Valves (OPS-40201D02).

Question origin: NEW

Basis for meeting K/A: K/A is met by having candidate evaluate conditions and determine if an autostart permissive will allow an AFW pump to autostart. In this situation, normally the pump will autostart due to SG low level, but an LOSP signal is present which blocks the normal autostart signal.

SRO justification: N/A

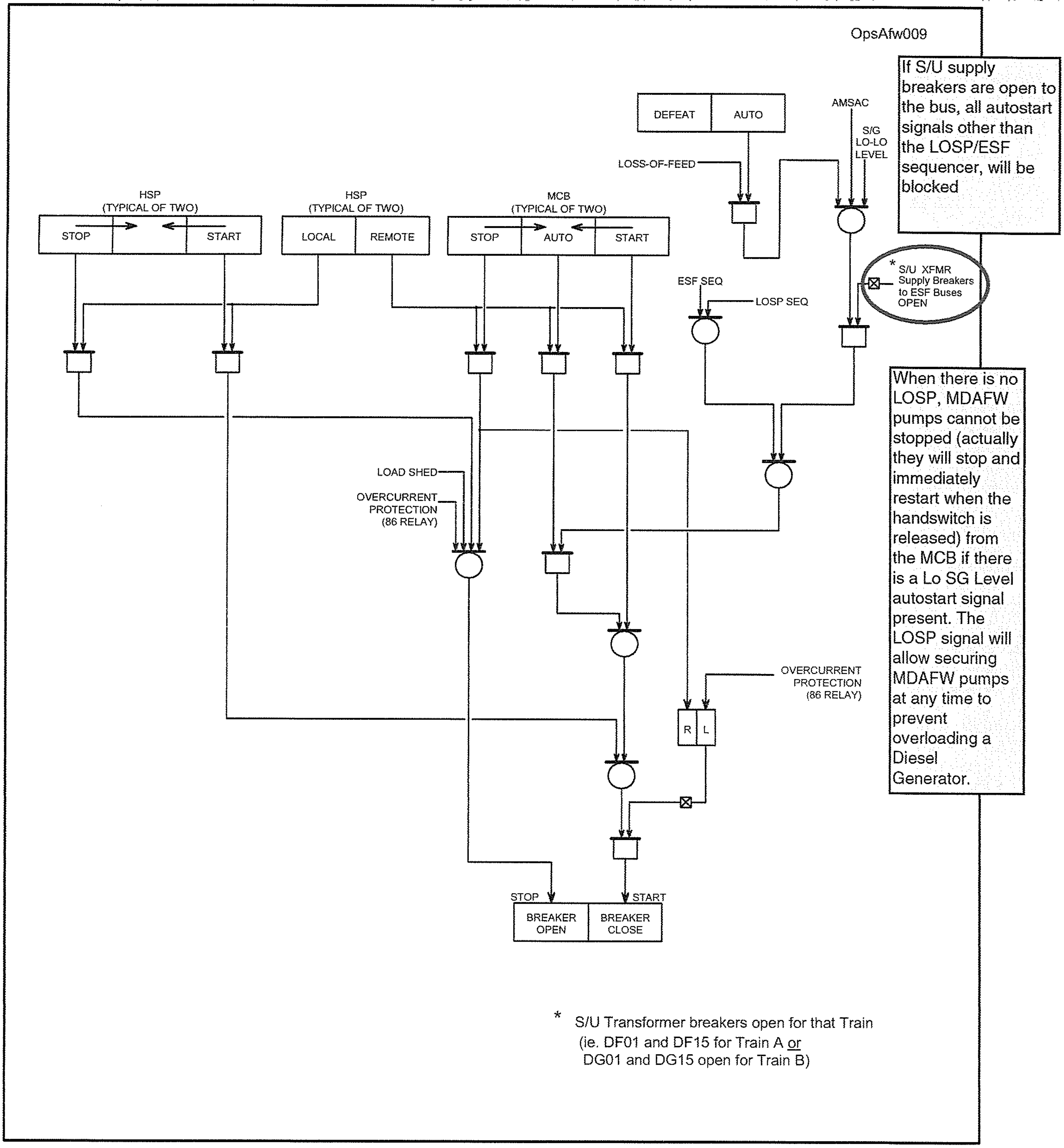

FIGURE 5 - Motor-Driven Auxiliary Feedwater Pump Control

43. 061K6.01 043/BANK/RO/C/A 2.5/2.8/061K6.01/N///C

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

- A failure has occurred in the controller/positioner for HV-3235A, TDAFWP STM SUPP FROM 1B SG, such that air is continuously supplied to HV-3235A.

Which one of the following completes the statement below?

The TDAFW pump will _____

A. **NOT** autostart under any condition.

B. immediately start and operate at full design capacity.

C✓ autostart when a signal occurs and operate at full design capacity.

D. autostart when a signal occurs, but insufficient steam is available to operate at full design capacity.

A failure has occurred in the positioner for HV3235A that makes the valve go open. This valve is controlled by the same handswitch as HV3226, such that when the handswitch is taken to open, both valves get an open signal. The failure in HV3235A has no effect on HV3226. In addition, to start the TDAFWP, both HV3226 and HV3235A or HV3235B must be opened. The resulting effects of the failure will not start the TDAFWP, but the TDAFWP will autostart when demanded and will supply full flow.

A. Incorrect - Plausible because both valves are operated from one handswitch. Candidate may think HV3235A is failed closed and HV3226 will not open as a result. The failure has caused one valve to go open, but has no effect on the other valve.

B. Incorrect - Plausible because both HV-3235A and HV-3226 are operated from the same switch. If candidate knows that HV-3235A goes open during this failure, he may also assume that HV-3226 will open and the TDAFWP will start.

C. Correct - HV-3235A is failed open. It is available if an autostart signal occurs, and the TDAFWP will operate at full capacity.

D. Incorrect - Plausible because candidate may think this valve is failed closed. As a result, candidate may determine that the other steam supply to the TDAFWP is not sufficient for full design capacity.

061K6.01

061 Auxiliary / Emergency Feedwater (AFW) System

Knowledge of the effect of a loss or malfunction of the following will have on the AFW components:
(CFR: 41.7 / 45.7)
K6.01 Controllers and positioners 2.5 2.8*

Importance Rating:	2.5 / 2.8
Technical Reference:	FNP-1-AOP-6.0 v37
References provided:	None
Learning Objective:	RELATE AND IDENTIFY the operational characteristics including design features, capacities and protective interlocks for the components associated with the AFW System to include the components found on Figure 2, Auxiliary Feedwater System, Figure 3, TDAFWP Steam Supply, and Figure 4, Air Supply to TDAFWP Steam Admission Valves (OPS-40201D02).
Question origin:	Modified FNP BANK AFW-40201D06 02
Basis for meeting K/A:	K/A is met by having candidate evaluate the effects of a failure in the controller/positioner for HV3235A, one of the steam supplies to the TDAFWP. Candidate must determine the status of the valve with the failure, and its resultant effect on the TDAFWP.
SRO justification:	N/A

phase A containment isolation signal. Valve position indication lights are located above each switch. The valve will fail closed on a loss-of-power or loss-of-air or power. These valves are located on the non-rad side, 127 foot elevation, in the MSVR.

TDAFW Pump Steam Supply from Steam Generator B (C) (3235A and B; 3226) (Figures 4 and 7)

A three-position handswitch (STOP/AUTO/START, spring return to AUTO) on the MCB provides remote control for each air-operated steam supply valve to the TDAFW pump. A three-position handswitch (STOP/Neutral/START, spring return to Neutral) on the HSP provides local control of the steam supply valves. Steam admission valve 3226 is controlled in conjunction with the steam supply valve from steam generator B. A LOCAL/REMOTE selector switch on the HSP determines whether the local or remote controls are operable. The selector switch must be in REMOTE for the associated MCB switch and auto-start features to be operable.

In the AUTO position of the MCB switch, the associated valve(s) will open automatically on one of the following:

1. A steam generator lo-lo level of 28% NR (2/3 level instruments in 2/3 steam generators)
2. Blackout (An undervoltage signal of 64.4% on 1/2 UV relays on 2/3 RCP buses)**
3. AMSAC (2/3 steam generators < 10% NR level for 25 seconds; blocked below C-20 after 260 sec (Figure 13)

**It is important to note that on Unit 1, Startup transformer 1A feeds 4160v bus 1A and Startup transformer 1B feeds 4160v bus 1B and 1C. Unit 2 is different in that Startup transformer 2A feeds 4160v bus 2B and 2C and Startup transformer 2B feeds 4160v bus 2A. This is important because, depending which unit is being discussed, the loss of a particular Startup transformer may or may not cause a blackout signal to the TDAFW Pump.

With the selector switches in LOCAL, all automatic start signals are bypassed. A common alarm sounds on the MCB when the TDAFW pump is placed in local control.

Unit 1 and Unit 2 differ in operation in that, to manually start the TDAFW pump, Unit 1's valve switches must be held in the START position until HV-3235A & B are fully open to seal in; Unit 2's valves will open shortly after the switches are taken to START for the 3235A/3226 handswitches. To secure Unit 1's TDAFW pump, the handswitches must be held until HV-3226 is fully closed. To secure Unit 2's TDAFW pump, the handswitches must be held until HV-3235A & B and HV-3226 are fully closed.

The valve position for HV-3235A, HV-3235B, and HV-3226 is indicated on monitor light box 4. These lights, for both units, illuminate when each valve is fully open. The status light on the HV-3235A/HV-3226 handswitch provides zero speed indication for the TDAFW pump and not valve position indication.

These valves are normally supplied with air from the instrument air system but can also be supplied from the emergency air compressors if necessary. HV-3235A and 3235B fail close on loss of air or power, however an air reservoir is provided that will hold these valves open for a nominal two hours. HV-3226 fails open or loss of air and power. Valve HV-3226 is located on the non-rad side, 100 foot elevation and HV-3235A, B are located on the non-rad side, 127 foot elevation, in the MSVR.

<u>TDAFW Pump Condensate to Auxiliary Steam Condensate Tank (LCV-3608) (Figure 8)</u>

A momentary push button control station near the TDAFW pump controls the air-operated control valve. The push button station has two push buttons (OPEN/CLOSE). The valve automatically opens on a high level in the steam line standpipe to the TDAFW pump. When the high level condition clears, and at least 4 seconds have elapsed, the valve will close. Valve position indication lights indicate on the control station. These valves are located on the non-rad side, 100 foot elevation. The valve fails closed on loss of air.

<u>TDAFW Pump Trip and Throttle Valve (3406) (Figure 14 and 15).</u>

A three-position handswitch (CLOSE/Neutral/OPEN, spring return to Neutral) on the BOP panel provides remote control of the motor-operated valve. Controls on the local control panel include CLOSE, OPEN, and STOP push buttons. Motor position indication lights indicate on the BOP panel. Since the valve will be disengaged from the motor after a pump trip, both valve position and valve control (motor position) lights indicate on the local control panel.

When the TDAFWP is in the standby, ready-for-auto-start condition, the TDAFWP Trip and Throttle valve is full open. The valve is furnished with hardened bushing type packing, and there is a certain amount of steam leakage inherent in the construction. Since the TDAFWP normally has warm-up steam aligned when in standby, it is normal and acceptable to observe a *small* amount of

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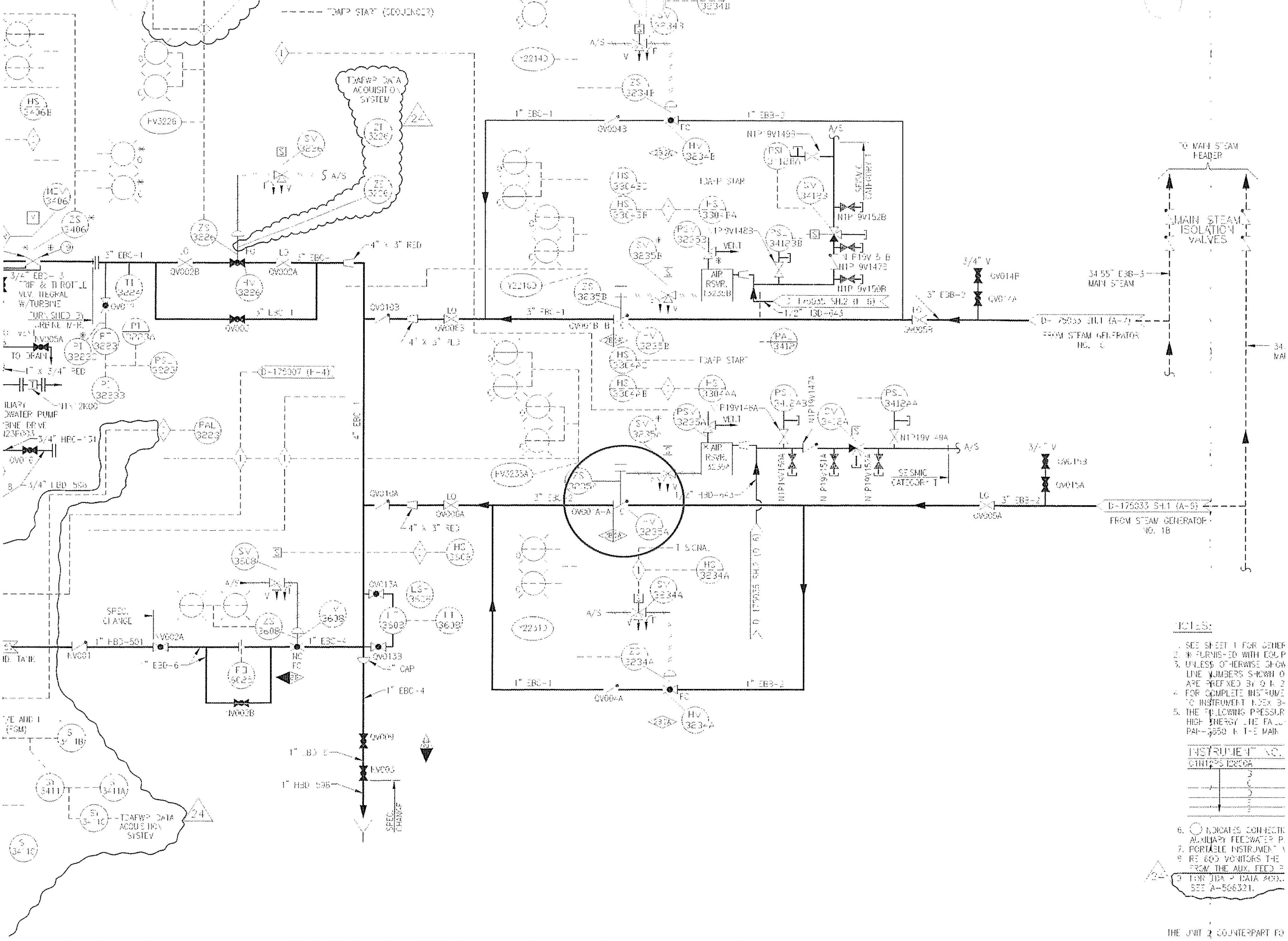

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44. 062AA2.01 044/BANK/RO/C/A 2.9/3.5/062AA2.01/N///B

Unit 1 has experienced a Reactor Trip and Safety Injection with the following alarms:

- AF4, CTMT CLR SW FLOW HI-LO
  SETPOINT: Lo Flow Range (< 1980 gpm): Diff Flow HI: 300 +0, -75 gpm
  Hi Flow Range ($\geq$ 1980 gpm): Diff Flow HI: 750 +0, -30 gpm

- AD4, SW PRESS A TRN LO -
  SETPOINT: 60 ± 1 psig

Which one of the following would cause the conditions described above?

A. A piping failure has occurred downstream of the 1C containment cooler.

B.✓ A piping failure has occurred upstream of the 1A containment cooler.

C. The 1A Service Water Pump has approximately 20% degraded head.

D. MOV-3024A, EMERG SW FROM 1A CTMT CLR, has failed to open on the SI.

Candidate is given conditions for entry of AOP-10, Loss of Service Water, by annunciator AD4 in alarm. In addition, candidate must assess the effect of annunciator AF4 to determine why this combination of annunciators is in alarm. AF4 setpoint is based on a differential flow between the A Train Containment Coolers' inlet and outlet flow **OR** the B Train Containment coolers differential flow. With the information that A Train SW pressure is low and there is a flow differential on the Containment Coolers, candidate should determine that there is a leak on one of the A Train Containment Coolers (A or B Containment Cooler).

A. Incorrect - Plausible because the candidate may incorrectly determine that C Containment Cooler is associated with the A Train system. Other systems at Plant Farley (CCW) have different train relationships than the normal convention.

B. Correct - See explanation above.

C. Incorrect - Plausible because this could cause AD4 alarm, and candidate may determine that this would create a low flow condition on the Containment Coolers, causing AF4. This condition would not cause a differential across the ctmt coolers and AF4 would not be in alarm.

D. Incorrect - Plausible if candidate thinks that the differential is between A and B Containment Coolers, and with one valve closed, there would be more flow through one cooler than the other. This condition could cause AF4 to come into alarm but not AD4.

062AA2.01

APE: 062 Loss of Nuclear Service Water

Ability to determine and interpret the following as they apply to the Loss of Nuclear Service Water:

(CFR: 43.5 / 45.13)

AA2.01 Location of a leak in the SWS 2.9 3.5

Importance Rating:	2.9 / 3.5
Technical Reference:	FNP-1-ARP-1.1 v51
References provided:	None
Learning Objective:	SELECT AND ASSESS the following instrument/equipment response expected when performing Service Water System evolutions including the fail condition, alarms, and trip setpoints (OPS-52102F05). Supply Header Temperature Indicators TI-4119, 4120, 4121, 4122 Supply Header Flow Indicators FI-612, and 613 Supply Header Pressure PS-502, 503, 504, and 505 Turbine Building High Flow Isolation PDS-565, 566, 568 and 569 Diesel Generator Low Flow Alarm PDS-675, 676, 677, 678, 679 Discharge Header Pressure PS-559,560, 685, 686 Surge Tank Level LS 687 (Unit 1) Surge Tank Level LS 650 (Unit 2) Dilution Flow FS 580 Service Water Wet Pit Low Level LS 508 and 509
Question origin:	FNP BANK SW-52102F05 02
Basis for meeting K/A:	K/A is met by placing candidate in a situation with entry conditions for AOP-10, Loss of Service Water, and a leak on one of the Containment Coolers. Candidate must assess the information and determine that a leak is in progress on the SW to Ctmt Cooler line for the A train Coolers.
SRO justification:	N/A

LOCATION AD4

D4
SW PRESS A TRN LO

SETPOINT: 60 ± 1 PSIG for Q1P16PS504-N
60 ± 1 PSIG for Q1P16PS505-N

ORIGIN:
1. Pressure Switch (Q1P16PS504-A)
2. Pressure Switch (Q1P16PS505-A)

PROBABLE CAUSE

1. A Train Service Water Pump tripped.
2. Improper valve lineup on A Train Service Water.
3. A Train Service Water Minimum Flow Bypass Valve (Q1P16V577) has failed open.
4. Rupture of an A Train Service Water pipe.

AUTOMATIC ACTION

NONE

OPERATOR ACTION

1. Check indications and attempt to identify the cause of A Train Service Water low pressure.
2. IF the low pressure was caused by loss of a service water pump, THEN start another Service Water Pump in A Train
3. IF the cause is other than loss of a Service Water Pump OR pressure can NOT be immediately restored, THEN perform the actions required by FNP-1-AOP-10.0.
4. Notify appropriate personnel to determine and correct the cause of the A Train Service Water low pressure.
5. Return the Service Water System to a normal lineup as soon as possible.
6. Refer to Technical Specification 3.7.8 for LCO requirements with a loss of Train A or B Service Water.

References: A-177100, Sh. 69; D-170119, Sh. 1 & 2; C-170617; A-170750, Sh. 65; B-170033, Sh. 19; B-175968, Sh. 25; B-175803; Technical Specification 3.7.8; **{CMT 0004933}**

LOCATION AF4

F4	
	CTMT CLR SW FLOW HI-LO

SETPOINT:
1. Lo Flow Range (< 1980 GPM):
   Diff. Flow HI: 300 $^{+\ 0}_{-\ 75}$ GPM
2. Hi Flow Range (≥ 1980 GPM):
   Diff. Flow HI: 750 $^{+\ 0}_{-\ 30}$ GPM

ORIGIN:
1. Flow Switch (Q1P16FDSH3013AA-N
2. Flow Switch (Q1P16FDSH3013AB-N)
3. Flow Switch (Q1P16FDSH3013BA-N)
4. Flow Switch (Q1P16FDSH3013BB-N)

NOTE:	**The appropriate alarm range is selected automatically in response to existing flow conditions; Lo Range for inlet flow < 1980 gpm and Hi Range for inlet ≥ 1980 gpm. The alarm comes in based on high diff flow from inlet to outlet.**

PROBABLE CAUSE

1. Improper Service Water to Containment Cooler valve lineup.
2. Rupture or leak in Service Water piping.

AUTOMATIC ACTION

NONE

OPERATOR ACTION

1. Check indications and determine which Service Water Train, A or B, has the high differential flow across the coolers.
2. Isolate service water to the containment coolers in the affected train.
3. Refer to FNP-1-SOP-12.1, CONTAINMENT AIR COOLING SYSTEM.
4. Have appropriate personnel determine the cause for the containment cooler service water high differential flow.
5. IF high differential flow is due to improper valve lineup, THEN have appropriate personnel correct the valve lineup in the affected train.

6. IF high differential flow is due to rupture in line, THEN isolate the affected CTMT cooler service water inlet valves (1-SW-MOV-3019A, B, C, D) and outlet valves (1-SW-MOV-3024A, B, C, and D and 1-SW-MOV-3023A, B, C and D).
7. Return system to normal lineup as soon as possible.

References: A-177100, Sh. 79; B-175968; D-175003, Sh. 1; U-199344; U-199361; **{CMT 0004933}**

45. 062K3.03 045/MOD/RO/M 3.7/3.9/062K3.03/N//B

Unit 1 has experienced a Reactor trip with the following conditions:

- An LOSP has occurred.
- A DG failure has occurred, and the A Train 4160V busses are de-energized.

Which one of the following states the time that the A Train Auxiliary Building 125V DC System Battery is designed to carry the required DC loads in this condition?

A. 30 minutes

B.✓ 2 hours

C. 8 hours

D. 12 hours

A. Incorrect - Plausible because ECP-0.0 states that if power is not restored to the battery chargers within 30 minutes, there may not be enough DC to start a DG and sequence loads. But this requirement is not the design load capacity of the batteries.

ECP-0.0:

CAUTION: IF power is not restored to the 125 V DC battery chargers on each train within 30 minutes, THEN there may not be enough DC capacity to start a DG and sequence needed loads.

B. Correct - FSD A181004 states that this is the design capacity of the Batteries. After initiation of an LOSP or LOSP + LOCA, the batteries shall have sufficient capacity to support automatic diesel generator starting and load sequencing, and to support operation from the main control room of all required safety-related DC loads for 2 hours assuming that a battery charger failure occurs after initiation of the LOSP or LOSP + LOCA event.

C. Incorrect - Plausible because this is the amount of time to fully recharge the Service Water Batteries and the Turbine Building batteries after a full discharge.

F2.1.2.3 System Capacity

Each 125 V DC system battery charger shall be sized to restore its battery to a fully charged condition within 8 hours after the battery has been discharged to 1.75 V/cell while carrying normal or emergency loads (References F6.1.02, F6.7.01, 6.7.04).

D. Incorrect - Plausible because this is the amount of time to fully recharge the Aux Building 125V DC Batteries after a full discharge.

E2.2.1.3 Each 125 V dc system battery charger shall be sized to restore its battery to a fully charged condition within 12 hours after the battery has been discharged to 1.75 V per cell while carrying normal or emergency loads (References E6.1.001, E6.3.001, E6.7.019).

062K3.03

062 AC Electrical Distribution System

Knowledge of the effect that a loss or malfunction of the ac distribution system will have on the following:

K3.03 DC system

Importance Rating:	3.7	3.9
Technical Reference:	Functional System Description (FSD) A181004 v22	
References provided:	None	
Learning Objective:	RELATE AND DESCRIBE the effect(s) on the DC Distribution System for a loss of an AC or DC bus (OPS-40204E06).	
Question origin:	Modified FNP BANK DC DIST-40204E02 10	
Basis for meeting K/A:	K/A is met by placing candidate in a situation with a Loss of the A Train AC busses, and candidate's knowledge is tested on the effect on the DC distribution system. Effectively, batteries would be able to carry loads for 2 hours with no A/C.	
SRO justification:	N/A	

E3.0 CRITICAL COMPONENT FUNCTIONAL DESIGN REQUIREMENTS

This section contains functional design requirements for all major components contained within the auxiliary building 125 V dc Class 1E electrical distribution system that are considered to be critical to safety-related system functions (i.e., failure of the component could lead to loss or impairment of safety-related system functions). The functions of each component, in addition to performance and interface requirements, are discussed in the following sections.

E3.1 125 V DC BATTERIES

TPNS Nos. QR42E002A-A
QR42E002B-B

E3.1.1 Basic Functions

The auxiliary building Class 1E 125 V station batteries shall provide power to the required dc and vital ac loads in case of loss of auxiliary system power or in the event of failure of a battery charger (Reference E6.1.001).

E3.1.2 Functional Requirements

E3.1.2.1 The 125 V station batteries shall be stationary type, consisting of 60 cells connected in series to establish a nominal 125 V station dc power supply (Reference E6.7.020). Under both normal and accident conditions the batteries shall be capable of providing the voltage required for operation of the non-safety-related and safety-related components considering an aging factor of 25% and electrolyte temperature within the range of 60°F to 110°F (Reference E6.7.025).

E3.1.2.1.1 During the normal plant operation, the batteries shall be capable of carrying the loads necessary to support plant operation for two hours. The two hour duration is based on the time required for the operators to connect the spare battery charger to the system if the connected battery charger fails on either train. During this two hour period, the redundant train of the dc system with operable battery charger is available for accident mitigation, if required. The normal load on the batteries during the two hour period will not exceed 250 amps for batteries 1A, 2A and 2B, and 300 amps for battery 1B (Reference E6.7.025).

E3.1.2.1.2 During the design basis accident (LOSP or LOSP + LOCA) the batteries shall be capable of carrying the DC loads necessary to support accident mitigation for a minimum of the 40 second period from the initiation of the LOSP or LOSP + LOCA until the battery chargers are reenergized from the emergency diesel generators. The design basis accident load on the batteries during the first minute period shall not exceed 500 amps (Reference E6.7.025).

E3.1.2.1.3 Although not a requirement for mitigation of the design basis accidents, the batteries shall be capable of supplying adequate voltage to all safety-related components for an extended period without battery charger support under the following scenario:

After initiation of an LOSP or LOSP + LOCA, the batteries shall have sufficient capacity to support automatic diesel generator starting and load sequencing, and to support operation from the main control room of all required safety-related DC loads for 2 hours assuming that a battery charger failure occurs after initiation of the LOSP or LOSP + LOCA event. Diesel generator automatic start or load sequencing failures with multiple attempts for diesel generator restart and automatic sequencing are not assumed during the event. The load profile for this scenario is shown below:

Time	Load
0-1 min	500 amps
1-120 min	350 amps

(Reference E6.7.025)

E3.1.2.1.4 Although not a design requirement, the batteries shall be capable of supplying adequate voltage to all safety-related components (without battery charger support) in the event that the diesel fails to start at the first attempt and the subsequent attempt to restart the diesel is taken during the 31-st minute, except battery 2A which is limited to

E2.2.1.4 All components of the dc distribution system shall be designed to carry and/or interrupt the maximum short circuit current contribution from the battery and battery charger (References E6.3.009, E6.7.020).

E2.2.2 System Voltage Level Limitations

The 125 V dc system shall be capable of providing the acceptable voltage levels at each safety-related component of the assigned dc load under any operating condition. There shall be no voltage drops of sufficient magnitude between the dc power source and Class 1E loads that, due to cable sizing or current demand during an event, can cause the voltage at the load to drop below the minimum required voltage for that component to operate properly. The allowable circuit voltage drop shall be limited by the voltage levels at the related system buses, as set by the design calculations and the operating voltage range established by the suppliers of the served components. The allowable circuit voltage drop values and maximum permissible circuit lengths for different types of loads shall be established based on the battery voltage level at the end of the first minute without battery charger support during SI and LOSP or LOSP only. These criteria are conservative because the charger support to the battery will be restored less than 1 minute after the LOSP or LOSP and SI signal initiation (References E6.3.001, E6.3.003, E6.3.004, E6.3.005).

Although not a requirement for the design basis, the batteries shall be capable of providing acceptable voltage to all safety related components for the following scenarios (References E6.3.012, E6.7.025):

a. After the diesel fails to start 0 sequence all loads after initiation of an LOSP or LOSP/SI, the batteries shall be capable of restarting the diesel and sequencing loads within 31 minutes, except battery 2A which is limited to 16 minutes (Reference E6.7.030).

b. If the battery charger fails to sequence after initiation of an LOSP or LOSP/SI, the batteries shall provide adequate voltage for control of all components from the control room for a period of two hours.

E2.2.3 System Status Monitoring

The 125 V dc system is required to be monitored to the extent that it is shown to be ready to perform its intended function (Reference E6.7.019). To satisfy this requirement, each dc system is equipped with the following status monitoring features in the main control room and locally to provide continuous monitoring of dc power source condition:

1. DC DIST-40204E02 010 062K3.03

Which one of the following states the time that the auxiliary building 125V direct current (DC) system batteries are designed to carry the required DC and vital AC loads without support from a battery charger?

A.✓ 2 hours

B. 4 hours

C. 8 hours

D. 12 hours

Choice A is correct.

FSD A181004 section F.2.1.2.3 states that: "Each 125 V DC system battery shall be sized to have sufficient capacity to independently supply (without support from battery charger) the required loads for 2 hours with end battery cell terminal voltage of 1.75 V or greater. "

Distractor analysis/plausibility:
Each 125 V DC system battery charger shall be sized to restore its battery to a fully charged condition within **8 hours** after the battery has been discharged to 1.75 V/cell while carrying normal or emergency loads.

Each The auxiliary building 125 V dc system **battery charger shall be sized** to restore its battery to a fully charged condition within **12 hours** after the battery has been discharged to 1.75 V per cell while carrying normal or emergency loads

46. 063A1.01 046/MOD/RO/M 2.5/3.3/063A1.01/N///A

Unit 1 has experienced a Reactor trip with the following conditions:

- A Loss of All AC has occurred.
- ECP-0.0, Loss of All AC Power, is in progress.

Which one of the following completes the statements below?

The 1B Aux Building DC bus voltage will __(1)__ .

DC loads are minimized in ECP-0.0 to __(2)__ .

A.✓ 1) drop slowly at first; then later drop rapidly as the battery nears exhaustion

2) prolong battery life

B. 1) drop slowly at first; then later drop rapidly as the battery nears exhaustion

2) prevent damage to the DC components

C. 1) drop at a constant, linear rate the entire time the battery discharges

2) prolong battery life

D. 1) drop at a constant, linear rate the entire time the battery discharges

2) prevent damage to the DC components

During Battery discharge, voltage will slowly drop until the battery approaches exhaustion. As the battery approaches exhaustion, voltage will decrease exponentially until exhaustion.
During ECP-0.0, loads are minimized to increase and prolong battery life. Candidate may think DC loads are minimized to protect DC components from excessive current draw as voltage decreases, but this is incorrect.

A. Correct - both parts are correct, see above.

B. Incorrect - first part is correct. see above

Second part is plausible. For an AC system, when the voltage starts dropping, current draw increases. Candidate may correlate this to the DC system and think DC loads are minimized to prevent damage to components.

C. Incorrect - first part is incorrect, see above.

Second part is correct.

D. Incorrect - both parts are incorrect, see above.

063A1.01

063 DC Electrical Distribution System

Ability to predict and/or monitor changes in parameters associated with operating the DC electrical system controls including:
(CFR: 41.5 / 45.5)
A1.01 Battery capacity as it is affected by discharge rate 2.5 3.3

Importance Rating:	2.5 / 3.3
Technical Reference:	FNP-0-ECB-0.0 v1
References provided:	None
Learning Objective:	RELATE AND DESCRIBE the effect(s) on the DC Distribution System for a loss of an AC or DC bus (OPS-40204E06).
Question origin:	Modified FNP BANK DC DIST-40204E07 07
Basis for meeting K/A:	K/A is met by placing candidate in a situation with a Loss of all AC event, and candidate's ability to monitor changes in DC voltage as the battery is discharged, is tested. In addition, questioning candidate's knowledge of the reason for minimizing DC loads while in ECP-0.0, determines his knowledge of the effect on the DC system from minimizing the rate of discharge of the battery.
SRO justification:	N/A

Intact SG Levels

Intact SG levels are checked to verify adequate heat sink. Maximum flow is maintained until any SG narrow range level reaches 31% {48%} in order to restore narrow range level as soon as possible so the secondary depressurization (which requires narrow range level in at least one SG) can be started as soon as possible. Once in the narrow range > 31%{>48%}, AFW flow should be controlled to maintain the required narrow range level 31%-65%{48%-65%}. Control of AFW flow is accomplished by adjusting the TDAFW pump speed and/or the TDAFW flow control valve(s) position with the handwheels locally as required. If the TDAFW pump has lost control power, then the RNO action directs operation of the pump manually using SOP-22.0, Appendix I.

If SG level in any SG continues to rise after AFW flow to the SG is isolated, a SG tube rupture may exist. Performing step 12 of ECP-0.0 should isolate the ruptured SG and will minimize the release of radioactive steam.

DC Loads

The purpose of this step is to conserve DC power by shedding non-essential DC loads from the DC buses. Following a loss of AC power, the station batteries are the only source of electrical power. Since AC emergency power is not available to charge the station batteries, battery power must be conserved to permit monitoring and control of the plant until AC power can be restored.

Since the remaining life of the battery cannot be monitored from the control room, an electrician is dispatched to perform EMP-1340.10, Battery Capacity Calculation for Emergency Discharge Conditions. This will determine the amount of battery capacity remaining based on the current discharge rate of the battery and individual battery cell voltage. This will provide additional information to the plant operator on remaining battery life and the need to shed additional DC loads.

Monitor CST Level

This is a continuing action step. The CST level is checked to ensure an adequate long-term AFW supply. When CST level is <5.3 feet, then the operator must align the SW system to supply AFW. A level of 5.3 feet in the CST provides the operator sufficient time to transfer the supply for AFW to the alternate AFW source (SW) before losing suction to the AFW pumps.

Once SW is aligned, it will provide AFW as needed to maintain an adequate heat sink. However, until the SW pumps are started when electrical power is returned, even this supply of

LOSS OF ALL AC POWER
Plant Specific Background Information

Section: Procedure

Unit 1 ERP Step: 14 **Unit 2 ERP Step:** 14 ***ERG Step No:*** *14*

ERP StepText: Minimize DC loads.

ERG StepText: *Check DC Bus Loads*

Purpose: To conserve dc power supply by shedding non-essential dc loads from the dc busses as soon as practical

Basis: Following loss of all ac power, the station batteries are the only source of electrical power. The station batteries supply the dc busses and the ac vital instrument busses. Since ac emergency power is not available to charge the station batteries, battery power supply must be conserved to permit monitoring and control of the plant until ac power can be restored. A plant specific procedure should be prepared to prioritize the shedding of dc loads in order to conserve and prolong the station battery power supply. The plant specific evaluation should consider shedding of equipment loads from the dc busses and of instrumentation from the ac vital busses. The intent of load shedding is to remove all large non-essential loads as soon as practical, consistent with preventing damage to plant equipment. Consideration should be given to the priority of shedding additional loads in case ac power cannot be restored within the projected life of the station batteries. Consideration should also be given to securing a portable diesel powered battery charger to ensure dc power availability. Since the remaining battery life cannot be monitored from the control room, Step 14 requires personnel to be dispatched to locally monitor the dc power supply. This is intended to provide the operator information on remaining battery life and the need to shed additional dc loads. The plant specific procedure should be structured to ensure communications with the control room operator to ensure his knowledge of dc power status.

Knowledge: N/A

References:

Justification of Differences:

1 Changed to make plant specific.

2 Placed actions in an Attachment to allow an extra operator to perform required actions outside of the control room without interfering with the flow of the procedure.

1. DC DIST-40204E07 007 063A1.01

A failed breaker has caused the loss of the A Train Auxiliary Building DC battery charger.

Which one of the following describes the 1A Aux Building DC bus voltage over time with no operator action?

The 1A Aux Building DC bus voltage will drop __________.

A.✓ slowly at first; then later drop faster as the battery nears exhaustion

B. quickly at first; then later drop more slowly as the battery nears exhaustion

C. at a constant, but slow rate the entire time the battery discharges

D. at a constant, but quick rate the entire time the battery discharges

DISTRACTOR ANALYSIS:

A. Correct. After the initial drop the voltage will drop slowly until cell reversal starts having an effect at which time the voltage drop will occur at a faster rate.

B. Incorrect. See A. Could be chosen based on misconception of cell reversal effects.

C. Incorrect. See A. Could be chosen if cell reversal effects are not considered.

D. Incorrect. See A. Could be chosen based on misconception of cell reversal effects.

47. 063K3.02 047/MOD/RO/M 3.5/3.7/063K3.02/N//A

Unit 1 is in Mode 3 with the following conditions:

- The 1B MDAFW pump is operating to provide secondary inventory.
- The B Train Auxiliary Building 125V DC bus becomes de-energized.

Which one of the following completes the statements below?

The 1B MDAFW pump Main Control Board switch indication will __(1)__ .

The 1B MDAFW pump will __(2)__ .

	(1)	(2)
A.✓	**NOT** be LIT	continue to run
B.	**NOT** be LIT	trip
C.	be LIT	continue to run
D.	be LIT	trip

Candidate has to determine the status of the MDAFW pump after a loss of DC. The determination is complicated by the fact that 1B MDAFW pump has alternate DC power provided from the Hot Shutdown Panels. This alternate DC power is only supplied when the Hot Shutdown Panel switch is taken to Local for this component. In this situation, the alternate DC power has no effect, but the candidate may think it automatically switches to the alternate DC. DC power supplies control power for the 4160V breaker for the MDAFW pump, and also the MCB indication. The indication will be lost for the handswitch due to the loss of DC, but the pump will remain running. The MDAFW pump breaker requires DC to open or close, and the breaker will not trip open on a loss of DC.
conversely, the MDAFW pump will nt auto start in this configuration and can not be started from the MCB once the DC power is removed.

A. Correct - see above.

B. Incorrect - first part is correct.

Second part is plausible if the candidate thinks DC power has to be continuously supplied for the breaker to remain closed.

C. Incorrect - first part is incorrect, see above.

Second part is correct.

D. Incorrect - both parts are incorrect, see above.

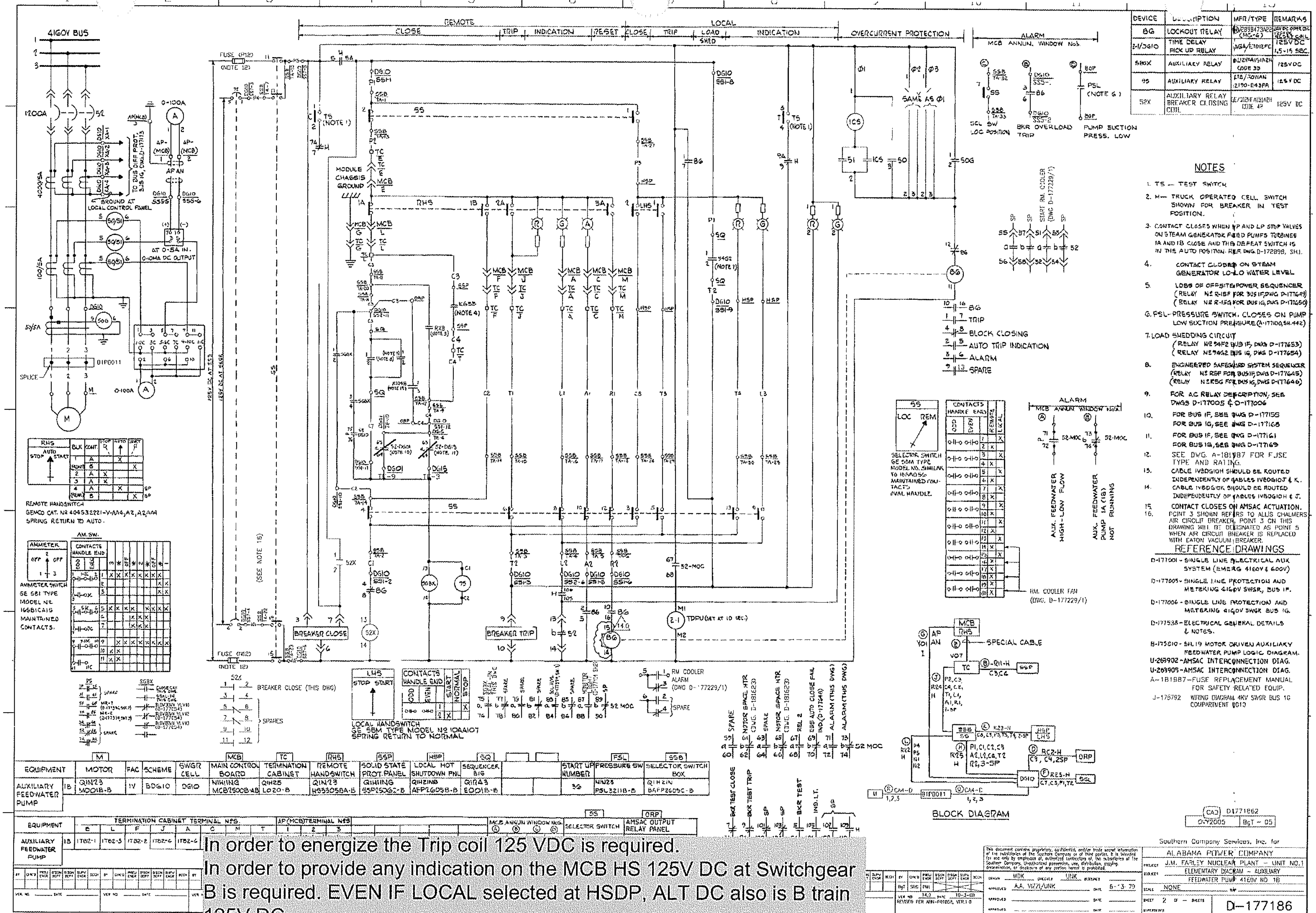
063K3.02

063 DC Electrical Distribution System

Knowledge of the effect that a loss or malfunction of the DC electrical system will have on the following:
(CFR: 41.7 / 45.6)
K3.02 Components using DC control power 3.5 3.7

Importance Rating:	3.5 / 3.7
Technical Reference:	D177186 sheet 2 v14
References provided:	None
Learning Objective:	RELATE AND DESCRIBE the effect(s) on the AFW System for a loss of an AC or DC bus, loss of uninterruptible power supply (UPS), or a malfunction of the Instrument Air System (OPS-40201D06).
Question origin:	Modified FNP BANK AOP-29.1/.2-52521F06 03 from 2008 Harris NRC Exam
Basis for meeting K/A:	K/A is met by having candidate evaluate and determine the effects of a loss of the DC bus on an operating AFW pump. Candidate must determine the direct effects on the pump breaker and also the effects on Control Room indication.
SRO justification:	N/A

Date: 2/14/2011 Time : 47:13 PM



In order to energize the Trip coil 125 VDC is required.
In order to provide any indication on the MCB HS 125V DC at Switchgear B is required. EVEN IF LOCAL selected at HSDP, ALT DC also is B train 125V DC.

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1. AOP-29.1/.2-52521F06 003 063 K3.02

Given the following:

- The plant is in Mode 3.
- 1A AFW Pump is operating to provide secondary inventory.
- DC Bus 1A becomes de-energized.

Which ONE of the following describes the effect on the operating AFW pump?

A.✓ MCB control switch indication is extinguished and the pump remains running.

Control from the MCB is lost.

B. MCB control switch indication is extinguished and the pump remains running.

Control from the MCB is available.

C. MCB control switch indication is availableand the pump trips.

Control from the MCB is lost.

D. MCB control switch indication is available and the pump trips.

Control from the MCB is available.

A is correct. Loss of DC Bus DP-1A-SA means control power lost to operating AFW pump. Switch indication and MCR control is lost, but pump remains running.
B is incorrect. MCR breaker control will NOT be available since DP-1A-SA supplies control power to the "A" AFW pump.
C is incorrect. The AFW pump will not trip and the lights will not be available. Breaker control will be lost.
D is incorrect. The AFW pump will not trip, the lights will not be available, and breaker control will not be available.

48. 064A1.04 048/MOD/RO/C/A 2.8/2.9/064A1.04/N///C

-Unit 1 is in Mode 3 with the following conditions:

- An LOSP has occurred on Unit 1 ONLY.

The Diesel Building SO reports that crankcase pressure is out of spec on the 1C DG.

Which one of the following completes the statement below?

The __(1)__ CRANKCASE PRESSURE alarm comes in when 1C DG crankcase pressure reaches + 2" H_20 gage and the 1C DG __(2)__ .

	(1)	(2)
A.	HIGH	will trip
B.	LOW	will trip
C✓	HIGH	will **NOT** trip
D.	LOW	will **NOT** trip

Candidate is given conditions of an LOSP causing an automatic start of the Diesel Generators. Any autostart signal energizes the Emergency Start Relay for the DG's, and this blocks all non essential trips of the DG's. Candidate is given that there is a crankcase pressure problem on the 1C DG, and candidate has to determine if there is a high crankcase pressure alarm or a low alarm. The setpoint for the small DGs is + 2" H_20 gage and for the Big DGs it is 0.6 " H_20 gage, both a positive number and both a HIGH alarm. The crankcase pressure is normally a negative value when running. Candidate will have to know there is a high crankcase pressure alarm or the normal value of the running DG for Crankcase pressure.

When the alarms comes in (due to high crankcase pressure setpoint of + 2" H_20), normally the DG will trip due to the HIGH CRANKCASE PRESSURE - non-essential trip. In this situation, the LOSP signal has caused an Emergency start of the DG and the DG does not trip because the non-essential trips are blocked.

A. Incorrect - first part is correct. see above.

Second part is incorrect. Plausible because this would be correct if the DG was running for a normal surveillance procedure.

B. Incorrect - first part is incorrect. The alarm and trip come from positive crankcase pressure. Second part is incorrect, see above.

C. Correct -first part is correct. see above.

Second part is correct. see above,

D. Incorrect - first part is incorrect see above.

Second part is correct.

064A1.04

064 Emergency Diesel Generator (ED/G) System

Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ED/G system controls including:
(CFR: 41.5 / 45.5)
A1.04 Crankcase temperature and pressure 2.8 2.9

Importance Rating:	2.8 / 2.9
Technical Reference:	FNP-0-ARP-19.2 v25
References provided:	None
Learning Objective:	SELECT AND ASSESS the following instrument/equipment response expected when performing Diesel Generator and Auxiliaries System evolutions including the fail condition, alarms, and trip setpoints (OPS-52102I05): Diesels 1C, 2C: Crankcase Pressure Switch (PS-522, PS-521) Low Lube Oil Pressure Switch (PS-530, PS-529) Low Lube Oil Pressure Shutdown Switch (PS-532, PS-531) Lube Oil Temperature Controller (TS-791B, TS-792B) Lube Oil High Temperature Shutdown (TS-542, TS-541) Fuel Oil Supply Tank Level Switch (LS-503B, LS-504B) Jacket Water Coolant Low Pressure Switch (PS-567, PS-576) Jacket Water Coolant Low Pressure Shutdown Switch (PS-588, PS-575) Compressor Pressure Switch (PS-519A/B, PS-520A/B)
Question origin:	Modified from Watts Bar December 2009 NRC Exam
Basis for meeting K/A:	K/A is met by having candidate monitor and determine when to expect reaching the alarm setpoint for crankcase pressure on an operating Diesel Generator. In addition, candidate must determine the effect on the DG during an LOSP condition, (will the DG trip or not?) due to the crankcase pressure problem.
SRO justification:	N/A

LOCATION 13

13
HIGH CRANKCASE PRESSURE

SETPOINT: 2.0 INCHES WATER GAGE.

ORIGIN: Crankcase pressure switch (CCP) QSR43PS522 for 1C DG and QSR43PS521 for. 2C DG

PROBABLE CAUSE

1. Piston blow by.
2. Clogged air separator.
3. Ejector tubes plugged.

AUTOMATIC ACTION

IF an emergency start condition does NOT exist, THEN the diesel trips.

OPERATOR ACTION

1. Notify appropriate personnel to investigate and repair.

References: U-184804; PCN B89-0-6087; A-181005

1. 064 A1.04 050 2009 Watts Bar Question 064A1.04

The operating crew has performed a manual start of Diesel Generator (DG)1A-A using 1-HS-82-14, START-STOP, on 0-M-26, when the following alarm is received:

- 196-D, "CRANKCASE PRESS HI"

Which ONE of the following:

(1) Is the LOWEST crankcase pressure which would result in the above alarm,
and
(2) how the crankcase pressure will affect DG operation?

	(1)	(2)
A.	1"$H_2$0	DG will NOT automatically trip.
B.✓	1"$H_2$0	DG will automatically trip.
C.	7"$H_2$0	DG will NOT automatically trip.
D.	7"$H_2$0	DG will automatically trip.

DISTRACTOR ANALYSIS:

A. *Incorrect, the alarm will come in when the pressure rises to 1" H_2O pressure but the DG will not require operator action to emergency stop. The DG will automatically trip. Plausible because the setpoint for the alarm is correct and if the DG had been manually started on 0-M-26 using the emergency start push button, then a manual emergency stop would be required.*

B. *Correct, the alarm will come in when the pressure rises to 1" H_2O pressure and with a normal start the DG will automatically trip.*

C. *Incorrect, the alarm does not first come in at 7" H_2O pressure (will come in when the pressure rises to 1" H_2O pressure) and the DG will not require operator action to emergency stop. The DG will automatically trip. Plausible because 7" is the setpoint required for the Engine Crankcase Lube Oil Level and if the DG had been manually started on 0-M-26 using the emergency start push button, then a manual emergency stop would be required.*

D. *Incorrect, the alarm does not first come in at 7" H_2O pressure (will come in when the pressure rises to 1" H_2O pressure) but the DG will automatically trip. Plausible because 7" is the setpoint required for the Engine Crankcase Lube Oil Level, and the DG automatically tripping is correct.*

49. 065AK3.08 049/NEW/RO/M 3.7/3.9/065AK3.08/N///D

Unit 1 tripped from 100% power with the following conditions:

- A steam line break occurred in Containment.
- In addition, a complete loss of all AFW occurred.
- Containment pressure is 31 psig.
- FRP-H.1, Response To Loss Of Secondary Heat Sink, is in progress.
- Bleed and Feed criteria has been met.

Which one of the following completes the statements below?

Bleed and Feed criteria was met as soon as two SG wide range levels were LESS THAN __(1)__ .

Reset of Phase B isolation is required to __(2)__ .

	(1)	(2)
A.	12%	establish RCP support conditions
B.	12%	restore Instrument Air to Containment
C.	31%	establish RCP support conditions
D.✓	31%	restore Instrument Air to Containment

With a steam break in Containment (Containment pressure of 31 psig) and a loss of all AFW, an SI and Phase B isolation has occurred. If AFW flow is not restored, bleed and feed criteria are met normally when two SG wide range levels decrease to less than 12%. Since adverse Containment conditions are present (Containment pressure >4 psig), it changes the SG level criteria for initiating bleed and feed to - two SG levels less than 31%. Since a Phase B isolation has occurred, PORV's (which are required for the RCS bleed function) have no instrument air available to them. The reason for resetting the Phase B isolation signal is to be able to realign instrument air to Containment for PORV operation.

A. Incorrect - 1) incorrect, Adverse Containment conditions changes level to 31%. Plausible because the level for non adverse Containment is 12%.
2) incorrect, plausible because most emergency procedures try to establish RCP support conditions to restore forced flow. A candidate with inadequate knowledge may think this would facilitate core cooling while in bleed and feed conditions.

B. Incorrect - 1) incorrect, see A.1.
2) correct, Instrument air is restored to allow operation of the PORV's.

C. Incorrect - 1) correct, adverse Containment level criteria for bleed and feed is 31%.
2) incorrect, see A.2.

D. Correct - 1) correct, see C.1.
2) correct, see B.2.

065AK3.08

APE: 065 Loss of Instrument Air

Knowledge of the reasons for the following responses as they apply to the Loss of Instrument Air:

(CFR 41.5,41.10 / 45.6 / 45.13)

AK3.08 Actions contained in EOP for loss of instrument air 3.7 3.9

Importance Rating:	3.7 / 3.9
Technical Reference:	FNP-1-FRP-H.1 v27
References provided:	None
Learning Objective:	ANALYZE plant conditions and DETERMINE if actuation or reset of any Engineered Safety Features Actuation Signal (ESFAS) is necessary. (OPS-52533F05)
Question origin:	NEW
Basis for meeting K/A:	K/A is met by placing candidate in a situation with high Containment pressure and a complete loss of AFW, causing entry into FRP-H.1. The high Containment pressure causes instrument air to isolate to Containment. Candidate must know that the reason Phase B isolation is reset is to allow restoring Instrument air to Containment to provide air for opening PORV's due to bleed and feed conditions being met.
SRO justification:	N/A

Step	Action/Expected Response	Response NOT Obtained
___14	**Verify SI RESET.** [] MLB-1 1-1 not lit (A TRN) [] MLB-1 11-1 not lit (B TRN)	14 Perform the following: 14.1 IF any train will NOT reset using the MCB SI RESET pushbuttons, THEN place the affected train S821 RESET switch to RESET. (SSPS TEST CAB.) 14.2 IF a failure exists in SSPS such that SI cannot be reset, THEN reset SI using FNP-1-SOP-40.0, RESPONSE TO INADVERTENT SI AND INABILITY TO RESET OR BLOCK SI, Appendix 2.
___15	**Verify containment isolation RESET.** 15.1 Verify PHASE A CTMT ISO RESET. [] MLB-2 1-1 not lit [] MLB-2 11-1 not lit 15.2 Verify PHASE B CTMT ISO RESET. [] MLB-3 1-1 not lit [] MLB-3 6-1 not lit 15.3 IF any train of PRF started, THEN verify proper operation using FNP-1-SOP-60.0, PENETRATION ROOM FILTRATION SYSTEM.	

Step	Action/Expected Response		Response NOT Obtained
___16	**Verify instrument air to containment established.**	16	Perform the following. a) Establish backup PRZR PORV instrument air supply using FNP-1-SOP-62.1, BACK-UP AIR OR NITROGEN SUPPLY TO THE PRESSURIZER POWER OPERATED RELIEF VALVES. <u>OR</u> b) Establish PRZR PORV air supply from nitrogen bottle using FNP-1-SOP-62.1, BACK-UP AIR OR NITROGEN SUPPLY TO THE PRESSURIZER POWER OPERATED RELIEF VALVES.
	16.1 Verify at least one air compressor - STARTED. AIR COMPRESSOR [] 1A [] 1B [] 1C		
	16.2 Verify INST AIR PRESS PI 4004B - GREATER THAN 85 psig.		
	16.3 Check the following: IA TO CTMT [] MLB-3 1-2 <u>NOT</u> lit IA TO PENE RM PRESS LO [] Annunciator KD1 clear <u>OR</u> Verify instrument air aligned to containment. (BOP) IA TO PENE RM [] N1P19HV3825 open [] N1P19HV3885 open IA TO CTMT [] Q1P19HV3611 open		

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: Severe core uncovery will result if an RCS bleed path is established without an RCS feed path (SI flow).

****

___17 **Establish RCS bleed path.**

	Action/Expected Response	Response NOT Obtained
17.1	Turn off all pressurizer heaters. PRZR HTR GROUP VARIABLE [] 1C PRZR HTR GROUP BACKUP [] 1A [] 1B [] 1D [] 1E	
17.2	Check PRZR PORV ISOs - POWER AVAILABLE.	17.2 Restore power to any deenergized PRZR PORV ISO. (139 ft, AUX BLDG rad side) Q1B31MOV8000A(B) [] BKR FUK4 closed [] BKR FVW4 closed
17.3	Verify both PRZR PORV ISOs - OPEN.	

Step 17 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
17.4	Open both PRZR PORVs.	17.4 Perform the following. 17.4.1 Open all available PORV's. 17.4.2 Open reactor vessel head vent valves. RX VESSEL HEAD VENT OUTER ISO [] Q1B13SV2213A [] Q1B13SV2213B RX VESSEL HEAD VENT INNER ISO [] Q1B13SV2214A [] Q1B13SV2214B 17.4.3 Align any possible water source to intact SGs. 17.4.4 IF any water source aligned to intact SGs, THEN reduce pressure in at least one intact SG to atmospheric pressure. IF NOT, THEN proceed to Step 18.

Intact SG	1A	1B	1C
1A(1B,1C) MS ATMOS REL VLV PC	[]3371A open	[]3371B open	[]3371C open

NOTE: The intent of the following step is to verify proper response of SI equipment (if not already performed) while continuing in this procedure, as manpower and time permit.

___18 Perform steps 1 through 6 of FNP-1-EEP-0, REACTOR TRIP OR SAFETY INJECTION, PROCEDURE STEPS.

Step	Action/Expected Response	Response NOT Obtained
1	**<u>Monitor bleed and feed criteria.</u>** **(applicable steps 1 thru 11 only)**	
1.1	Check at least two SG wide range levels - GREATER THAN 12%{31%}.	1.1 Perform the following. 1.1.1 Stop all RCPs. RCP [] 1A [] 1B [] 1C 1.1.2 Proceed to Step 12
1.2	Check pressurizer pressure - LESS THAN 2335 psig.	1.2 <u>IF</u> pressurizer pressure greater than 2335 psig due to loss of secondary heat sink, <u>THEN</u> perform the following. 1.2.1 Stop all RCPs. RCP [] 1A [] 1B [] 1C 1.2.2 Proceed to Step 12

50. 068AA2.04 050/NEW/RO/MEM 3.7/4.0/068AA2.04/N///C

Unit 1 was operating with PT-474, 1A SG PRESS, failed LOW when the following occurred:

- A fire onsite has required the Control Room to be evacuated.
- The crew has implemented AOP-28.2, Fire in the Control Room.
- Steam is coming from the MSVR roof.
- The crew has closed all MSIVs.
- TI-410, LOOP A WIDE RANGE Thot, is 542°F.
- TI-413, LOOP A WIDE RANGE Tcold, is 538°F.

The crew is evaluating PCV-3371A, 1A SG ATMOSPHERIC RELIEF VLV, to determine if it is OPEN or leaking by.

Which one of the following completes the statement below?

The 1A SG Pressure indication __(1)__ available for monitoring on the Hot Shutdown Panels.

Low Steam Line Pressure SI signal __(2)__ be blocked locally.

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

Distractor Analysis:

PI-3371A/B/C are the only Steam pressure instruments on the HSDPs. This instrument is that required by TS 3.3.4, Remote Shutdown.

PI-474 is a PROTECTION Channel (II - A train) for 1A SG. This instrument is located on the MCB and is required for TS 3.3.3, PAM instrumentation.

AOP-28.2, step 43.5 is preceded by the following NOTE:

There are **no local controls available for blocking low steam header pressure SI below 543°F**. Therefore, the intent of the following step is to "disable" the HHSI flow path and RHR motor supply breakers prior to reaching plant conditions that would actually result in an injection. This will allow for a controlled plant cooldown and depressurization.

A. Incorrect 1) See information above.

Plausible: PI-0474 is an instrument that all candidates should be familiar. This instrument is a PROTECTION channel located on the MCB. This instrument is an A Train instrument, and since all indications on the HSD Panels are on the 1A panel, one might believe that the instruments are train specific. PI-0474 is also specifically listed in the TABLE for TS 3.3.3, for PAM instrumentation, whereas, TS 3.3.4, REMOTE Shutdown, does not provide the same detail of which is the applicable instrument.

2) see C.1

B. Incorrect. 1) See A.1
2) See D.2.

Plausible: if the candidate were NOT familiar with the Instrumentation available and thought that SI signal could be blocked or disabled when < 543°F.

C. Correct 1) See information above. PI-474 is NOT a HSDP indication.
2) see above. SI can not be blocked from the HSDP as it can be from the MCB, and will actuate to initiate SI if the setpoint is exceeded (585 psig)

D. Incorrect SI can not be blocked and is NOT de-activated when control is shifted to the HSDP. This is why Attachment 1 is implemented to **"disable" the HHSI flowpath and RHR motor supply breakers prior to reaching plant conditions that would actually result in an injection."**

The signal will actuate regardless of completion of Attachment 1 or taking local control of components.

Plausible: Various Equipment, when placed in local at the Hot Shutdown Panel will not operate automatically, therefore one might believe that the SI signal will not actuate or can be locally blocked since temperature is less than 543°F (P-12 satisfied) as it can be from the MCB.

~~068AA2.04~~

068 Control Room Evacuation

Ability to determine and interpret the following as they apply to the Control Room Evacuation:

(CFR: 43.5 / 45.13)

AA2.04 S/G pressure 3.7 4.0

Importance Rating:	3.7	4.0
Technical Reference:	FNP-1-AOP-28.2 v27	
References provided:	None	
Learning Objective:	**RECALL AND DESCRIBE the physical in-plant location** of those components associated with the Main and Reheat Steam System, to include the components found on Figure 2 and 3, Main and Reheat Steam System (OPS-40201A03). **ANALYZE plant conditions and DETERMINE if actuation or reset of any Engineered Safety Features Actuation Signal (ESFAS) is necessary.** (AOP-28.1/.2-52521C05)	
Question origin:	NEW	
Basis for meeting K/A:	a control room evacuation is given with a failed Stm line instrument and the candidate is asked if the information can be determined and interpreted from the HSDP. Since one of the normal indications on the MCB is not available, the candidate has to know that this instrument is not on the HSDP and the SG PRESSURE can be observed on a different PT. A situation is provided in which a determination is required to be made regarding the isolation of a SG (19.1 of AOP-28.1), and **will result** in an Automatic Actuation of ESFAS signals related to SG pressure. The candidate must be aware that the SI signal will still actuate and that despite P-12 being satisfied, there is NO local means to BLOCK the Low steam pressure SI signal-- this would require implementation of Attachment 1 of AOP-28.2 **if SI flow is NOT needed.**	
SRO justification:	N/A	

__ **11 Align G-HSDP components for local operation. (121' Hallway Rm 254)**

125 VDC CONT PWR FOR HSP XFER RELAYS
[ ] Q1H22HS0001-A to ON

PRZR PORV
[ ] Q1B31PCV445A to LOCAL

PRZR PORV ISO
[ ] Q1B31MOV8000A to LOCAL

__ **12 Align A-HSDP components for local operations. (121' Hallway Rm 254)**

12.1 Place the following in LOCAL.

MDAFWP to 1A (1B, 1C) SG
[ ] Q1N23HV3227A
[ ] Q1N23HV3227B
[ ] Q1N23HV3227C

1A (1B, 1C) MS ATMOS REL VLV
[ ] Q1N11PCV3371A
[ ] Q1N11PCV3371B
[ ] Q1N11PCV3371C

1A CHG PUMP
[ ] Q1E21P002A

1B CHG PUMP A TRN
[ ] Q1E21P002B

1A MDAFWP
[ ] Q1N23P001A

1C CCW PUMP
[ ] Q1P17P001C

1B CCW PUMP A TRN
[ ] Q1P17P001B

Page Completed

UNIT 1

****

CAUTION: To prevent inadvertent steamline differential pressure SI, steam generator atmospheric relief valves should be adjusted to provide approximately equal SG demands. Consideration must be given to the steam load supplied to the TDAFWP.

****

__ **17 Adjust steam generator atmospheric relief valves to maintain SG pressures at approximately 1005 psig. (A HSDP Rm 254)**

17.1 Monitor 1A (1B, 1C) SG PRESS (A-HSDP)

[ ] Q1N11PI3371A
[ ] Q1N11PI3371B
[ ] Q1N11PI3371C

17.2 Adjust as required 1A (1B, 1C) MS ATMOS REL VLV (A HSDP)

[ ] Q1N11PCV3371A
[ ] Q1N11PCV3371B
[ ] Q1N11PCV3371C

__ **18 Locally trip all reactor coolant supply breakers.**

[ ] 1A RCP BKR DA-04 (139 ft, AUX BLDG Rm 346)
[ ] 1B RCP BKR DB-03 (139 ft, AUX BLDG Rm 343)
[ ] 1C RCP BKR DC-03 (139 ft, AUX BLDG Rm 343)

18.1 Verify breaker open by observing open indicating light illuminated.

18.1.1 Open the door; verify breaker open by observing mechanical indicator window.

18.1.2 Open DC control power breaker.

__ **19 Isolate the Main Steam system.**

19.1 IF inadvertent SI occurs while closing MSIVs,
THEN perform recovery from inadvertent SI using ATTACHMENT 1, RESPONSE TO SPURIOUS OR INADVERTENT SAFETY INJECTION.

19.2 Align MSIVs for local operation at G HSDP.

19.2.1 Place local / remote handswitch for 1A (1B, 1C) SG MSIV in LOCAL

[ ] Q1N11HV3369A to LOCAL
[ ] Q1N11HV3369B to LOCAL
[ ] Q1N11HV3369C to LOCAL

Step 19 continued on next page

Page Completed

NOTE: There are no local controls available for blocking low steam header pressure SI below 543°F. Therefore, the intent of the following step is to "disable" the HHSI flowpath and RHR motor supply breakers prior to reaching plant conditions that would actually result in an injection. This will allow for a controlled plant cooldown and depressurization.

43.5 <u>WHEN</u> SG pressure approaches 580 psig,
<u>THEN</u> begin preparations for recovery from Low Steamline Pressure SI using ATTACHMENT 1, RESPONSE TO SPURIOUS OR INADVERTENT SAFETY INJECTION

****

<u>CAUTION:</u> High steamline differential pressure SI may result from unbalanced steam loads while SG's are isolated. Use extreme caution when adjusting SG atmospheric relief valves.

****

43.6 Adjust SG atmospheric relief valves to establish RCS cooldown.

43.6.1 1A (1B, 1C) MS ATMOS REL VLV

[ ] Q1N11PCV3371A

[ ] Q1N11PCV3371B

[ ] Q1N11PCV3371C

Step 43 continued on next page

Page Completed

****

CAUTION: To prevent the possibility of discharging accumulators into the RCS, the following step should be completed prior to reducing RCS pressure to less than 800 psig.

****

__ **46 Isolate accumulators.**

46.1 Check with the Shift Manager that preparations for a containment entry have been completed.

46.2 WHEN RCS pressure < 1000 psig,
THEN locally close accumulator discharge valves. (105 ft, CTMT)

1A (1B, 1C) ACCUM DISCH ISO
[ ] Q1E21MOV8808A
[ ] Q1E21MOV8808B
[ ] Q1E21MOV8808C

****

CAUTION: To ensure compliance with Technical Specifications, RHR should be aligned to the RCS prior to reducing RCS temperature to less than 325°F.

****

__ **47 Continue RCS cooldown.**

47.1 Maintain RCS pressure and temperature within limits using FIGURE 2 or FIGURE 3 as appropriate.

47.2 Maintain cooldown rate less than 25°F/hr. while on natural circulation.

****

CAUTION: High steamline differential pressure SI may result from unbalanced steam loads while SG's are isolated. Use extreme caution when adjusting SG atmospheric relief valves.

****

47.3 Adjust SG atmospheric relief valves to establish RCS cooldown to approximately 350°F.

1A (1B, 1C) MS ATMOS REL VLV
[ ] Q1N11PCV3371A
[ ] Q1N11PCV3371B
[ ] Q1N11PCV3371C

Page Completed

~~Plausibility for PT-474 being thought to be~~
on HSDPs.

Table B 3.3.3-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

PAM INSTRUMENTATION	TPNS
RCS Hot Leg Temperature (Wide Range)	TE-413, TE-423, TE-433
RCS Cold Leg Temperature (Wide Range)	TE-410, TE-420, TE-430
RCS Pressure (Wide Range)	PT-402, PT-403
Steam Generator (SG) Water Level	Wide Range – LT-477, LT-487, LT-497
	Narrow Range – LT-474, LT-475, LT-476 LT-484, LT-485, LT-486 LT-494, LT-495, LT-496
Refueling Water Storage Tank Level	LT-501, LT-502
Containment Pressure (Narrow Range)	PT-950, PT-951, PT-952, PT-953
Pressurizer Water Level	LT-459, LT-460, LT-461
Steam Line Pressure	PT-474, PT-475, PT-476 PT-484, PT-485, PT-486 PT-494, PT-495, PT-496
Auxiliary Feewater Flow Rate	FT-3229A, FT-3229B, FT-3229C
RCS Subcooling Margin Monitor	Q1(2) H11NGCCM2523A&B
Containment Water Level (Wide Range)	LT-3594A, LT-3594B
Core Exit Temperature	TE-2301 – TE-2351
Reactor Vessel Level Indicating System	LE-2352, LE-2353
Condensate Storage Tank Level	LT-515, LT-516
Containment Area Radiation (High Range)	RE-27A, RE-27B

Table 4 – INDICATIONS (CONT'D)

MAIN STEAM/FEED VALVE ROOM			
Name	Designator	Type	Range
Main Steam Header Pressure	PI-464B	vertical edgewise indicator	0-1250 psig

HOT SHUTDOWN PANEL			
Name	Designator	Type	Range
SG A Steam Pressure	PI-3371A	vertical edgewise indicator	0-1250 psig
SG B Steam Pressure	PI-3371B	vertical edgewise indicator	0-1250 psig
SG C Steam Pressure	PI-3371C	vertical edgewise indicator	0-1250 psig

51. 072K4.01 051/NEW/RO/MEM 3.3/3.6/072K4.01/N///A

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

- Containment Mini-Purge is in service.
- R-24B, CTMT PURGE, has failed HIGH.

Which one of the following completes the statements below?

Mini-Purge dampers inside __(1)__ will isolate.

Mini-Purge supply and exhaust fans __(2)__.

	(1)	(2)
A.✓	Containment	remain running
B.	Containment	automatically stop
C.	the Piping Penetration room	remain running
D.	the Piping Penetration room	automatically stop

Containment Purge System Valves (HV-2866D, 2867D, 3196, 3197, 3198B, and 3198C) Refer to Figure 4. The mini-purge supply and exhaust valves (HV-2866D and H-2867D), the main purge supply and exhaust valves (HV-3197 and HV-3196), and the purge supply and exhaust valves (HV-3198C and HV-3198B) are operated by a common MCB handswitch (CLOSE/MINIPURGE/FULL PURGE). With the handswitch in the CLOSE position, all valves are closed. All valves automatically close if a containment ventilation isolation signal or **RE- 24B high** radiation alarm exists. **HV-2866D, 2867D, 3196, 3197 are inside ctmt and 3198B and 3198C are outside the PPR.**

Containment Purge System Valves (HV-2866C, 2867C, 3198A, and 3198D) inside the PPR

Refer to Figure 5. The mini-purge supply and exhaust for isolation valves (HV-2866C & HV-2867C) and the full purge supply and exhaust duct valves (HV-3198D & HV-3198A) are controlled by a common MCB handswitch (CLOSE/MINIPURGE/FULL PURGE). With the handswitch in the CLOSE position, all valves are closed. All valves will automatically close if a containment ventilation isolation signal or RE-24A high radiation alarms exist.

Radiation monitor R24A is a gaseous radiation monitor and will send a signal to isolate 4 dampers (2 mini-purge dampers and 2 main purge dampers) outside Containment. Radiation monitor R24B will isolate 4 dampers inside Containment and 2 outside Containment and NOT in the PPR.

A. Correct - first part is correct since R-24B closes **HV-2866D, 2867D, 3196, 3197 which are inside ctmt**

second part is correct since these fans do not have a signal to secure them.

B. Incorrect - First part is incorrect. Plausible because FNP has both particulate and gaseous radiation monitors.

Second part is not correct.

C. Incorrect - First part is incorrect. Plausible because candidate may not know that R-24B isolates ctmt dampers and R-24A isolates PPR dampers.

Second part is correct. see A.2

D. Incorrect - First part is incorrect, see C.1

Second part is incorrect, see A.2

072K4.01

072 Area Radiation Monitoring (ARM) System

Knowledge of ARM system design feature(s) and/or interlock(s) which provide for the following:

(CFR: 41.7)

K4.01 Containment ventilation isolation 3.3* 3.6*

Importance Rating:	3.3 / 3.6
Technical Reference:	D175010 sh2 & FNP-1-STP-18.1 V13
References provided:	None
Learning Objective:	RELATE AND IDENTIFY the operational characteristics including design features, capacities and protective interlocks for the components associated with the Radiation Monitoring System to include those items in Table 4-Remote and Local Indications and Controls (OPS-40305A02).
Question origin:	NEW
Basis for meeting K/A:	K/A is met by testing candidate's knowledge of the design and automatic isolation features associated with radiation monitor R-24. A high radiation signal causes a Containment Purge system damper isolation.
SRO justification:	N/A

CONTAINMENT VENTILATION AND PURGE

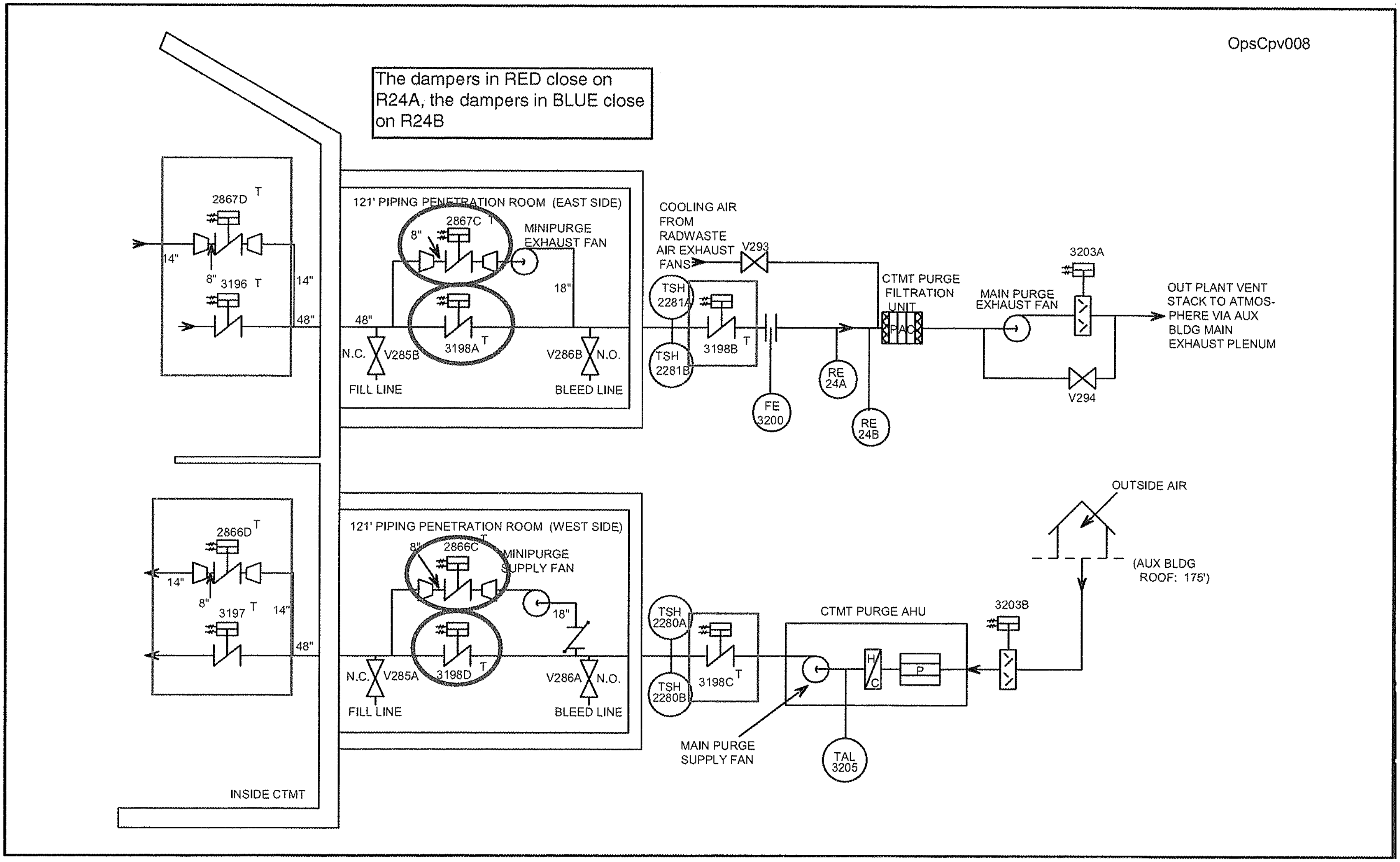

FIGURE 2 - Containment Purge System

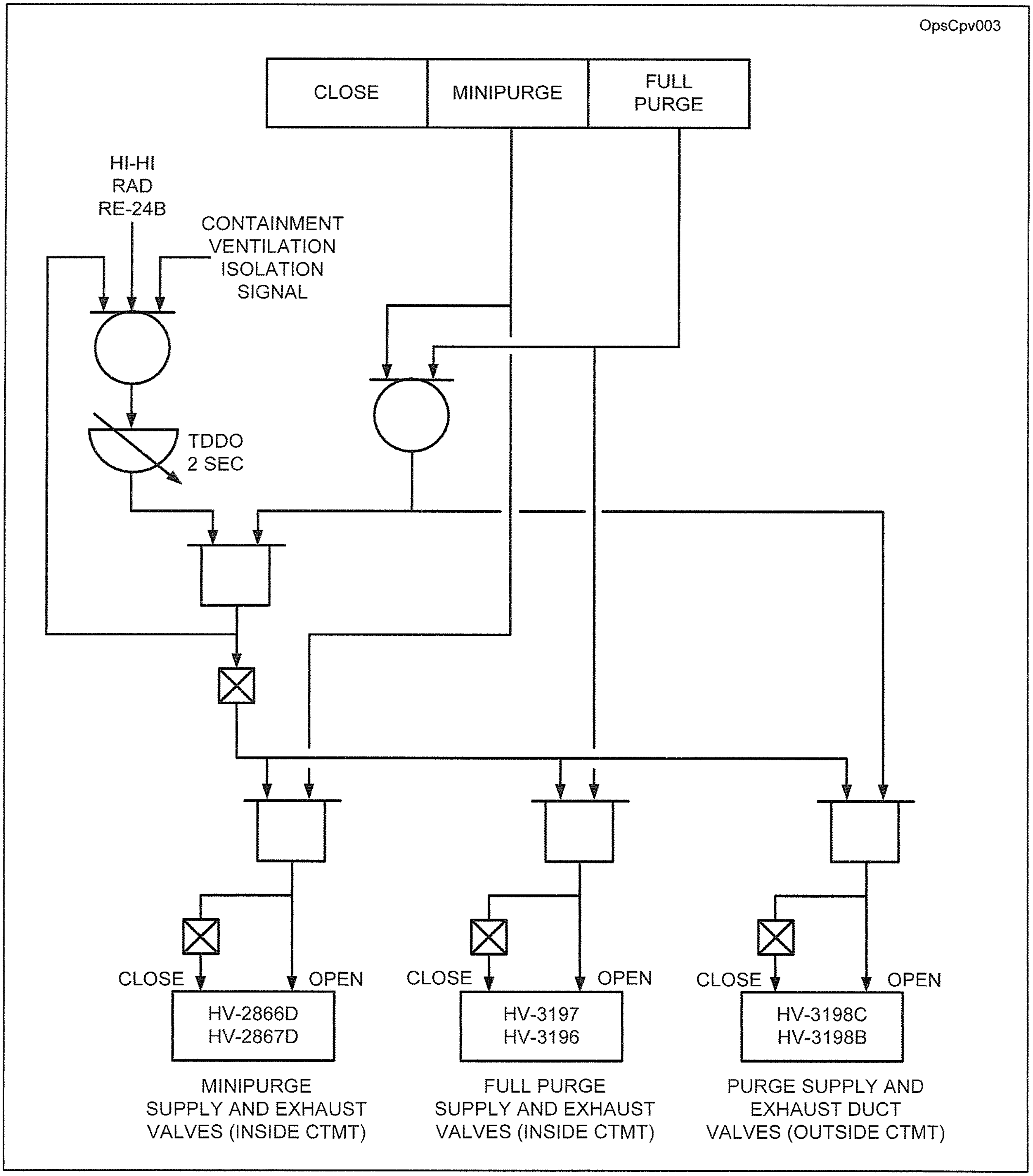

FIGURE 4 - Containment Purge System Valves (HV-2866D, 2867D, 3196, 3197, 3198B, 3198C)

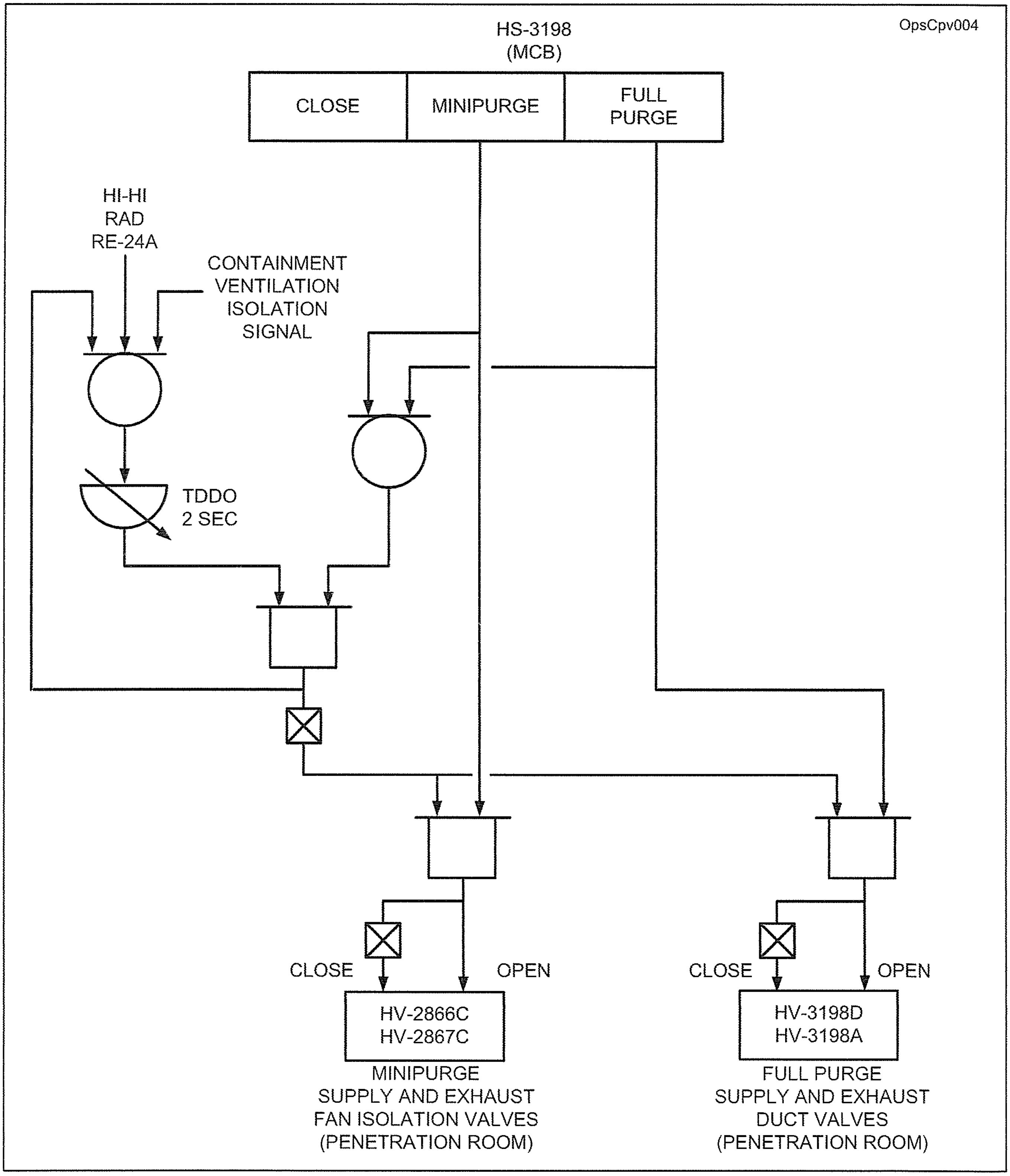

FIGURE 5 - Containment Purge System Valves (HV-2866C, HV-2867C, HV-3198A and D)

4.0 Precautions and Limitations

4.1 The testing of main purge supply and exhaust can only be performed in Modes 5, 6 & Defueled. Do not use this procedure in Modes 1, 2, 3 & 4.

4.2 Sections 5.1, 5.2, and 5.3 may be performed in any order.

4.3 Only the steps for the applicable sections being tested need to be signed off. The other steps can be marked N/A with Shift Supervisor's review and approval, as designated by his initial next to the steps that are marked N/A.

5.0 Instructions

5.1 Radiation monitor R24A functional test.

The circled portion shows which dampers isolate when testing R24A.

NOTE:	**Steps 5.1.1 and 5.2.1 may be performed concurrently.**

_____ 5.1.1 Obtain the current high voltage setpoint and check source settings from the High Voltage, Check Source and Calibration Date Log, and record these values.

H.V. setpoint___________________

C.S. setting___________________

_____ 5.1.2 INDEPENDENTLY verify the data recorded in step 5.1.1.

_____ 5.1.3 Place the FUNCTION switch to the HV position, and record reading.

High voltage___________________

NOTE	**WHEN the function switch is placed in the "CAL" position, THEN the meter is disconnected from the detector signal and an electronically generated 60,000 (6 E4) counts per minute signal is injected. The Control Room drawer meter indication should indicate approximately 6 E4 (marked with heavy line on meter scale). Submit a CR if the meter does not indicate approximately 6 E4.**

5.1.4 Place the function switch to the CAL position.

_____ 5.1.4.1 Record the indication on the log rate meter front panel meter.

Reading ______________CPM

_____ 5.1.5 Depress the ALERT indicator button and record the high trip setpoint.

Setpoint_______________________

_____ 5.1.6 Depress the HIGH indicator button and record the high-high trip setpoint.

Setpoint_______________________

NOTE: In the following step, allow the signal sufficient time to decay to prevent unnecessary actuation of Containment Purge Dampers.

_____ 5.1.7 Return the FUNCTION switch to the OPER position.

_____ 5.1.8 Verify damper handswitch HS-3198 in the FULL position.

5.1.9 Check the following containment purge dampers are open:

_____ • HV-3198A

_____ • HV-3198D

_____ 5.1.10 Notify HP prior to securing CTMT purge. (AI 2009200897)

NOTE: Depressing the check source button may not initiate a high-high alarm and cause damper isolation. It may be necessary to manually trip the alarm.

_____ 5.1.11 Depress and hold the check source button to initiate CTMT Purge Damper isolation. Record the maximum rate indicated on the log rate meter front panel meter and release the check source button.

Record ____________ CPM

_____ 5.1.12 IF check source level is NOT sufficient to trip the High-High Level alarm AND cause CTMT Purge Damper isolation, THEN pull the log rate meter drawer out of the cabinet and cycle switch S-1 to actuate high-high level alarm and CTMT Purge Damper isolation.

* 5.1.13 Check the following containment purge dampers closed:

_____ • HV-3198A

_____ • HV-3198D

ACCEPTANCE CRITERIA: Dampers HV-3198A and HV-3198D closed.

5.1.14 Check the following:

_____ 5.1.14.1 The ALERT and HIGH trip alarms on the log rate meter module remain on.

_____ 5.1.14.2 Annunciator FH4 is ON.

NOTE:	**<u>IF</u> switch S-1 is used to actuate closure, <u>THEN</u> computer alarms will not function.**

_____ 5.1.14.3 Computer alarms RE0024A HI caution and HI alert are in.

_____ 5.1.15 Place damper handswitch HS-3198 in the CLOSE position.

_____ 5.1.16 Reset the ALERT and HIGH trip alarms by depressing the reset button.

_____ 5.1.17 Verify Annunciator FH4 is cleared.

_____ 5.1.18 Place damper handswitch HS-3198 to MINI.

5.1.19 Check the following containment mini-purge dampers are open:

_____ • HV-2867C

_____ • HV-2866C

NOTE:	**Depressing the check source button may not initiate a high-high alarm and cause damper isolation. It may be necessary to manually trip the alarm.**

_____ 5.1.20 Depress and hold the check source button to initiate CTMT Mini-Purge Damper isolation. Record the maximum rate indicated on the log rate meter front panel meter and release the check source button.

Record ____________ CPM

_____ 5.1.21 <u>IF</u> check source level is <u>NOT</u> sufficient to trip the High-High Level alarm <u>AND</u> cause CTMT Mini-Purge Damper isolation, <u>THEN</u> pull the log rate meter drawer out of the cabinet and cycle switch S-1 to actuate high-high level alarm and CTMT Mini-Purge Damper isolation.

* 5.1.22 Check the following mini-purge dampers closed:

_____ • HV-2867C

_____ • HV-2866C

ACCEPTANCE CRITERIA:	**Dampers HV-2867C & HV-2866C closed.**

_____ 5.1.23 Place damper handswitch HS-3198 in the CLOSE position.

_____ 5.1.24 Reset the ALERT and HIGH TRIP alarms by depressing the reset button.

_____ 5.1.25 Verify annunciator FH4 is cleared.

52. 073A4.02 052/BANK/RO/M 3.7/3.7/073A4.02/N///D

The following conditions exist on Unit 1:

- R-19, SGBD SAMPLE, radiation monitor is in alarm and indication is stable above the alarm setpoint.
- The Shift Radio Chemist requests to sample the Steam Generators.

Which one of the following describes the actions that will allow the Shift Radio Chemist to obtain a sample of the Steam Generators per SOP-45.0, Radiation Monitoring System?

A. Manually open the sample valves one at a time.

B. Pull the DC power fuses to each sample valve solenoid to fail the valve open.

C. Pull the INSTRUMENT power fuses for R-19 to allow opening the sample valves.

D✓ Place R-19 Operation Selector Switch to the RESET position, then open the sample valves.

The solenoids on the valve are on the air inlet since these valves are AOVs controlled from the Sample control panel or the BOP.

Steam Generator Blowdown sample valves go closed on a high radiation signal from Rad Monitor R-19. Sampling is required to determine which Steam Generator has high radiation. The operator must take action to bypass the high rad signal to allow these valves to be opened for sampling. These valves are solenoid actuated, and will fail closed on a loss of power. R-19 Operation Selector switch must be placed in RESET to allow these valves to be opened under these conditions.

A. Incorrect - These valves can not be manually opened. The SGBD sample valves do not have a manual handwheel. Plausible because most automatic valves do have a manual handwheel for operation.

B. Incorrect - Pulling the DC power fuses will cause these valves to fail closed. Plausible if candidate thinks these valves fail open on loss of power.

C. Incorrect - Plausible because this is the procedure directed action for a rad monitor in saturation, but not the correct action to allow sampling when a high rad signal is present. This will actually place the valve in a fail closed position.

D. Correct - this is the correct action per SOP-45.0 section 4.4.

Q1P15HV3328 1A Steam Generator Blowdown sample valve
Q1P15HV3329 1B Steam Generator Blowdown sample valve
Q1P15HV3330 1C Steam Generator Blowdown sample valve

073A4.02

073 Process Radiation Monitoring (PRM) System

Ability to manually operate and/or monitor in the control room:
(CFR: 41.7 / 45.5 to 45.8)
A4.02 Radiation monitoring system control panel 3.7 3.7

Importance Rating:	3.7 / 3.7
Technical Reference:	FNP-1-SOP-45.0 V41
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the Radiation Monitoring System components and equipment, to include the following (OPS-40305A07): Normal control methods Abnormal and Emergency Control Methods Automatic actuation Protective isolations Protective interlocks Actions needed to mitigate the consequence of the abnormality
Question origin:	FNP BANK RMS-52106D03 07, 2007 FNP NRC EXAM
Basis for meeting K/A:	K/A is met by having candidate demonstrate the ability to manually operate components in the Control Room to initiate sampling of the Steam Generators when the Steam Generator Sample Radiation monitor is in high alarm. Sampling of the Steam Generators is required when a high alarm is received, to validate the alarm. Actions are required to manipulate components on the Rad Monitor Panel to allow sampling.
SRO justification:	N/A

4.4 Obtaining a Steam Generator Sample with R-19 in Alarm or Inoperable:

4.4.1 **Notify** Health Physics and Chemistry that R-19 will be inoperable during the time required to obtain a sample. ☐

4.4.2 IF in alarm, THEN **place** the switch for R-19 to the Reset position. ☐

4.4.3 **Open** the Steam Generator Blowdown sample valves listed below as necessary to obtain a Steam Generator sample:

Q1P15HV3328	1A Steam Generator Blowdown sample valve	☐
Q1P15HV3329	1B Steam Generator Blowdown sample valve	☐
Q1P15HV3330	1C Steam Generator Blowdown sample valve	☐

4.4.4 WHEN sampling of the Steam Generators is completed, THEN **verify** the switch for R-19 to the OPERATE position. ☐

4.4.5 **Verify** that R-19 is aligned per Section 4.1. ☐

4.4.6 **Notify** Health Physics and Chemistry that R-19 has been returned to service. ☐

53. 075K3.07 053/NEW/RO/C/A 3.4/3.5/075K3.07/N///D

Unit 2 is at 31% power with the following conditions:

- A lightning strike causes the 2A **AND** 2B Circulating Water pumps to trip.
- Main Condenser pressure is 6.0 psia and degrading rapidly.
- All Steam Generator narrow range levels are 50% and slowly falling.

Which one of the following completes the statement below?

An automatic Reactor trip _(1)_ occurred, _(2)_ .

	(1)	(2)
A.	HAS	Steam Dumps have opened
B.	HAS	MDAFW pumps have started
C.	has NOT	Steam Dumps have opened
D.✓	has NOT	MDAFW pumps have started

For these conditions, steam is being dumped to the Mmain Condenser by the Main Turbine and the Steam Generator Feed Pumps (SGFP's). Condenser pressure is at the Turbine automatic trip setpoint of 4.41 psia. **Since power is <35%, the Turbine trip does NOT cause a Reactor trip.**

As Condenser pressure continues to rise, the **SGFP's will trip at 5.9 psia.** The trip of both SGFP's will cause an **autostart of both Motor driven AFW pumps**.

Although one part of the C-9 interlock is satisfied via the pressure (<10.8 psia) , the second component of the C-9 interlock is NOT satisfied; **at least 1 Circ Water pump must be running. Therefore Steam Dumps are blocked by the loss of C-9.**

A **Manual Rx trip would be required** if the SGFPs trip with RX power remaining **> 5%** per AOP-13, and may **automatically trip if SG Water levels fall below 28%**, but this would **NOT be an IMMEDIATE** condition.

A. Incorrect - 1) incorrect, Turbine will trip, but Reactor will not trip IMMEDIATELY. Plausible because the Reactor would trip if >P-9.
2) incorrect, Steam Dumps would normally open, **but C-9 is lost** so the Steam Dump signal is blocked.

Plausible: True **if > P-9 and any Circ** water pump running; since the STM dumps would be required to respond to the high temperature condition of the RCS ***before condenser pressure*** were to fall to < 5.9 psia (SGFP trip setpoint) and **water level shrinks to < 28% in any SG OR < P-9**

B. Incorrect - 1) incorrect, see A.1
2) correct, SGFPs will trip at 5.9 psia resulting in both MDAFW pumps Auto starting.

Plausible: True **if > P-9 or water level immediately shrank to < 28% in any SG.**

C. Incorrect - 1) correct, Turbine does trip, but since < P-9 the Rx does not.
2) incorrect, see A.2.

Plausible: **True if any Circ** water pump were running and Condenser pressure were to remain < 10.8 psia, which would permit the dumps to ARM and the elevated TAVE would actuate the dumps. This would occur on a slow loss of Vacuum even before the SGFPs tripped at 5.9 psia.

D. Correct - 1) correct, see C.1.
2) correct, see B.2.

075K3.07

075 Circulating Water System

Knowledge of the effect that a loss or malfunctions of the circulating water system will have on the following:
(CFR: 41.7 / 45.6)
K3.07 ESFAS 3.4* 3.5*

Importance Rating: 3.4 / 3.5

Technical Reference: Tech Specs v178 - TS 3.3.2, function 6.e
FNP-0-SOP-0.3, v44
FNP-2-ARP-1.10, v58

References provided: None

Learning Objective: LIST AND DESCRIBE the sequence of major actions associated with AOP-8.0, Partial Loss of Condenser Vacuum. (OPS-52520H04).

Question origin: NEW

Basis for meeting K/A: K/A is met by testing candidate's integrated knowledge of how a malfunction in the Circulating Water system will ultimately affect the overall plant and cause actuation of ESF equipment.

SRO justification: N/A

Table 3.3.2-1 (page 4 of 4)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	TRIP SETPOINT
5. Turbine Trip and Feedwater Isolation						
a. Automatic Actuation Logic and Actuation Relays	1,2	2 trains	H	SR 3.3.2.2 SR 3.3.2.3 SR 3.3.2.8	NA	NA
b. SG Water Level - High High (P-14)	1,2	3 per SG	I	SR 3.3.2.1 SR 3.3.2.4 SR 3.3.2.7 SR 3.3.2.9	≤ 82.4%	≤ 82%
c. Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.					
6. Auxiliary Feedwater						
a. Automatic Actuation Logic and Actuation Relays	1,2,3	2 trains	G	SR 3.3.2.2 SR 3.3.2.3 SR 3.3.2.8	NA	NA
b. SG Water Level - Low Low	1,2,3	3 per SG	D	SR 3.3.2.1 SR 3.3.2.4 SR 3.3.2.7 SR 3.3.2.9(g)	≥ 27.6%	≥ 28%
c. Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.					
d. Undervoltage Reactor Coolant Pump	1,2	3	I	SR 3.3.2.5 SR 3.3.2.7 SR 3.3.2.9	≥ 2640 volts	≥ 2680 volts
e. Trip of all Main Feedwater Pumps	1	2 per pump	J	SR 3.3.2.10	NA	NA
7. ESFAS Interlocks						
a. Automatic Actuation Logic and Actuation Relays	1,2,3	2 trains	L	SR 3.3.2.2 SR 3.3.2.3 SR 3.3.2.8	NA	NA
b. Reactor Trip, P-4	1,2,3	1 per train, 2 trains	C	SR 3.3.2.6	NA	NA
c. Pressurizer Pressure, P-11	1,2,3	3	K	SR 3.3.2.4 SR 3.3.2.7	≤ 2003 psig	≤ 2000 psig
d. T_{avg} - Low Low, P-12 (Decreasing) (Increasing)	1,2,3	1 per loop	K	SR 3.3.2.4 SR 3.3.2.7	≥ 542.6°F ≤ 545.4°F	≥ 543°F ≤ 545°F

(g) Applicable to MDAFW pumps only.

LOCATION KC3

SETPOINT: N/A

ORIGIN: HP and LP stop valve limit switch contacts.

C3
1A OR 1B SGFP TRIPPED

NOTE: This annunciator has REFLASH capability.

PROBABLE CAUSE

NOTE The alarm comes in when both the LP and HP stop valves on either SGFP are closed and clears after these valves have remained closed for approximately three (3) minutes.

1. 1A or 1B SGFP has tripped.
2. Timing relay (device 2 on D-172886 sh.1) failure when a SGFP is shutdown allowing signal from stop valve limit switches to feed alarm relay.

AUTOMATIC ACTION

1. The steam generator water level control system will attempt to maintain steam generator level at program value.
2. Both MDAFWP's start if both SGFP's tripped.

OPERATOR ACTION

1. Perform the actions of FNP-1-AOP-13, LOSS OF MAIN FEEDWATER.
2. Perform the applicable actions of FNP-1-SOP-21.0 CONDENSATE AND FEEDWATER SYSTEM for a Feedwater System Shutdown.
2. Notify appropriate personnel to determine the cause for the SGFP trip and correct problem.

References: PCN B89-1-6096; A-177100, Sh. 458; D-172886, Sh. 1; D-172898, Sh. 1; U-260647; D-181991, Sh. 4; D-181992, Sh. 3; D-181774, Sh. 4; D-172889, Sh. 2, D-172890, Sh. 2; B-175810, Sh. 165

CONTROL INTERLOCKS

	Interlock	Source	Setpoint	Coincidence & Light Status	Function
6.	C-7 Sudden Loss of Load	Turb. Impulse Press Instr. 447 rate ckt.	15% Turb. Power Reduction 120 sec Time Const.	1/1 > setpoint lit > setpoint	Arms steam dump valves. Manually reset by placing the control mode selector switch to reset momentarily.
7.	C-9 Condenser Available	Cond. Press. Switch and Circ Water Pump Bkrs.	8" Hg Vac. and Closed	2/2 > setpoint and 1/2 > setpoint lit > setpoint	Allows steam dump valves to be armed. At least 1of 2 Circ Water Pump breakers are required to be closed to enable C-9 and operate Steam Dumps.
8.	C-11 Bank D Stop	P/A Converter Bank D Position	220 Steps	1/1 = setpoint lit after being at setpoint for 3 min.	Stops outward rod motion in auto.
9.	C-20 AMSAC Enabled	Turb. Impulse Pressure Inst. 2446 and 2447	> 40%	2/2 > setpoint; also sealed in for 260 seconds after Pimp lowers to < 40%; lit < setpoint	Allows AMSAC to be armed.

54. 076A4.02 054/NEW/RO/MEM 2.6/2.6/076A4.02/N//D

Which one of the following Service Water MOV's receive a signal to automatically re-position due to a Safety Injection signal?

A. MOV-550, SW TO CW CANAL ISO, will close.

B. MOV-3084A, SW TO AUX BLDG A HDR ISO, will open.

C. MOV-3130C, SW TO 1C CCW HX, will open.

D✓ MOV-3149, SW TO BLDN HX & BTRS CHLRS, will close.

A. Incorrect - Plausible because the Circulating Water system is a non safety related system. Candidate may think this MOV would isolate to ensure sufficient Service Water flow to safety related components.

B. Incorrect - Plausible because candidate may think this MOV will open to supply safety related loads in the Aux Building.

C. Incorrect - Plausible because candidate may think this MOV would open to supply SW to the CCW Hx. The CCW system is a safety related system and it does autostart on an SI.

D. Correct - this MOV isolates SW to non safety related loads.

076A4.02

076 Service Water System (SWS)

Ability to manually operate and/or monitor in the control room:

(CFR: 41.7 / 45.5 to 45.8)

A4.02 SWS valves 2.6 2.6

Importance Rating:	2.6 / 2.6
Technical Reference:	FNP-1-EEP-0 v41
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the Service Water System components and equipment, to include the following (OPS-40101B07): Normal control methods Abnormal and Emergency Control Methods Automatic actuation including setpoint (example SI, Phase A, LOSP) Protective isolations such as high flow, low pressure, low level including setpoint Protective interlocks Actions needed to mitigate the consequence of the abnormality
Question origin:	NEW
Basis for meeting K/A:	K/A is met by testing candidate's ability to monitor automatic operation of Service Water MOV's during a Safety Injection. The MOV's are operated from the Control Room.
SRO justification:	N/A

Step	Action/Expected Response	Response NOT Obtained

ATTACHMENT 9

	1	2	3	4	5	6	7	8	9	10
1	SAFETY INJECTION	CHG PMP TRN A ON	RHR PMP 1A ON	SW PMP 1A ON	SW PMP 1B ON	CCW PMP TRN A ON	CTMT CLR TRN A SLOW ON		AFW PMP 1A ON	CHG RM CLR TRN A ON
2	LCV-115C CLOSED	LCV-115B OPEN			3131 CLOSED	HV-2229 CLOSED	3019A OPEN	3019B OPEN		RHR RM CLR 1A ON
3	8808A OPEN	8803A OPEN	8107 CLOSED	3149 CLOSED	3150 CLOSED	3096A CLOSED	3024A OPEN	3024B OPEN		CCW RM CLR 1A ON
4	8808C OPEN					3096B	3441C OPEN	3441D OPEN		AFW RM CLR 1A ON
	LAMP TEST TRAIN A									

Monitor light Box-1 shows that MOV3149 goes closed on an SI signal

	11	12	13	14	15	16	17	18	19	20
1	SAFETY INJECTION	CHG PMP TRN B ON	RHR PMP 1B ON	SW PMP 1D ON	SW PMP 1E ON	CCW PMP TRN B ON	CTMT CLR TRN B SLOW ON		AFW PMP 1B ON	CHG RM CLR TRN B ON
2	LCV-115E CLOSED	LCV-115D OPEN			3134 CLOSED		3019C OPEN	3019D OPEN	3328 CLOSED	RHR RM CLR 1B ON
3	8808B OPEN	8803B OPEN	8108 CLOSED		3135 CLOSED		3024C OPEN	3024D OPEN	3329 CLOSED	CCW RM CLR 1B ON
4							3441A OPEN	3441B OPEN	3330 CLOSED	AFW RM CLR 1B ON
										LAMP TEST TRAIN B

2 Notify control room of safety injection alignment status.

-END-

55. 076AK2.01 055/MOD/RO/M 2.6/3.0/076AK2.01/N///D

Unit 1 has high reactor coolant activity due to failed fuel.

Which one of the following completes the statements below for the Gross Failed Fuel Detector (GFFD)?

The GFFD provides indication of failed fuel by detection of __(1)__ .

The GFFD __(2)__ on a high radiation signal.

	(1)	(2)
A.	N-16 gamma radiation	automatically isolates the RCS sample system
B.	N-16 gamma radiation	provides **NO** automatic isolation
C.	delayed neutrons	automatically isolates the RCS sample system
D✓	delayed neutrons	provides **NO** automatic isolation

OPS Lesson Plan OPS-52106E

Theory of Operation

Delayed neutron activity is measured in a flowing reactor coolant sample. The sample flow rate is delayed from the time it leaves the center of the core until the time it enters the neutron detector to ensure dose rates remain < 15 mR/hr. Neutron activity above a predetermined background level indicates the existence of radioactive fission products that emit delayed neutrons.

A. Incorrect - First part is incorrect, but plausible. N-16 detectors are used on the Main Steam lines to give indication of SG tube leakage. Second part is incorrect per ARP-1.6, but plausible as well. Many radiation monitors provide isolation of a system on a high rad signal.

B. Incorrect - First part is incorrect - see A. Second part is correct per ARP-1.6.

C. Incorrect - First part is correct - see above. Second part is incorrect - see A.

D. Correct - See above.

076AK2.01

APE 076: High Reactor Coolant Activity

Knowledge of the interrelations between the High Reactor Coolant Activity and the following:
(CFR 41.7 / 45.7)
AK2.01 Process radiation monitors 2.6 3.0

Importance Rating:	2.6 / 3.0
Technical Reference:	FNP-1-ARP-1.6 v66 and FNP-2-ARP-1.6 v55
References provided:	None
Learning Objective:	RELATE AND IDENTIFY the operational characteristics including design features, capacities and protective interlocks for the components associated with the Gross Failed Fuel Detector, to include the components found on Figure 2, GFFD Failed Fuel Detector System, and Figure 3, Sampling Assembly Flow Diagram (OPS-52106E02).
Question origin:	FNP MOD GFFD-52106E02 03
Basis for meeting K/A:	K/A is met by questioning the candidate on the operation of the Gross Failed Fuel Detector, and automatic isolation actions on a fuel failure/high rad signal associated with the GFFD.
SRO justification:	N/A

GROSS FAILED FUEL DETECTOR

INTRODUCTION

The Farley Nuclear Plant uses a three-barrier concept to prevent releasing radioactive material to the environment. These barriers (in order) are the following: (1) the cladding around the fuel pellets, (2) the reactor coolant system, and (3) the containment building. Early detection of a breach of a barrier lessens the possibility of releasing radioactive material to the environment. The purpose of the gross failed fuel detector (GFFD) is to detect a breakdown of the first barrier, the fuel cladding.

GENERAL DESCRIPTION (Figure 1)

The fission process results in the formation of fission products, some of which decay radioactively by emitting a neutron. The neutrons emitted during radioactive decay are referred to as delayed neutrons because they appear some time after the fission event.

During reactor operation, a portion of the reactor coolant flows through the GFFD. If the fuel cladding develops a leak, some of the fission products are released into the reactor coolant system (RCS). The GFFD counts the number of delayed neutrons emitted by radioactive fission products in the reactor coolant, and the count rate displays continuously in the control room.

If an increase in the neutron count rate is detected, an alarm will sound on the main control board (MCB), warning the operator of a possible fuel cladding failure. When an alarm annunciates, a reactor coolant sample should be drawn to verify the GFFD reading.

The GFFD indicating panel is located in the control room, and the GFFD sampling assembly is located in the sampling room on Unit 2 and in the 121' piping penetration room on Unit 1.

DETAILED DESCRIPTION

System Description (Figure 2)

RCS Hot Leg Inlet Three-way Valve

The GFFD connects to the hot leg sample lines (loops B and C) via a three-way solenoid operated valve (3102). The valve is controlled from the sample control panel in the sampling room. With a loss of power, the three-way solenoid operated valve fails with sample flow streams from loop B directed to the GFFD.

Containment Isolation Valves

The hot leg sample lines join a common line via SV-3102 before penetrating containment. Containment isolation valves (3765 and 3333) automatically isolate the containment on a phase-A containment isolation signal (T-Signal). Isolation valve (3765) inside containment automatically closes on a penetration room high differential pressure (3-inch water gauge). Both containment isolation valves can be controlled from either the sample control panel or the balance of plant (BOP) panel. These solenoid operated valves fail closed on a loss of power.

When the reactor is shut down, the GFFD is lined up to take a sample from the RHR loops via air-operated isolation valves (3105 and 3106). These valves are controlled from the sample control panel.

GFFD Sampling Assembly (Figures 3 and 4)

The neutron detector is mounted on the sampling assembly, along with various related instruments and components. After the reactor coolant sample is delayed and cooled, the neutron detector monitors the sample for neutron and gamma radiation. The sample assembly is supplied power from 120 VAC Control Panel N. The Gross Failed Fuel Detector is also known as Radiation Monitor R-50 on the plant computer.

The major component parts of the sampling assembly are described below.

Sample Cooler

The sample cooler lowers the reactor coolant sample from approximately 600°F to not more than 135°F. Component cooling water (CCW) cools the sample cooler.

Temperature Indicator

The reactor coolant sample temperature, sensed by a thermocouple attached near the sample cooler outlet, is displayed on the front of the sampling assembly. High sample temperature is indicated by an alarm light on the indicating panel. The light is illuminated when the sample temperature increases to 135°F.

Neutron Detector and Preamplifier

The neutron detector circulates reactor coolant through coils that wrap around a BF_3 proportional counter. The BF_3 proportional counter, similar in operation to a source range detector, detects both neutrons and gammas. The preamplifier portion of the GFFD amplifies the pulses produced by a neutron or a gamma ray. The pulses are sent to the electronic console assembly in the control room for further electronic processing.

Flow Indicator

The flow indicator monitors the reactor coolant flow rate (approximately 0.5 gpm) in the GFFD. The flow rate is displayed both locally and on the electronic console assembly in the control room.

Nitrogen-16 and Nitrogen-17 Removal

The reactor coolant sample is delayed for 60 seconds, from the time it leaves the center of the core until the time it reaches the neutron detector. The time delay ensures that the major portion of nitrogen-17 (a neutron emitter normally present in the RCS) and nitrogen-16 has decayed prior to the sample's entering the neutron detector to ensure dose rates remain < 15 mR/hr.

The time delay is dependent on the reactor coolant flow rate. The flow controller, a high-pressure regulating valve, accurately sets the reactor coolant flow rate. The designed

LOCATION FG5

G5
GFFD SYS TRBL

SETPOINT:
1. High: 1×10^4 CPM above background
2. Low: 1×10^1 CPM
3. High sample temperature: 135°F

ORIGIN:
1. High Neutron Relay (K101)
2. Low Neutron Relay (K102)
3. Malfunction Alarm Relay (K-2)

PROBABLE CAUSE

NOTE: Low Alarm (1×10^1 CPM) and High Sample Temperature are used for indicating a system malfunction.

1. High RCS Activity due to Fuel Failure.
2. Loss of 118VAC Control Power.
3. Gross Failed Fuel Detector (GFFD) System circuit malfunction.
4. Low flow thru Gross Failed Fuel Detector system.
5. Chemistry Sampling Activities
6. Low Component Cooling Water flow through GFFD Sample Cooler

AUTOMATIC ACTION

NONE

OPERATOR ACTION

NOTE: A high sample temperature condition will illuminate the red local high sample temperature indicator light on the control room GFFD panel.

1. Check actual reading to determine if alarm is due to high activity, instrument malfunction, low flow, or high sample temperature.
2. IF high activity is indicated, THEN perform the actions required by FNP-1-AOP-32.0, REACTOR COOLANT HIGH ACTIVITY.
3. IF a high sample temperature condition exists, THEN dispatch personnel to locally check the GFFD to determine and correct the cause of the problem.
   3.1 WHEN the high condition has cleared, THEN manually reset the alarm by depressing the reset button on the lower left of the digital temperature indicator. (GFFD 121' PPR)
4. IF an instrument malfunction is indicated, THEN:
   A. Sample and analyze the Reactor Coolant to verify that High Activity does not exist.
   B. Notify appropriate personnel to determine and correct the cause of the malfunction as soon as possible.
5. Refer to the Technical Specifications section on Reactor Coolant System Specific Activity, section 3.4.16.
6. WHEN activity levels have decreased below the alarm setpoint, THEN reset the HI alarm on the drawer by rotating OPERATION SELECTOR switch to RESET and back to OPERATE.

References: A-177100, Sh. 305; U-215440; U-215441

1. GFFD-52106E02 003 076AK2.01

Which ONE of the following describes the function of the Gross Failed Fuel Detector (GFFD) system?

A. • Has no automatic interlocks;
   • provides indication of failed fuel only after shutdown due to N-16 and N-17 at power masking.

B. • Automatically closes RCS LOOPS 2 & 3 HOT LEG SAMPLE Isolation Valve (SV3102) on High Radiation;
   • provides indication of failed fuel only after shutdown due to N-16 and N-17 at power masking.

C. • Automatically closes RCS LOOPS 2 & 3 HOT LEG SAMPLE Isolation Valve (SV3102) on High Radiation;
   • provides indication of failed fuel at power.

D✓ • Has no automatic interlocks;
   • provides indication of failed fuel at power.

A. Incorrect, Sample time is delayed to allow decay of N-16 and N-17 activity to prevent masking.

B. Incorrect, SV3102 does not auto close on high radiation. This is now a two position valve that aligns to either loop 2 or 3, and does not isolate.

C. Incorrect, See B above.

D. Correct, GFFD provides only indication and alarm to give indication of cladding failure at power.

(modified by a design change implemented in 1999)

56. 076K2.08 056/BANK/RO/MEM 3.1/3.3/076K2.08/N///A

Which one of the following completes the statement below?

MOV-515, SW TO TURB BLDG ISO, on Unit 1 is powered from 600V __(1)__, which is supplied from a(n) __(2)__ Diesel Generator during an LOSP.

	(1)	(2)
A.✓	MCC 1N	A Train
B.	MCC 1T	A Train
C.	MCC 1N	B Train
D.	MCC 1T	B Train

MOV-515 is an isolation for SW to the Turbine Building on the A Train supply line. It receives an ESF actuation signal to isolate on a Safety Injection and go to a throttled position on a Loss of Site Power. This MOV is powered from Safety Related 600V MCC 1N, which is powered by an A Train Diesel Generator (either 1C or 1-2A DG) during LOSP conditions.

A. Correct - see above.

B. Incorrect - First part is incorrect. MCC 1T is powered from B Train.

Second part is correct.

C. Incorrect - First part is correct,

second part is incorrect.

D. Incorrect - Both parts are incorrect. This answer would be correct if the MOV was powered from B Train.

076K2.08

076 Service Water System (SWS)

Knowledge of bus power supplies to the following:
(CFR: 41.7)
K2.08 ESF-actuated MOVs 3.1* 3.3*

Importance Rating:	3.1 / 3.3
Technical Reference:	FNP-1-SOP-24.0A v21
References provided:	None
Learning Objective:	NAME AND IDENTIFY the Bus power supplies, for those electrical components associated with the Service Water System, to include those items in Table 7- Power Supplies (OPS-40101B04).
Question origin:	FNP BANK SW-40101B04 02 - 2006 FNP NRC Exam
Basis for meeting K/A:	K/A is met by testing candidate's knowledge of the power supply to MOV-515, a Service Water supply isolation to the Turbine Building. This MOV gets an ESF actuation signal to go closed on a Safety Injection, and to a throttled position on an LOSP.
SRO justification:	N/A

Type: SOP, Unit: 1, Procedure: FNP-1-SOP-24.0A, Revision: 21

Step: 1.60 ==> 1N 600V MCC - 1C Diesel Generator Room

Equipment:	Description/Instruction:	Location:	Required Config:	Actual Config:	Verif:	Initials	
Q1R17BKRFNB3	SW TO TURB BLDG ISO A TRN Q1P16V515-A	1N MCC - Q1R17B507-A, 1C DIESEL GENERATOR ROOM	CLOSED		IV		
Notes:							
Q1R17BKRFNB4	SW TO TURB BLDG ISO B TRN Q1P16V517-A	1N MCC - Q1R17B507-A, 1C DIESEL GENERATOR ROOM	CLOSED		IV		
Notes:							
Q1R17BKRFND3	UNIT 1 A TRAIN SW DILUTION BYPASS Q1P16V558-A	1N MCC - Q1R17B507-A, 1C DIESEL GENERATOR ROOM	CLOSED		IV		
Notes:							
Q1R17BKRFNG2	SW A HDR EMERG RECIRC TO POND Q1P16V539-A	1N MCC - Q1R17B507-A, 1C DIESEL GENERATOR ROOM	CLOSED		IV		
Notes:							
Q1R17BKRFND5	U1 SW FROM TURB BLDG TO A TRN SW HDR Q1P16V542-A	1N MCC - Q1R17B507-A, 1C DIESEL GENERATOR ROOM	CLOSED		IV		
Notes:							

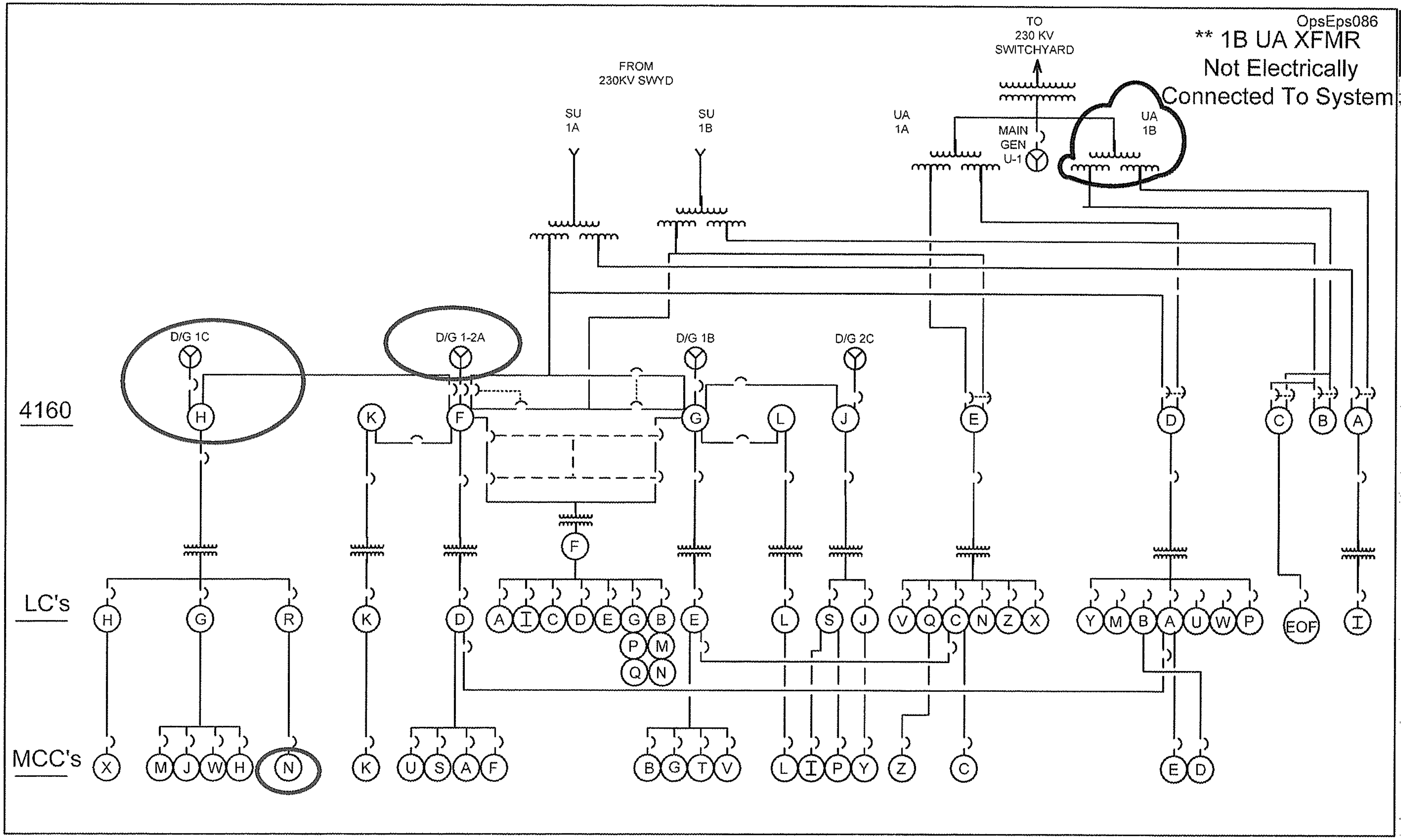

FIGURE 2 - Unit 1 Electrical Distribution Simplified

57. 077AG2.4.45 057/NEW/RO/C/A 4.1/4.3/077AG2.4.45/N///A

The following conditions exist on Unit 2:

At 10:00:
- Reactor power is 25% and stable.
- PCC (Power Control Center) has notified the Control Room that the offsite grid has become degraded.

At 10:05:
- Multiple alarms occur in the Unit 2 Control Room.

Actions will be performed **FIRST** for which one of the following alarms?

A.✓ EF1, 2A RCS LOOP FLOW LO OR 2A RCP BKR OPEN (Red Window)

B. YE2, 2G 4KV BUS OV-OR-UV OR LOSS OF DC (White Window)

C. KG2, EH FLUID LEVEL LO-LO (Red Window)

D. MB1, 2B S/U XFMR UV (White Window)

Initial conditions are that the Control room team has degraded grid conditions. Grid conditions continue to degrade until power is lost to the 2B startup transformer. Candidate must determine which alarm needs to be addressed as the highest priority. For the alarms given, the only one that has actions that must be immediately performed is EF1, due to a trip of the 2A RCP. The ARP guides the candidate to perform Immediate Operator Actions of AOP-4.0. None of the other annunciators have any immediate actions associated with them. In addition, two of the annunciator windows are white, and two are red. Candidate should understand that SOP-0.10 gives guidance that normally red annunciators take higher priority over white annunciators.

A. Correct - This annunciator indicates that a trip of the 2A RCP has occured. Candidate should know that AOP-4.0, Loss of Reactor Coolant Flow, Immediate Operator Actions should be implemented.

B. Incorrect - Plausible because upon a loss of the 2B startup transformer, this annunciator will be in alarm. The DG will start and supply power to the B Train 4160V ESF busses, but a Reactor trip should not occur. No Immediate Operator Actions are required, but candidate may think a Reactor trip would occur, and this annunciator should be the highest priority.

C. Incorrect - Plausible because this annunciator window is red. Candidate should understand that red annunciator window alarms should normally be the highest priority.

This condition could quickly result in a Turbine Throttle Valve closure and would require implementation of AOP-3, Turbine Trip Below P-9 Setpoint. AOP-3.0 has no Immediate Operator Actions. This annunciator requires personnel to be dispatched to the EH reservoir and Trip ONLY IF EH pressure is no longer being maintained or IF the EH fluid pumps trip.

D. Incorrect - Plausible because the candidate may think that this ARP would provide guidance to control or stabilize the offsite power to the onsite distribution system.

077AG2.4.45

APE: 077 Generator Voltage and Electric Grid Disturbances

2.4.45 Ability to prioritize and interpret the significance of each annunciator or alarm.
(CFR: 41.10 / 43.5 / 45.3 / 45.12)
IMPORTANCE RO 4.1 SRO 4.3

Importance Rating:	4.1 / 4.3
Technical Reference:	FNP-0-SOP-0.10 v9, FNP-2-ARP-1.5 v47, FNP-2-ARP-1.12 v41, FNP-0-ARP-2.4 v24
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the Off-Site Power System components and equipment, to include the following (OPS-40102A07): Normal control methods Abnormal and Emergency Control Methods Automatic actuation including setpoint Protective isolations Protective interlocks Actions needed to mitigate the consequence of the abnormality
Question origin:	NEW
Basis for meeting K/A:	K/A is met by placing candidate in a situation with a degraded grid, and then subsequently a further degradation of grid conditions. The grid conditions cause a number of annunciators to come into alarm, and the candidate must determine which alarm receives the highest priority.
SRO justification:	N/A

4.2.3 Unexpected Alarms:

4.2.3.1 For unexpected alarms, the control room ARP should be referenced to verify the correct automatic response and proper operator actions are taken. If the ARP has already been referenced during the current shift, then operator judgment will determine whether the ARP should be referenced again.

4.2.3.2 During normal power operations, unexpected alarms received as a result of a work sequence or procedure should be documented to prevent recurrence. It should be captured in a feedback process (such as OREV, PM feedback, etc) or a condition report should be written by the group responsible for the work activity. During outage periods, unexpected alarms should be captured based on the judgment of the operator (considering items such as the impact on the control room, nature of the alarm, systems in service, etc).

4.2.4 MCB Annunciator Window Colors:

Annunciator windows on the MCB are color coded to help prioritize operator response. RED annunciators generally represent a first out alarm or conditions which could lead to a plant trip or transient. YELLOW annunciators generally represent conditions which must receive prompt attention to prevent equipment damage, radiation release or plant shutdown. WHITE annunciators generally represent conditions which do not require rapid operator response. This color scheme, along with operator training and experience, should be used to help in the prioritization of response to multiple alarms.

LOCATION MB1

SETPOINT: Variable, less than 2450V

ORIGIN: 1A Start-up Transformer Potential Transformer Undervoltage Relay (27A/DA07)

B1
1A S/U XFMR UV

PROBABLE CAUSE

1. Undervoltage condition on 1A Startup Transformer.
2. Voltage Sensing Potential Transformer fuse blown.

AUTOMATIC ACTION

1. Possible 1A RCP Trip on undervoltage.
2. Possible Reactor Trip.

OPERATOR ACTION

1. Verify an undervoltage condition.
2. IF an undervoltage condition exists, THEN perform the actions required by FNP-1-AOP-5.0, LOSS OF A OR B TRAIN ELECTRICAL POWER.
3. IF A REACTOR TRIP OCCURS, THEN REFER TO FNP-1-EEP-0, REACTOR TRIP OR SAFETY INJECTION.
4. Notify appropriate personnel to repair the damage to the Transformer.
5. Return the Transformer to service, per FNP-1-SOP-36.1, STARTUP AUXILIARY, UNIT AUXILIARY AND MAIN TRANSFORMERS PREPARATION FOR OPERATION, when repairs are completed.
6. Refer to Technical Specifications LCO 3.8.1 or LCO 3.8.2 for LCO Requirements.

References: A-177100, Sh. 551; D-177147; D-177002; A-177048, Sh. 325.

LOCATION KG2

G2	EH FLUID LEVEL LO-LO

SETPOINT: 7.625 inches from bottom

ORIGIN: Level Lockout Relay 86/LFT actuated by 71/FL2 contact of 71/LFT from Level Switch N1C23LS517

PROBABLE CAUSE

1. E.H. Fluid Line rupture.
2. Level switch failure.

AUTOMATIC ACTION

NONE

OPERATOR ACTION

1. Place one EH fluid pump control switch in OFF.
2. Dispatch an operator to verify the low level and add EH fluid to the reservoir as required.
3. IF the running EH fluid pump trips OR EH fluid Pressure is no longer being maintained, THEN Perform the following steps as applicable:
   a) IF reactor power is greater than or equal to 35%, THEN trip the reactor and go to FNP-1-EEP-0, REACTOR TRIP OR SAFETY INJECTION.

NOTE: In the following step, loss of main feedwater may have occurred or is imminent. In conjunction with next step, refer to FNP-1-AOP-13.0, LOSS OF MAIN FEEDWATER.

   b) IF reactor power is less than 35%, THEN trip the Turbine and perform the actions required by FNP-1-AOP-3.0, TURBINE TRIP < P-9 SETPOINT.

NOTE: This alarm will not clear until the EH FLUID LEVEL LOW LOCKOUT 86/LFT is reset. The RESET push-button is located on Meter and Relay Panel 9 (N1H11L0509).

4. Determine and correct the cause of the E.H. Fluid Reservoir Low Level.
5. Restore E.H. Fluid Reservoir Level to normal.
6. WHEN E.H. Fluid Reservoir Level is returned to normal operating band, THEN push the EH FLUID LEVEL LOW LOCKOUT RESET 86/LFT pushbutton on Meter and Relay Panel 9 (N1H11L0509) to reset the alarm.

References: A-177100, Sh. 477; D-172722; C-172716; D-170812; U-162213, Tab 5; D-172842

F1
1A RCS LOOP FLOW LO OR 1A RCP BKR OPEN

SETPOINT: 1. Flow: 90% of Normal
2. Breaker open

ORIGIN: 1. Loop 1A Flow:
a) Flow Transmitter (Q1B21FT414)
b) Flow Transmitter (Q1B21FT415)
c) Flow Transmitter (Q1B21FT416)
2. 4KV Breaker DA04 Auxiliary Contact

PROBABLE CAUSE

1. Loss of power to RCP 1A.
2. RCP 1A breaker tripped due to electrical or mechanical fault.

AUTOMATIC ACTION

1. None if below P-8 setpoint (30% Power) and loops 1B and 1C are normal.

NOTE: Reactor trip will not occur when above P-8 setpoint if alarm is due to failure of a single flow transmitter.

2. Reactor Trip will occur if above P-8 setpoint (30% power).

OPERATOR ACTIONS

1. Verify loss of flow from MCB indication (FI-414/FI-415/FI-416 and from TSLB-2).
2. IF required, THEN perform the actions required by FNP-1-AOP-4.0, LOSS OF REACTOR COOLANT FLOW.
3. IF an instrument failure has occurred, THEN go to FNP-1-AOP-100, INSTRUMENT MALFUNCTION
4. IF a reactor trip has NOT occurred, THEN immediately check steam generator levels.
5. If necessary, THEN manually control the Feed Reg Valves and/or the Feed Reg. Bypass valves to re-establish normal level in all steam generators.
6. IF in modes 1 or 2, THEN place the plant in Hot Standby in accordance with FNP-1-UOP-2.1, SHUTDOWN OF UNIT FROM MINIMUM LOAD TO HOT STANDBY, and restart the affected RCP per FNP-1-SOP-1.1, REACTOR COOLANT SYSTEM.
7. In mode 3 check that two RCS loops are in operation when the rod control system is capable of rod withdrawal.
   7.1 Refer to Technical Specifications LCOs 3.4.4, 3.4.5, and 3.4.6.

References: A-177100, Sh. 256; U-211024; U-260610; PLS Document

LOCATION YE2

SETPOINT: From UV Relays 27-1 or 27-2:
Variable below 2450V From digital voltmeter:
QSH11EPBVMR2G
LO 3850 V (10 sec. delay)
HI 4220 V (10 sec. delay)

E2
2G 4KV BUS OV-OR-UV OR LOSS OF DC

ORIGIN:
1. Under Voltage Relays (27-1 and/or 27-2)
2. Aux. Relay (74)
3. Digital Voltmeter Relay Contact (LO-27V)
4. Digital Voltmeter Relay Contact (HI-59V)

PROBABLE CAUSE

1. Under voltage condition or degraded grid on 2G 4KV bus.
2. Loss of DC control power to 2G 4KV bus protection relays.
3. Over voltage condition.
4. Voltmeter selector switch in "Off" position.

AUTOMATIC ACTION

NOTE:
- **IF the alarm is due to a loss of DC, THEN underfrequency protection is lost.**
- **On bus undervoltage of < 2870 V digital indication will be lost because indicators are powered from PTs.**

IF undervoltage on 2G 4KV bus, THEN B2G sequencer load shedding circuit will be energized and 2B Diesel Generator starts.

OPERATOR ACTION

1. IF a reactor trip occurs, THEN refer to FNP-2-EEP-0, REACTOR TRIP OR SAFETY INJECTION.

2. Determine cause of alarm.

3. IF undervoltage was cause, THEN refer to FNP-2-AOP-5, LOSS OF A OR B TRAIN ELECTRICAL POWER.

4. IF Loss of D.C. to Protection Relays was cause, THEN notify appropriate plant personnel to locate and correct the cause.

5. IF degraded grid voltage is indicated, THEN refer to FNP-2-AOP-5.2, DEGRADED GRID.

LOCATION YE2

OPERATOR ACTION cont'd

6. Return electrical and component lineups to normal as soon as possible.

7. IF the alarm is determined to be inoperable, THEN refer to LCO 3.3.5 Condition D.

8. IF the alarm is due to an actual undervoltage condition, THEN refer to LCO 3.3.5 Condition E.

References: D-207163; D-207069; D-177218, Sh. 2; PCN S91-2-7597; REA 95-1022

58. 078G2.1.32 058/MOD/RO/MEM 3.8/4.0/078G2.1.32/N///A

On **Unit 1**, which one of the following describes the reason why one Air Compressor should be aligned with the air compressor panel key switch in **LOCAL** OR in the **MCB** position with the AUTOMATIC OPERATION LED (green light) LIT, while the other air compressors are aligned to the sequencer panel?

A.✓ To prevent a complete loss of Instrument Air pressure due to a failure of the sequencer panel pressure transducer.

B. To prevent a complete loss of Instrument Air pressure due to a loss of power to the sequencer panel.

C. To ensure that an air compressor is available to be started from the ESS or LOSP Sequencer.

D. To ensure that all three air compressors do not run at the same time and possibly overheat due to insufficent Service Water flow.

Normal alignment is to have two air compressors controlled by the sequencer panel and have one air compressor in the MCB (Main Control Board) position. If the sequencer panel pressure transducer fails high, the two compressors controlled by the sequencer panel will not load and supply air pressure. As air pressure drops, the air compressor selected to the MCB will start and load based on its internal pressure switch.

SOP-31.0, Compressed Air System -Precaution and Limitations

3.19 Failure of the sequencer panel pressure transducer could unload all air compressors selected (integrated) and result in complete loss of air pressure. To prevent loss of air from a single failure, at least one air compressor should be aligned with the air compressor panel key switch in LOCAL OR in MCB with the AUTOMATIC OPERATION LED lit (green).

A. Correct - Per SOP-31.0 P&L.

B. Incorrect - Plausible because candidate may think that a loss of power will cause the air compressors to not load. In actuality per P&L 3.12, the air compressor will load and unload on its internal pressure switch.

C. Incorrect - Plausible because an air compressor is sequenced on by the ESS or LOSP sequencer, but this occurs regardless of whether the air compressor is aligned to the sequencer panel.

D. Incorrect - Plausible because we have had problems with air compressors overheating, but this was due to the Service Water cooling control valve not opening, not due to multiple air compressors running.

078G2.1.32

078 Instrument Air System (IAS)

2.1 Conduct of Operations

2.1.32 Ability to explain and apply system limits and precautions.
(CFR: 41.10 / 43.2 / 45.12)
IMPORTANCE RO 3.8 SRO 4.0

Importance Rating:	3.8 / 4.0
Technical Reference:	FNP-1-SOP-31.0 v69
References provided:	None
Learning Objective:	RECALL AND DISCUSS the Precautions and Limitations (P&L), Notes and Cautions (applicable to the "Reactor Operator") found in SOP-31.0, Compressed Air System. (OPS-52108A04).
Question origin:	Modified FNP BANK COMP AIR-40204D07 04 - 2007 FNP NRC Exam
Basis for meeting K/A:	K/A is met by testing candidate's ability to understand and explain the reason for why actions are taken per the Precautions and Limitations of SOP-31.0, Compressed Air System.
SRO justification:	N/A

3.0 Precautions and Limitations

3.1 Open air valves slowly to allow pressure to equalize gradually.

3.2 DO NOT operate the air compressors without cooling water.

3.3 Unload the air compressors prior to stopping.

3.4 In order to prevent excessive condensation, DO NOT circulate cooling water through an air compressor that has been removed from service. (via the supply bypass valve)

3.5 Maintain cooling water outlet temperature less than 122°F ('cool. water element out' on the air compressor panel display screen).

3.6 The air compressors have a maximum permissible number of compressor motor starts of 5 per hour. It is recommended by the manufacturer to observe an interval of 20 minutes between each manual start.

3.7 Stop times (not associated with power loss)

3.7.1 Programmed Stop Time (Compressor): After pressing the stop button (0), the compressor will run unloaded for 3 seconds and then stop. A start command during this period is ignored.

3.7.2 Minimum Stop Time (Motor): After stopping, the module prevents the motor from restarting for 20 seconds. A start command during this time will be memorized and executed after this 20–second time period.

3.8 Any air compressor with the panel key switch in the MCB position will (1) stop if the MCB handswitch is selected to OFF and (2) start and load if the MCB handswitch is taken to the START/RUN position and returned to AUTO position, based on the Internal Mode pressure settings on the air compressor. The AUTOMATIC OPERATION LED on the air compressor panel will be lit (green) when the MCB handswitch has been taken to the START/RUN position and returned to AUTO. The lit LED indicates the air compressor will load and unload based on its Internal Mode pressure settings. IF the MCB handswitch is taken from START/RUN to OFF, THEN the air compressor panel AUTOMATIC OPERATION LED will not be lit AND the LED will remain off if the MCB handswitch is taken from OFF back to AUTO without going to START/RUN AND the air compressor will not load and unload based on its Internal Mode pressure settings.

3.9 Various messages on the air compressors' panel DISPLAY and the sequencer DISPLAY have arrows pointing up and/or down, i.e., ↑ ↓. These arrows are for scrolling through different options. These arrows do not indicate trends for selected parameters.

3.10 **DO NOT** use the EMERGENCY STOP button for the normal shutdown of any air compressor (a normal stop unloads the compressor first, and maintains cooling water flow to the compressor for several seconds after stopping the compressor, EMERGENCY STOP does neither).

3.11 During an LOSP or SI/LOSP the emergency section of Load Center 1A will automatically align to Load Center 1D, and 1C air compressor supply breaker EA-15 will automatically close. If the air compressor was operating prior to the LOSP, the compressor will resume operation after the LOSP if (1) the MCB handswitch is in AUTO (returned from START/RUN and not been taken to OFF) and the 1C panel key switch is in MCB position OR (2) the 1C panel key switch is in the SEQ position and 1C is selected (integrated) to the sequencer OR (3) the 1C panel key switch is in the LOCAL position.

3.12 When an air compressor is being controlled by the sequencer, the Internal Mode load and unload pressure settings from the panel at the air compressor are inactive. The AUTOMATIC OPERATION LED will be lit (green) continuously, and the compressor will be loaded and unloaded only by the sequencer. However, if the sequencer loses power or fails, the air compressor will be controlled by its Internal Mode load and unload pressure settings.

3.13 The purpose of the sequencer is to sequentially start compressors as required to meet system demand. One of three sequences may be selected. The order preference for starting air compressors is shown below.

Sequence #	Order of Air Compressor Start
1-2-3	1A, 1B, 1C
2-3-1	1B, 1C, 1A
3-1-2	1C, 1A, 1B

3.14 The sequencer will only control air compressors which are "selected" ("programmed" or "integrated") on the sequencer, and will skip any compressor that is de-selected (isolated) from the sequential loading sequence. The sequencer will load and unload the air compressors assigned to it as needed based on the header pressure. In addition, any air compressor started (locally or from the MCB) but not selected (integrated) on the sequencer will revert to Internal Mode pressure settings. IF operation by the Internal Mode pressure settings is desired, THEN refer to Section 4.2 Step 4.2.3 of this procedure for guidance on operating an air compressor in the LOCAL position.

3.15 The Automatic Restart After Voltage Failure Function has been activated for all air compressors and the sequencer.

3.15.1 Air compressors: IF the panel key switch is in (1) LOCAL, or (2) MCB and the AUTOMATIC OPERATION LED is lit (green), or (3) SEQ and the key position was not changed during the power failure, THEN the air compressor will automatically restart if the power is restored.

3.15.2 Sequencer: After power is restored, the sequencer returns selected (integrated) air compressors to the condition they were in before the power failure. Programmed delay times and simultaneous start prevention will be taken into account.

3.16 Three FUNCTION KEYS (F1, F2, F3) under the display screen on the air compressor and sequencer panels are used to make various selections when programming the air compressors and sequencer. The actual function of each function key is indicated on the bottom line of the display screen just above the relevant function key. For more detail, reference the following vendor manuals:

- U-418371, Chapter 1, Section 3, for the air compressors
- U-418372, Section 4, for the sequencer

3.17 Details about the air compressor and sequencer PANELS are included in the following vendor manuals:

- U-418371, Chapter 1, Section 2, for the air compressors
- U-418372 Section 3, for the sequencer

3.18 If a "?" or a "!" is flashing above an air compressor's number on the sequencer panel, there has been a communication error between the sequencer and that air compressor. Verify that the air compressor's key is in the SEQ position. If the "?" or the "!" is still flashing, refer to vendor manual U-418372 (start in Section 6.3, Sequence Display).

3.19 Failure of the sequencer panel pressure transducer could unload all air compressors selected (integrated) and result in complete loss of air pressure. To prevent loss of air from a single failure, at least one air compressor should be aligned with the air compressor panel key switch in LOCAL OR in MCB with the AUTOMATIC OPERATION LED lit (green).

1. COMP AIR-40204D07 004 078G2.1.32

Which ONE of the following describes the reason why one Air Compressor should be aligned with the air compressor panel key switch in **LOCAL** OR in the **MCB** position with the AUTOMATIC OPERATION LED (green light) LIT?

A.✓ To prevent a complete loss of Instrument Air pressure due to a single failure of the sequencer panel pressure transducer.

B. To allow one air compressor to be started from the MCB and operate from the selected sequencer for any complete loss of Instrument Air pressure situation.

C. To allow one air compressor to start after an LOSP and load and unload based on its Internal Mode pressure setting.

D. To prevent all three air compressors from running at the same time to prevent a complete loss of Instrument Air pressure in the event that Service Water is lost to the Turbine Building.

A. Correct. see P&L below.
3.19 Failure of the sequencer panel pressure transducer could unload all air compressors selected (integrated) and result in complete loss of air pressure. **To prevent loss of air from a single failure, at least one air compressor should be aligned with the air compressor panel key switch in LOCAL OR in MCB with the AUTOMATIC OPERATION LED lit (green).**

B is incorrect. The air compressor in LOCAL will start from the MCB if OFF is selected first, then AUTO, but will not operate on the sequencer, but will start by its internal mode pressure switch.
3.8 Any air compressor with the panel key switch in the MCB position will (1) stop if the MCB handswitch is selected to OFF and (2) start and load if the MCB handswitch is taken to the START/RUN position and returned to AUTO position, based on the **Internal Mode pressure settings on the air compressor**. The AUTOMATIC OPERATION LED on the air compressor panel will be lit (green) when the MCB handswitch has been taken to the START/RUN position and returned to AUTO. The lit LED indicates the air compressor will load and unload based on its Internal Mode pressure settings. IF the MCB handswitch is taken from START/RUN to OFF, THEN the air compressor panel AUTOMATIC OPERATION LED will not be lit AND the LED will remain off if the MCB handswitch is taken from OFF back to AUTO without going to START/RUN AND the air compressor will not load and unload based on its Internal Mode pressure settings.

C is incorrect. There is a P&L applicable to 1C air compressor and the compressor will cycle on the sequencer after the load shed and LOSP is complete. This is not necessarily true for any air compressor operation after an LOSP. The Air compressor will also sequence back on and run on the sequencer, not the Internal Mode pressure setting.
3.11 During an LOSP or SI/LOSP the emergency section of Load Center 1A will automatically align to Load Center 1D, and 1C air compressor supply breaker EA-15 will automatically close. If the air compressor was operating prior to the LOSP, the compressor will resume operation after the LOSP if (1) the MCB handswitch is in AUTO (returned from START/RUN and not been taken to OFF) and the 1C panel key switch is in MCB position OR (2) the 1C panel key switch is in the SEQ position and 1C is selected (integrated) to the sequencer OR (3) the 1C panel key switch is in the LOCAL position.

D. incorrect. If air pressure drops with the switches in the above configuration, then all 3 air compressors will be running. This does not prevent 3 a/cs from running.

The normal system line-up is three air compressors in AUTO on the MCB, two air compressor selected (integrated) on the sequencer, and one air compressor de-selected (isolated) from the sequencer. This will allow the sequencer to control two air compressors based on header pressure and allow the de-selected (isolated) air compressor to auto start based on its receiver pressure.

59. 103K4.04 059/NEW/RO/MEM 2.5/3.2/076K2.08/N///A

Which one of the following describes the correct configuration for the Containment Main Personnel Access Hatch doors and equalizing valves while the airlock is in use for entering/exiting Containment?

A.✓ Outer door OPEN
Outer door equalizing valve OPEN

Inner door CLOSED
Inner door equalizing valve CLOSED

B. Outer door OPEN
Outer door equalizing valve OPEN

Inner door CLOSED
Inner door equalizing valve OPEN

C. Outer door CLOSED
Outer door equalizing valve OPEN

Inner door OPEN
Inner door equalizing valve CLOSED

D. Outer door CLOSED
Outer door equalizing valve CLOSED

Inner door OPEN
Inner door equalizing valve CLOSED

The Containment Main Personnel Access Hatch doors are designed to ensure that Containment integrity is maintained during normal entry/exit of Containment. To provide integrity and ensure proper operation of the door, there is a sequence of operation for the Door Equalizing valve, Door Latch, and Door opening action. During Airlock door opening, the sequence is 1) Equalizing valve opens to equalize pressure across door 2) door latch operates to unlatch door 3) door swings open. The sequence is reversed for closure. A key feature is that the equalizing valve always opens prior to the door opening, remains open the entire time the door is open, and closes after the door closes. In addition, only one door can be operated at a time. This ensures that there is no air to air breach of Containment during door operation.

A. Correct - correct, only one door is open at a time
AND
when outer door is open, its equalizing valve is open.
AND
When the inner door is closed, its equalizing valve is closed.

B. Incorrect - incorrect, only one door is open at a time
BUT
both equalizing valves are open at the same time.

This creates a Containment integrity breach. Candidate with inadequate knowledge may think that this demonstrates proper operation of the equalizing valves to allow door operation.

C. Incorrect - incorrect, only one door is open at a time
BUT
the door that is closed has its equalizing valve open
AND
the door that is open has its equalizing valve closed.

This creates a Containment integrity breach. Candidate with inadequate knowledge may think that this demonstrates proper operation of the equalizing valves to allow door operation.

D. Incorrect - incorrect, only one door is open at a time
BUT
the door that is open has its equalizing valve closed.

This does not create a Containment integrity breach, but does not demonstrate proper operation of the door. The equalizing valve for a door will stay open the entire time a door is open. A candidate may think that since there is no Containment breach, this demonstrates proper operation of the door.

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103K4.04

103 Containment System

Knowledge of containment system design feature(s) and/or interlock(s) which provide for the following:
(CFR: 41.7)
K4.04 Personnel access hatch and emergency access hatch 2.5 3.2

Importance Rating:	2.5 / 3.2
Technical Reference:	Instruction Manual Airlocks and Closures U-261601 v2.0
References provided:	None
Learning Objective:	RELATE AND IDENTIFY the operational characteristics including design features, capacities and protective interlocks for the components associated with the Containment Structure and Isolation System, to include the following (OPS-40302B02): Three Barriers ¼ " Steel Liner Tendons Containment Accesses Penetrations having Relief valve Overpressure Protection
Question origin:	Based on Watts Bar 2006 NRC Exam question
Basis for meeting K/A:	K/A is met by testing candidate's knowledge of the design and interlocks associated with the Containment Main Personnel Access Hatch Air Lock.
SRO justification:	N/A

is surrounded by a watertight closure. This arrangement, which is the same as that used with the suction lines in the low head safety injection system, ensures that in the unlikely event of leakage from the suction pipe during long-term recirculation, the integrity of the recirculation system is not impaired and public safety is not jeopardized.

Fuel Transfer Tube

A fuel transfer penetration (Figures 1 and 18) is provided for fuel movements between the refueling transfer canal in the reactor containment and the spent fuel pit. The penetration consists of a 20-inch pipe inside a 28-inch sleeve. The inner pipe acts as the transfer tube and is fitted with a double gasketed blind flange in the refueling canal and a gate valve in the spent fuel pool transfer canal. The outer tube is welded to the containment liner and spent fuel pool liner. Bellows expansion joints are welded to the inner tube and outer tube for normal and seismic differential building movements.

Equipment Hatch

An equipment hatch is provided which is fabricated from welded steel and furnished with a double-gasketed flange and bolted dished door (19 ft 6 in inside diameter). Equipment up to and including the size of the reactor vessel O-ring seal can be transferred into and out of containment via this hatch. The hatch barrel is welded to the liner.

Personnel Hatches

Each personnel lock is a double door welded steel assembly. The two doors in each personnel lock are interlocked to prevent both being opened simultaneously and to ensure that one door is completely closed before the opposite door can be opened. A quick-acting type, equalizing valve connects the personnel lock with the interior of the containment structure for the purpose of equalizing pressure in the two systems when entering or leaving the containment. Two personnel locks are provided. One of these is for normal access. The other is an emergency escape hatch.

The personnel airlock serves as the normal access into or out of the containment building. The airlock structure consists of a cylindrical housing with a stiffened bulkhead at each end containing a door. The doors are hinged so that positive pressure inside the containment building tends to seat the doors. The doors are opened and closed mechanically. The mechanical system is equipped with an interlock safety feature that permits only one of the two doors to be opened at any time to prevent the release of the containment vessel atmosphere. Tech Specs allows the personnel hatch interlocks can be defeated provided certain requirements are administratively controlled.

The mechanical operating system consists of a mechanism for each door which converts the rotary motion input from the handwheel into an output motion that actuates the equalizing valve, door latch, and door swing.

Handwheels for operating the mechanism are located at each door and inside the airlock at a transfer box. Remote operation is possible by use of an additional handwheel at each door. The remote operation handwheel actuates the opposite door through a drive shaft system. Each handwheel is equipped with an indicator plate to identify which door it operates. A mechanical indicator is provided at each handwheel to show the position of the equalizing valve, latch, and door which are actuated by that handwheel.

The power operation drive system components consist of a reversible electric motor with a gear reducer and two electromagnetic clutches. These components are located in the transfer box inside the airlock and provide power operation for either door through the mechanical operating system. The drive system components are controlled by a solid state system of logic, motor speed, and clutch-torque controls.

During power operation, the handwheels provided for manual operation will rotate and the mechanical indicators at each handwheel will show the position of the equalizing valve, latch, and door which are actuated by the handwheel

Pushbutton stations for operating the mechanism are located at each door and inside the airlock. Each pushbutton station is equipped with indicator lights as well as an indicator plate to identify which door the button operates.

.Pushbuttons that stop the electrical operation of the airlock are provided at four locations:

1. Pushbutton electrical enclosure outside the airlock on the exterior bulkhead.
2. Pushbutton electrical enclosure inside the airlock above the transfer box.
3. Pushbutton electrical enclosure outside the airlock on the interior bulkhead.\
4. Electrical enclosure inside the airlock at the interior bulkhead

Actuating the stop pushbuttons immediately de-energizes the electric motor and electro-magnetic clutches. If the stop pushbutton is actuated while the airlock door is in motion, the motion will continue a short distance.

After actuating the stop pushbutton, electrical operation is restarted by pressing the pushbutton for the desired operation. The stop pushbutton must be actuated before reversing any operation in progress

A pressure differential switch is provided at each airlock bulkhead. Each switch is installed inside the airlock. These switches are actuated by the pressure differential between the inside and outside of the airlock. Whenever the pressure tending to open the door exceeds 0.5 psid, the switch signals activate switch contact elements in the solid state control system which temporarily de-energize the electromagnetic clutches before the door is unlatched. When air flow through the equalizing valve reduces the pressure differential below 0.5 psid, electric operation will automatically resume.

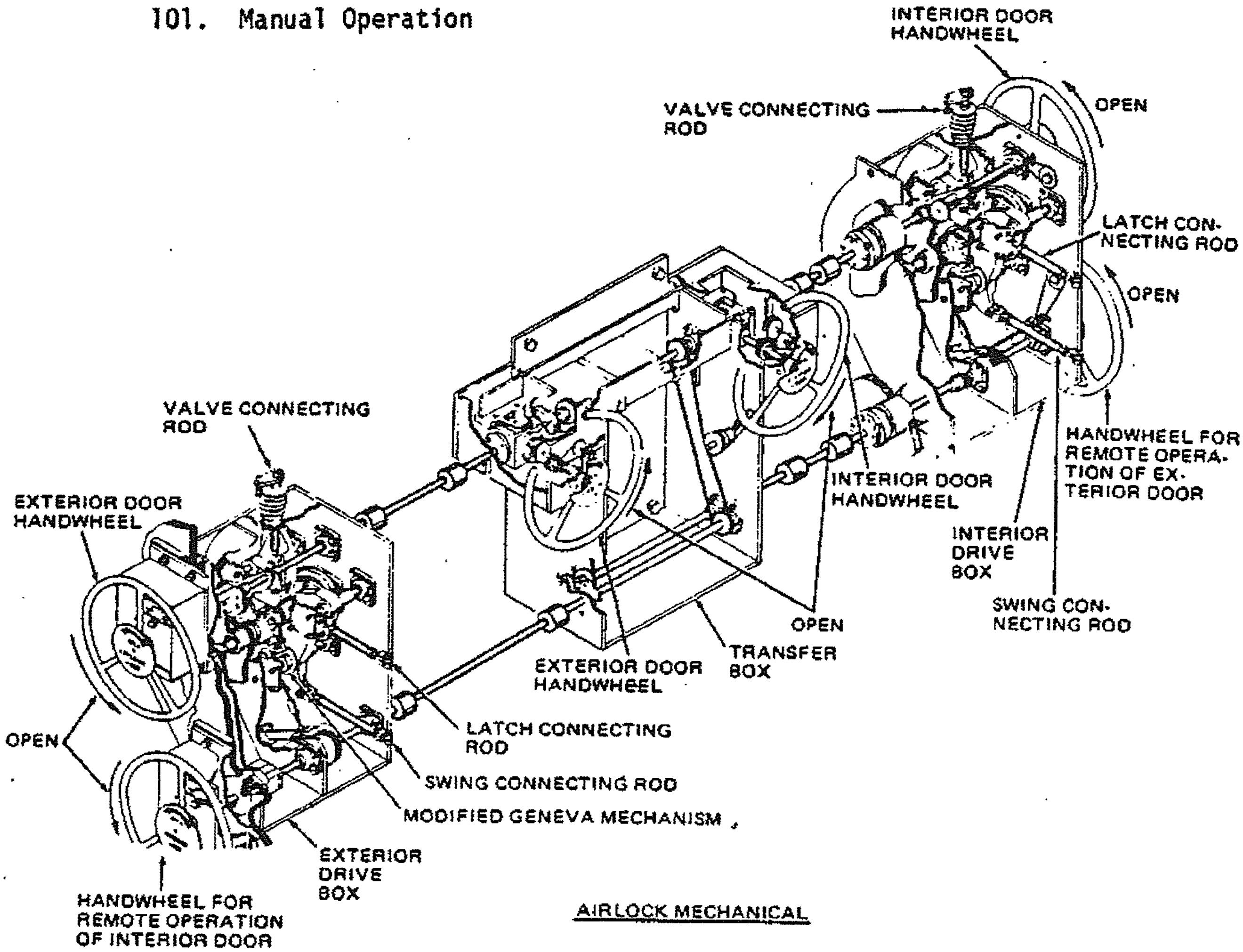
The electrical system protection is housed in the exterior pushbutton station located outside the airlock exterior bulkhead. The station contains 20 amp circuit breakers, as well as two 20 amp fuses.

Both airlock doors are intended to remain closed when the airlock is not in use. If either door is left open, the interlock is engaged in the mechanism at the opposite door. The door left open must be closed before the other may be opened. Overall passage through the airlock could be delayed by the time required to close an open door. (Rotating the handwheel which remotely actuates the open door through 5 1/2 revolutions)

The exterior door has been provided with double gaskets. The pressure tap for this feature is through the valve or valves on the exterior end of the lock.

DIVISION 1 - OPERATING PROCEDURES

101. Manual Operation



AIRLOCK MECHANICAL

101.1 Introduction

The mechanical operating system consists of a modified geneva mechanism for each door. This mechanism is driven by a pinion and gear which are manually operated by a handwheel. The geneva mechanism converts the rotary motion input from the handwheel into three interdependent and sequenced linear output motions that actuate the equalizing valve, door latch, and door swing.

Handwheels for operating the mechanism are located at each door and inside the Airlock at a transfer box. Remote operation is possible by use of an additional handwheel at each door. The remote operation handwheel actuates the geneva mechanism at the opposite door through a drive shaft system. Each handwheel is equipped with an indicator plate to identify which door it operates. A mechanical indicator is provided at each handwheel to show the position of the equalizing valve, latch, and door which are actuated by that handwheel.

101.2 Passage Through The Airlock

Assuming the door initially approached is fully closed and latched with equalizing valve closed

1) Observe the indicator for the opposite door. It must indicate closed. If necessary, rotate the handwheel which remotely actuates the opposite door in the closing direction until the mechanical indicator shows the opposite door latched and valve closed.

2) Rotate the handwheel which actuates door to be entered in the opening direction until the indicator shows valve open (approximately 1 1/2 revolutions). If a pressure differential exists across the bulkhead, pause until there is no audible flow of air through the equalizing valve. Continue handwheel rotation through an additional 4 revolutions for a total of 5 1/2 revolutions. Enter the Airlock.

3) Once inside the Airlock, rotate the handwheel which actuates the door entered in the closing direction through 5 1/2 revolutions to fully close and latch the door and close the equalizing valve.

4) Rotate the handwheel which actuates the door to be exited in the opening direction. If required, after 1 1/2 revolutions, pause for pressure equalization. Continue rotation for an additional 4 revolutions for a total of 5 1/2 revolutions. Exit the Airlock.

5) Once outside the Airlock, rotate the handwheel which actuates the door exited in the closing direction through 5 1/2 revolutions to fully close and latch the door and close the equalizing valve.

CAUTION: THE AIRLOCK MECHANISM IS INTENDED TO OPERATE AT A MODERATE RATE OF SPEED USING MODERATE HANDWHEEL EFFORT TO ACTUATE THE VALVE AND LATCH, AND SWING THE DOOR. ATTEMPTS TO OPERATE AT EXTREME SPEEDS AND/OR USE OF EXCESSIVE FORCE ON THE HANDWHEEL CAN JAM THE MECHANISM. IF THE MECHANISM BECOMES JAMMED AND WILL NOT FREE ITSELF, THE MECHANICAL SYSTEM IS INOPERABLE BY OTHER MEANS AND PERSONNEL WILL BE UNABLE TO PASS THROUGH THE AIRLOCK.

NEVER USE A PRYBAR, LEVER, ETC. ON OR TOGETHER WITH A HANDWHEEL AS THE MECHANISM MAY BE DAMAGED. NEVER TRY TO OVERPOWER A HANDWHEEL. IF THE HANDWHEEL WILL NOT TURN, SEE MANUAL SECTION ON "TROUBLESHOOTING". IF PERSONNEL CANNOT EXIT AIRLOCK OR CONTAINMENT VESSEL, SEE MANUAL SECTION ON "EMERGENCY PROCEDURES".

Both Airlock doors are intended to remain closed when the Airlock is not in use. If either door is left open, the interlock is engaged in the mechanism at the opposite door. The door left open must be closed before the other may be opened. Overall passage through the Airlock could be delayed by the time required to close an open door. (Rotating the handwheel which remotely actuates the open door through 5 1/2 revolutions)

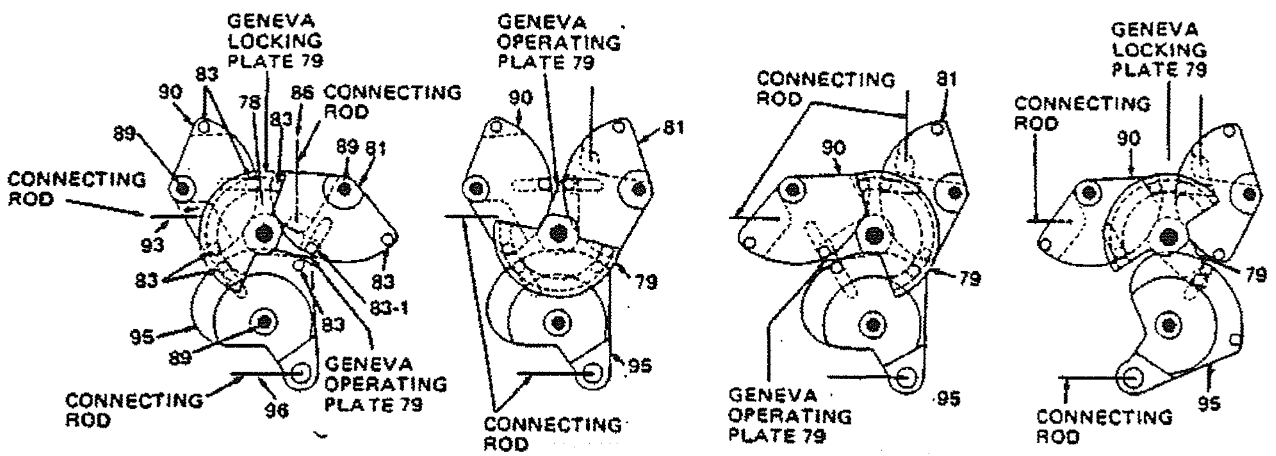
102. Mechanical Details

102.1 Introduction

A detailed description of the Airlock mechanical features is provided for persons requiring knowledge of Airlock operation beyond the basics of passage through the Airlock.

102.2 Valve, Latch, and Door Swing

The valve, latch, and door swing are actuated by mechanisms located in the interior and exterior drive boxes. A central operating plate, equipped with a cam follower, is rotated by a pinion and gear which are manually actuated by handwheel rotation. As the operating plate rotates, the cam follower engages slots in three independently mounted plates. The operating plate sequentially rotates each of the three driven members through about a 70° arc. The sequential rotation of the driven plates is converted to linear motion in connecting rods linking the plates with the valve, latch, and swing mechanisms, respectively. A locking plate, integrally mounted with the operating plate, prevents rotation of the three driven members when they are not being indexed. The locking plate engages cam followers mounted on each of the three driven plates and immobilizes two of the plates at any time the third plate is in motion.



CLOSED VALVE LATCH SWING

The four figures illustrate the full cycle beginning with the valve, latch, and swing mechanisms fully closed. Cam follower No. 83-1 on the operating plate, sequentially engages slots in Plates 81, 90, and 95 resulting in approximately 70° of rotation for each plate. The locking plate has a circular slot which engages cam follower number 83 on the plates not being indexed and prevents rotation.

102.2 Valve, Latch, and Door Swing (Continued)

The latching arrangement uses a single latch device located at about the mid-line of the door and hinge to apply gasket sealing forces to the door. A pivoting latch mounted on the bulkhead, engages a roller assembly attached to the hinge. As the latch moves past the rollers, the door moves toward the bulkhead, compressing the gasket. At the completion of the latching sequence, the latch is in an over-center position to prevent unplanned reversal of latch pivoting. The latch also serves a structural function in resisting external pressure.

The door swing is accomplished by two rods connected at their ends by lenghts of roller chain to form a continuous loop. Two sprockets engage the roller chain. One sprocket is fixed to the actuator shaft and the other to the hinge shaft. The linear output motion from the geneva mechanism connecting rod is converted into rotary motion of the actuator shaft which powers the roller chain to produce rotation of the door hinge.

60. G2.1.25 060/NEW/RO/C/A 3.9/4.2/G2.1.25/Y///D

Unit 1 has experienced a Reactor trip and Safety Injection due to a LOCA, with the following conditions:

- EEP-0, Reactor Trip or Safety Injection, has been completed and EEP-1, Loss of Reactor or Secondary Coolant, has been entered.
- AOP-34.0, Malfunction of RCS Wide Range Pressure Indication, has been implemented to determine actual RCS pressure.
- PT-455, 456, 457, PRZR PRESS, all indicate 1700 psig.
- PT-402, RCS WR PRESS, indicates 1600 psig.
- PT-403, RCS WR PRESS, indicates 750 psig.
- FI-943, A TRN HHSI FLOW indicates 550 gpm.

Which one of the following completes the statements below?

AOP-34.0 will require Charging Pump Miniflow valves to be __(1)__ prior to RCS pressure determination.

Actual RCS pressure is __(2)__ .

References Provided

	(1)	(2)
A.	open	750 psig
B.	open	1600 psig
C.	closed	750 psig
D.✓	closed	1600 psig

FIGURE 1

ONE CHARGING PUMP RUNNING IN SI MODE

3 pages are refences to be provided

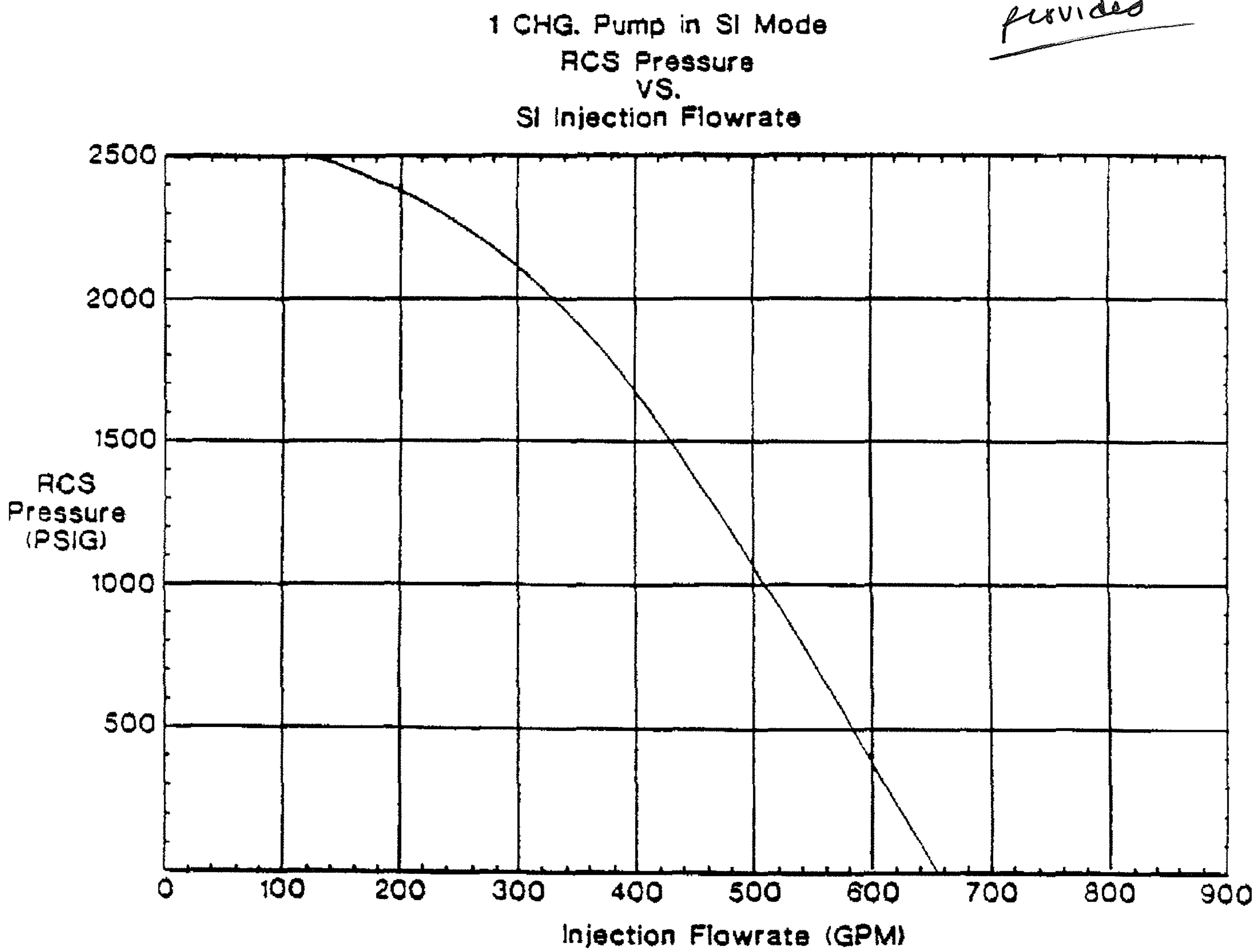


FIGURE 2

TWO CHARGING PUMPS RUNNING IN SI MODE

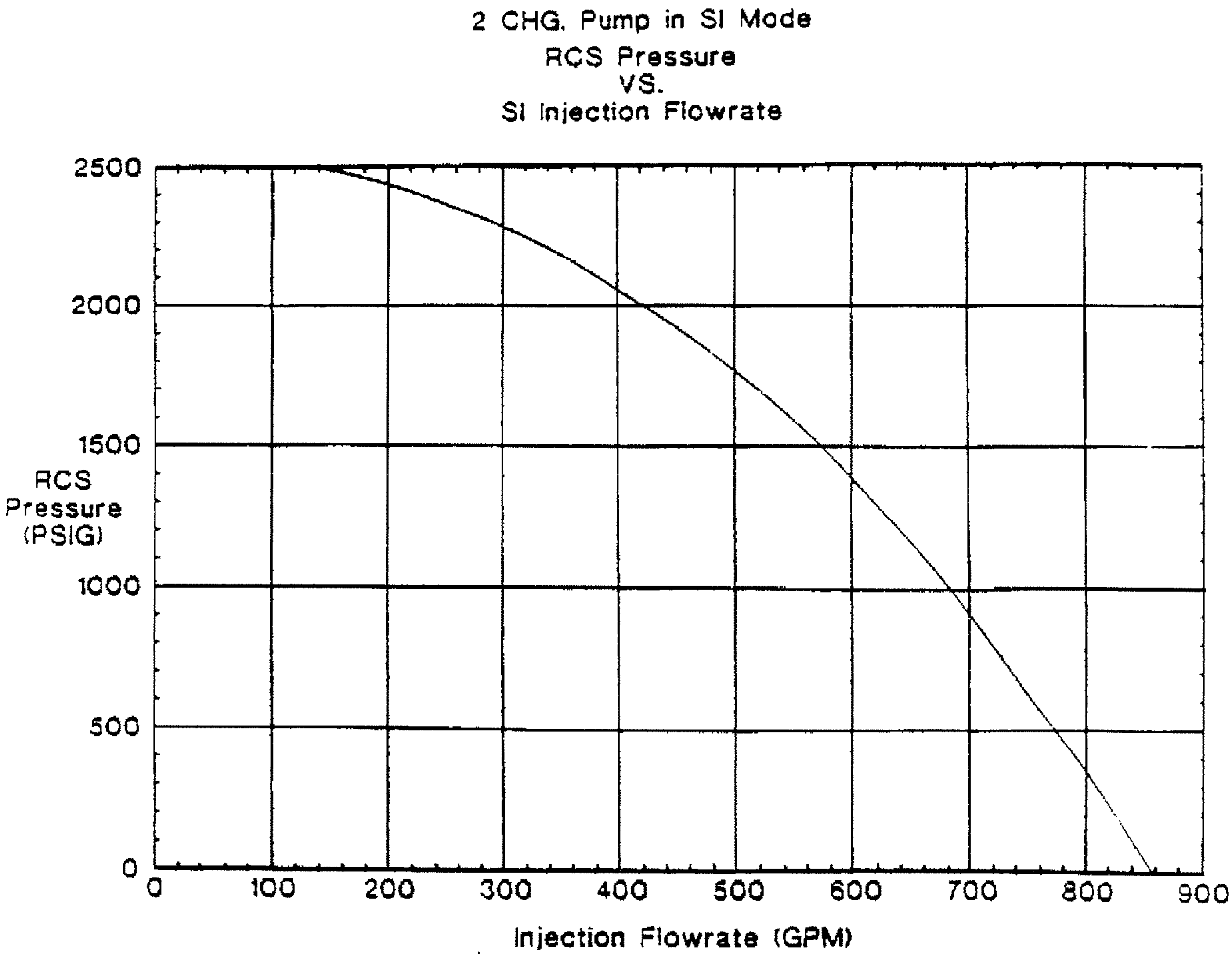


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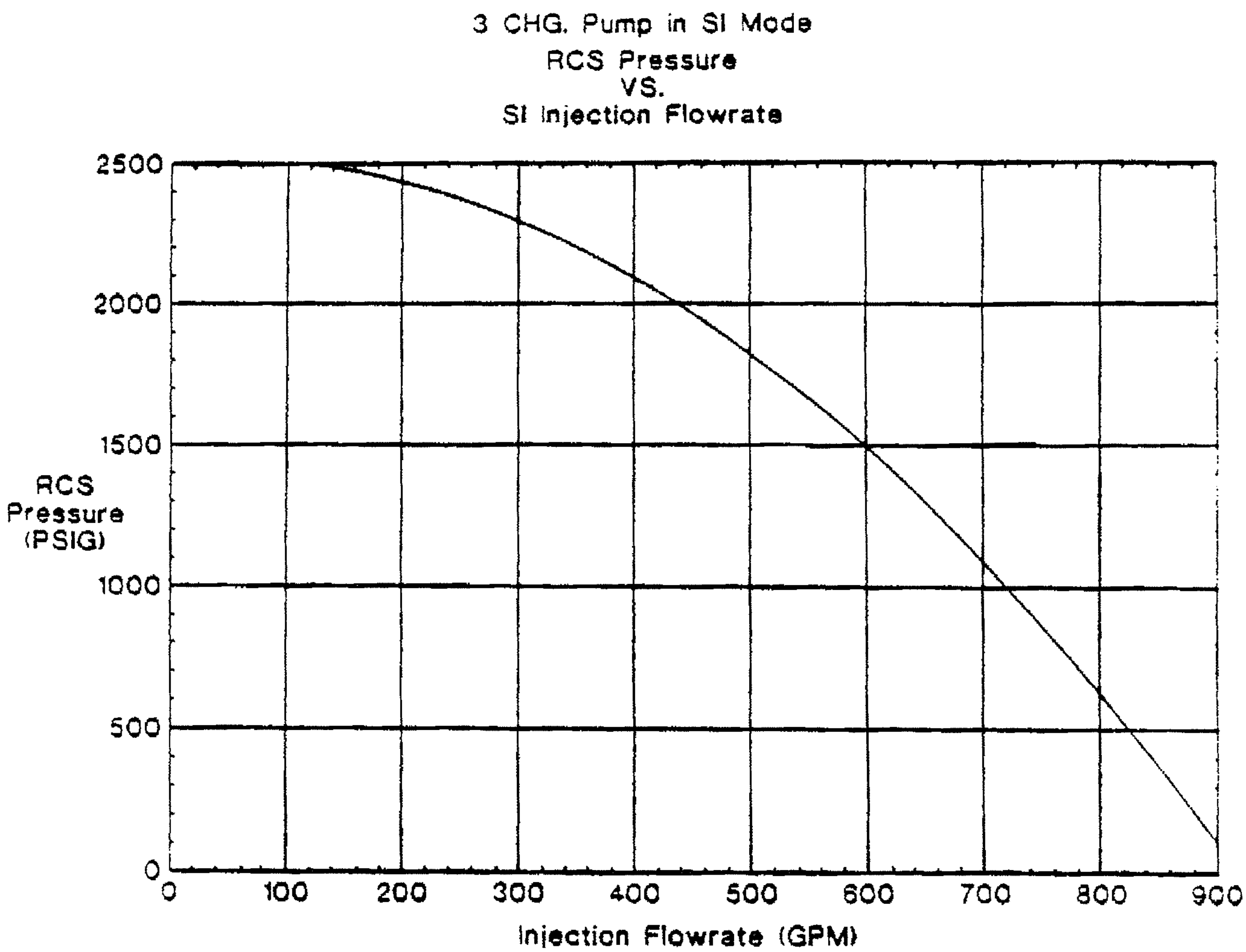
FIGURE 3

THREE CHARGING PUMPS RUNNING IN SI MODE



The miniflows are required to be closed by AOP-34.

Pressurizer pressure instruments indicate 1700 psig (bottom of the scale), and PT-402 & 403 indicate different pressures. AOP-34 has been implemented to determine actual RCS pressure. A LOCA has occurred and the Control Room team has gone from EEP-0 to EEP-1.
No Charging Pumps have been secured in any of the procedures up until this point, so candidate must recognize that 2 Charging Pumps are running and use the appropriate Figure in AOP-34 to determine actual RCS pressure.

A. Incorrect - first part is incorrect. Plausible because the candidate must know contents of AOP-34 to know that Charging Pump flow curves in AOP-34 are based on miniflows being closed , and with RCS pressure on one indicator being less than 1300 psig and the other less then 1900 psig, miniflows could be open or closed per the FO page of EEP-1.

Second part is incorrect. Plausible because this would be correct if only one Charging Pump were running.

B. Incorrect - First part is incorrect, see A.1

Second part is correct per AOP-34.

C. Incorrect - First part is correct per AOP-34.

Second part is incorrect, see A.1

D. Correct - Both parts are correct, see above.

G2.1.25

2.1 Conduct of Operations

2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc.
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 3.9 SRO 4.2

Importance Rating:	3.9 / 4.2
Technical Reference:	FNP-1-AOP-34.0 v8.0
References provided:	Figure 1, 2, and 3 of FNP-1-AOP-34.0
Learning Objective:	ANALYZE plant conditions and DETERMINE the successful completion of any step in AOP-34.0, Malfunction of RCS Wide Range Pressure Indication. (OPS-52521L07)
Question origin:	NEW
Basis for meeting K/A:	K/A is met by testing candidate's ability to interpret the curve in AOP-34 to determine actual RCS pressure upon the malfunction of one RCS pressure indicator. Interpretation includes determining which graph is required due to the number of running Charging Pumps. Candidate must determine RCS pressure per the curve based on how many Charging Pumps are running and SI flow.
SRO justification:	N/A

Step	Action/Expected Response	Response Not Obtained
__ 1	**Determine Status of RCS WR Pressure Indicators:**	
1.1	Perform Channel Check: • PI-402A, 1C LOOP RCS WR PRESS • PI-403A, 1A LOOP RCS WR PRESS	
1.2	Channel Check - DEVIATION GREATER THAN 100 PSIG	1.2 Go to procedure and step in effect.
__ 2	**Check PRZR Pressure - LESS THAN 1750 PSIG** • PI-455 • PI-456 • PI-457	2 Determine most accurate LOOP RCS WR PRESS indication based on PRZR PRESS indicators: 2.1 Compare 1C and 1A LOOP RCS WR PRESS indicators with PRZR PRESS indicators. 2.2 Use LOOP RCS WR pressure indicator reading closest to PRZR pressure indicators: • PI-402A, 1C LOOP RCS WR PRESS (Q1B21PT0402, Channel IV) OR • PI-403A, 1A LOOP RCS WR PRESS (Q1B21PT0403, Channel I) 2.3 Proceed to Step 7.

Page Completed

Step	Action/Expected Response	Response Not Obtained
__ 3	**Check SI Flow - GREATER THAN 0 GPM** [ ] FI-940, HHSI B TRN RECIRC FLOW <u>OR</u> [ ] FI-943, A TRN HHSI FLOW	3 Go to procedure and step in effect.
__ 4	**Verify Charging Pump Miniflow Isolation MOVs - CLOSED** [ ] 1A CHG PUMP MINIFLOW ISO Q1E21MOV8109A [ ] 1B CHG PUMP MINIFLOW ISO Q1E21MOV8109B [ ] 1C CHG PUMP MINIFLOW ISO Q1E21MOV8109C	4 Perform the following: 4.1 Verify CHG PUMP MINIFLOW ISO Q1E21MOV8106 - CLOSED 4.2 <u>IF</u> unable to isolate charging pumps miniflow, <u>THEN</u> go to procedure and step in effect.
__ 5	**Determine RCS Pressure Based On Charging Flowrates Using Applicable Curve:**	
5.1	Check Charging pumps - ONE <u>OR</u> TWO RUNNING	5.1 <u>IF</u> three charging pumps are running, <u>THEN</u> perform the following: 5.1.1 Determine actual RCS pressure using FIGURE 3, THREE CHARGING PUMPS RUNNING IN SI MODE. 5.1.2 Proceed to Step 6.
5.2	Check Charging pumps - ONLY 1 RUNNING	5.2 <u>IF</u> two charging pumps running, <u>THEN</u> perform the following: 5.2.1 Determine actual RCS pressure using FIGURE 2, TWO CHARGING PUMPS RUNNING IN SI MODE. 5.2.2 Proceed to Step 6.
5.3	Determine actual RCS pressure using FIGURE 1, ONE CHARGING PUMP RUNNING IN SI MODE.	

__ Page Completed

Step	Action/Expected Response	Response Not Obtained

__ 6 **Determine Most Accurate LOOP RCS WR Pressure Indication Based On Charging Flowrate Curves:**

6.1 Compare indicators to pressure determined previously in Step 5:

- PI-402A, 1C LOOP RCS WR PRESS
- PI-403A, 1A LOOP RCS WR PRESS

6.2 Use most accurate indicator closest to pressure determined previously in Step 5:

- PI-402A, 1C LOOP RCS WR PRESS (Q1B21PT0402, Channel IV)

<u>OR</u>

- PI-403A, 1A LOOP RCS WR PRESS (Q1B21PT0403, Channel I)

__ 7 **Align Miniflow Valves Based On Most Accurate LOOP RCS WR PRESS Indicator:**

RCS PRESSURE	<1300 psig	1300-1900 psig	>1900 psig
1A(1B,1C) CHG PUMP MINIFLOW ISO Q1E21MOV	[]8109A closed []8109B closed []8109C closed	[]8109A as is []8109B as is []8109C as is	[]8109A open []8109B open []8109C open
CHG PUMP MINIFLOW ISO Q1E21MOV	[]8106 closed	[]8106 as is	[]8106 open

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FIGURE 1

ONE CHARGING PUMP RUNNING IN SI MODE

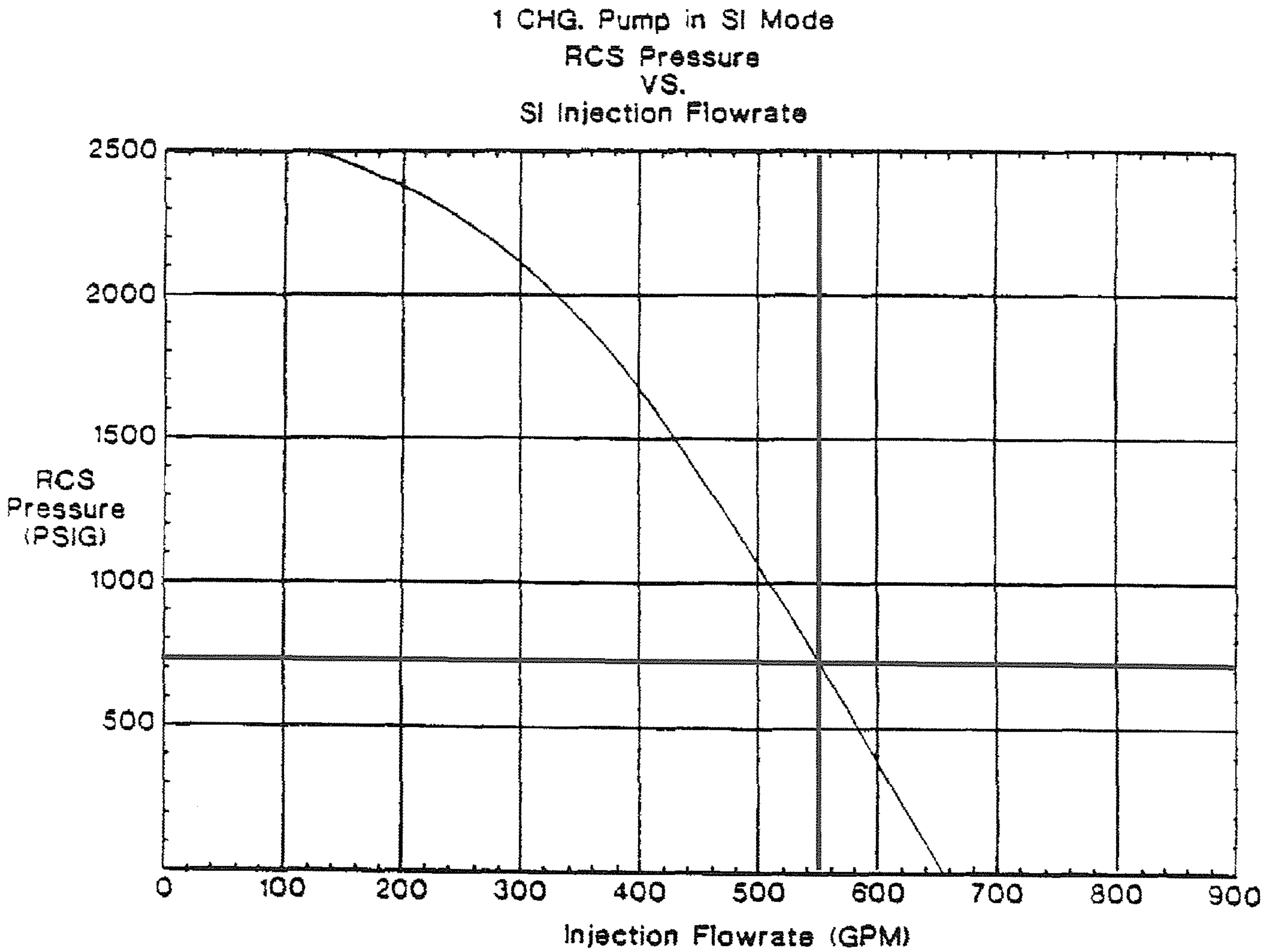
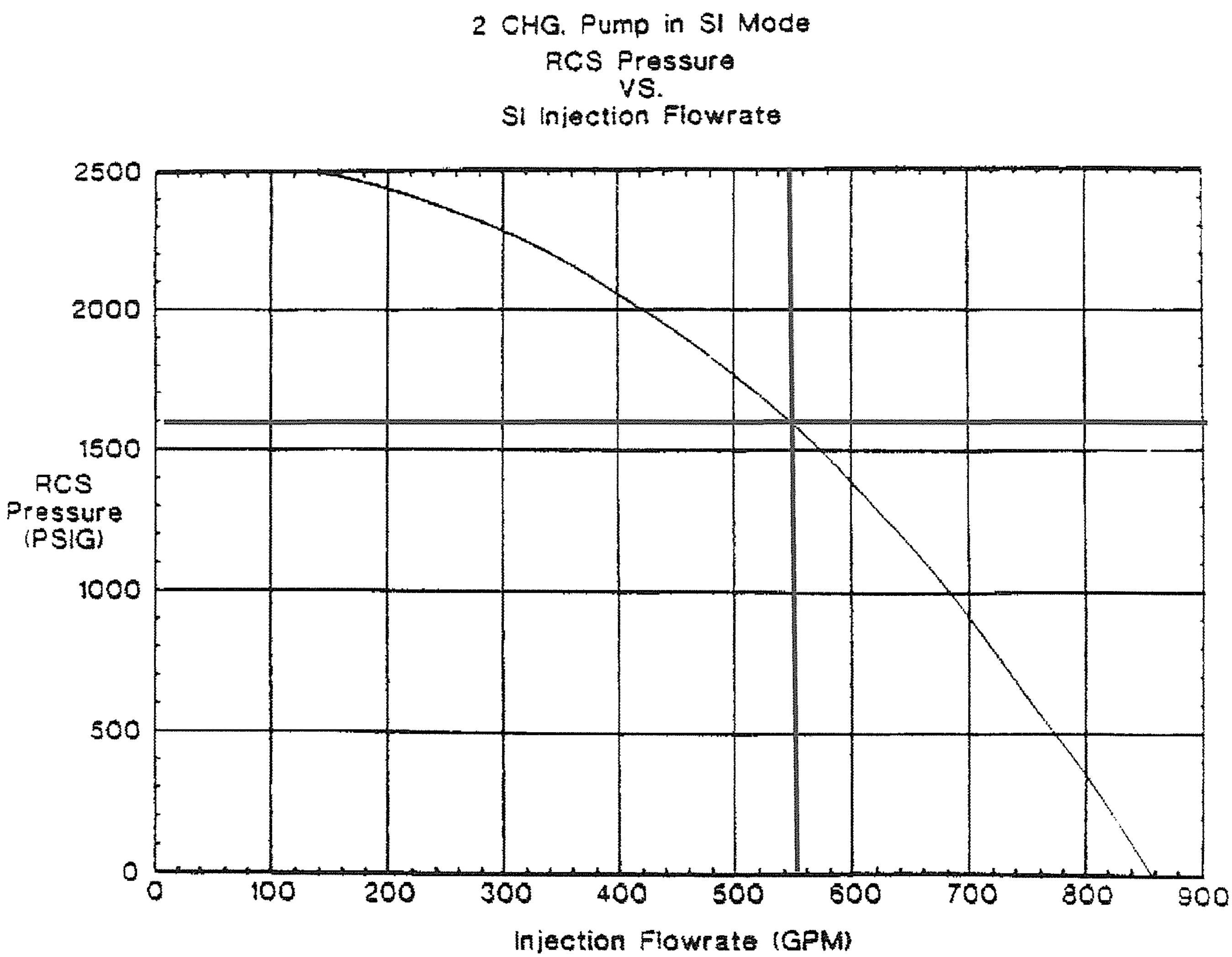


FIGURE 2

TWO CHARGING PUMPS RUNNING IN SI MODE



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61. G2.1.34 061/NEW/RO/MEM 2.7/3.5/G2.1.34/N//D

Unit 1 is in Mode 1 at 100% power with the following conditions.

- Chemistry reports that RCS Dissolved Oxygen is 50 ppm.

Which one of the following completes the statements below?

Per TRM 13.4.1, RCS Chemistry, the RCS Dissolved Oxygen limit __(1)__ been exceeded.

__(2)__ is used to control RCS Dissolved Oxygen in Mode 1.

	(1)	(2)
A.	has **NOT**	Hydrazine
B.	**HAS**	Hydrazine
C.	has **NOT**	Hydrogen
D.✓	**HAS**	Hydrogen

Hydrogen is added to the RCS by maintaining a Hydrogen overpressure on the VCT during normal operation in Mode 1-4. When RCS temperature is >250°F, procedures prevent adding hydrazine to the RCS. When RCS temperature is less than 250ºF, hydrazine may be added to the RCS for oxygen scavenging. Hydrazine is injected into the Steam Generators, on the secondary side, for Oxygen scavenging during Mode 1 operations. The TRM 13.4.1 table states that the dissolved Oxygen limit is only applicable when RCS temperature is >250ºF.
The Steady State limit for DO is ≤ 0.10 ppm and the Transient limit is ≤ 1.0 ppm

A. Incorrect - 1) incorrect, the DO limit has been exceeded.
2) incorrect, plausible because hydrazine can be added when RCS temperature is <250ºF, and is added to the Steam Generators secondary side when in Mode 1.

B. Incorrect - 1) correct, see above.
2) incorrect, see A.2.

C. Incorrect -1) incorrect, see A.1.
2) correct, Hydrogen is added to the RCS by maintaining an overpressure in the VCT while in Mode 1.

D. Correct - 1) correct, see B.1.
2) correct, see C.2.

G2.1.34

2.1 Conduct of Operations

2.1.34 Knowledge of primary and secondary plant chemistry limits.
(CFR: 41.10 / 43.5 / 45.12)
IMPORTANCE RO 2.7 SRO 3.5

Importance Rating:	2.7 / 3.5
Technical Reference:	FNP-1-SOP-2.5 v69 / TRM 13.4.1 v8
References provided:	None
Learning Objective:	RECALL AND DISCUSS the Precautions and Limitations (P&L), Notes and Cautions (applicable to the "Reactor Operator") found in the following Procedures (OPS-52101F08). SOP-2.1, CVCS Plant Startup and Operation SOP-2.5, RCS Chem Addition, VCT Gas Control and Demineralizer Operation SOP-2.7, CVCS Excess Letdown SOP-2.8, Charging Pump Lubrication Procedure AOP-16, CVCS Malfunction AOP-27.0, Emergency Boration
Question origin:	NEW
Basis for meeting K/A:	K/A is met by testing candidate's knowledge of primary chemistry oxygen limits' applicability. TRM 13.4.1 provides the RCS limits, and knowledge of this TRM validates knowledge of primary limits. The second part of the question also tests the candidate's knowledge of limits associated with use of hydrazine/hydrogen, an additional plant chemistry limit.
SRO justification:	N/A

13.4 Reactor Coolant System (RCS)

TR 13.4.1 Chemistry

TR 13.4.1 Reactor Coolant System chemistry shall be maintained within the limits specified in Table 13.4.1-1.

APPLICABILITY: At all times, except for dissolved oxygen when $T_{avg} \leq 250$ °F.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more chemistry parameters > steady-state limit and ≤ transient limit in MODES 1, 2, 3, or 4.	A.1 Restore parameter to within steady-state limit.	24 hours
B. One or more chemistry parameters > transient limit in MODES 1, 2, 3, or 4. <u>OR</u> Required Action and associated Completion Time of Condition A not met.	B.1 Be in Mode 3. <u>AND</u> B.2 Be in Mode 5.	6 hours 36 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. --------------NOTE------------ All Required Actions must be completed whenever this Condition is entered. ---------------------------------	C.1 Initiate action to reduce the pressurizer pressure to ≤ 500 psig.	Immediately
	AND	
Chloride or fluoride concentration > steady-state limit for > 24 hours in any condition other than MODES 1, 2, 3, or 4. OR Chloride or fluoride concentration > transient limit in any condition other than MODES 1, 2, 3, or 4.	C.2 Perform an engineering evaluation to determine the effects of the out-of-limit condition on the structural integrity of the Reactor Coolant System.	Prior to increasing pressurizer pressure > 500 psig. OR Prior to entering MODE 4.
	AND	
	C.3 Determine that the Reactor Coolant System remains acceptable for continued operation.	Prior to increasing pressurizer pressure > 500 psig. OR Prior to entering MODE 4.

TECHNICAL REQUIREMENT SURVEILLANCES

SURVEILLANCE		FREQUENCY
TRS 13.4.1.1	-------------------------------NOTE------------------------------- Not required to be performed for dissolved oxygen when T_{avg} ≤ 250 °F. --	
	Verify Reactor Coolant System chemistry within limits specified on Table 3.4.1-1.	72 hours

Table 13.4.1-1

Reactor Coolant System
Chemistry Limits

PARAMETER	STEADY-STATE LIMIT	TRANSIENT LIMIT
Dissolved Oxygen [a]	≤ 0.10 ppm	≤ 1.00 ppm
Chloride	≤ 0.15 ppm	≤ 1.50 ppm
Fluoride	≤ 0.15 ppm	≤ 1.50 ppm

[a] Limits not applicable when $T_{avg} \leq 250$ °F.

3.4.3 Applicable with any orifice or combination in service.

- Pressure reduction rates exceeding preceding limitation should be documented by Condition Report.
- Idle Charging pump suctions should be vented when VCT pressure reduction rate has exceeded preceding limit.
- The venting of the charging pump suctions following a VCT transient should not be delayed. It should be completed during the same shift as the VCT pressure transient. IF this is not practical, THEN it should be accomplished early in the following shift.

3.5 Oxygen concentration in VCT vapor space must not exceed 2% by volume when establishing or maintaining a hydrogen atmosphere.

3.6 Inhalation of, or skin contact with chemicals such as lithium hydroxide or hydrazine should be avoided. Protective clothing, face shield, and gloves are required when adding chemicals to chemical mixing tank.

3.7 Hydrazine addition must be performed between 140°F and 250°F RCS temperature.

- ≥ 140°F increases oxygen scavenging efficiency
- ≤ 250°F prevents hydrazine decomposition

3.8 A reactor coolant pump should be running when adding chemicals to the RCS.

3.9 Chemicals may be added to RCS without an RCP in operation if the following conditions are satisfied.

- RHR pump is on service providing 3000 gpm flow.
- Effects of RCS small volume dilution with inadequate mixing has been evaluated considering present shutdown margin.
- Subsequently boron samples are obtained AND SDM is verified.
- Shift Supervisor concurrence obtained.

3.10 Changing RCS boron concentration affects ph.

3.11 Hydrogen purge flow to the waste gas system should be increased to the maximum value (1.2 SCFM) several days prior to shutdown to reduce RCS fission gas activity.

3.12 Resin damage or channeling can occur if flow exceeds 135 gpm flow through mixed bed demineralizers or 60 gpm through cation bed demineralizer. Demineralizer performance is impacted negatively by either

3.13 Hydrazine addition for oxygen scavenging with Demineralizers in service results in resin bed depletion from hydrazine addition.

62. G2.2.13 062/MOD/RO/M 4.1/4.3/G2.2.13/N///C

A one step Tagout has been issued to place a Danger Tag on an MOV handwheel.

The following condition exists:

- A Caution Tag is on the handwheel of the MOV.

Which one of the following completes the statement below?

Per NMP-AD-003-001, Tag Standards, the operator is required to place the Danger Tag on the MOV handwheel and also ____ .

A. move the Caution Tag from the MOV handwheel and place it in a visible location on the MOV.

B. ensure the Caution Tag is visible and on top of the Danger Tag.

C.✓ ensure the Danger Tag is visible and on top of the Caution Tag.

D. remove the Caution Tag and return it to the Tagging Official.

A. Incorrect - A Caution Tag is never removed from a component unless it is directed by the Tagout. Plausible if the candidate thinks only one tag can be placed on a component.

B. Incorrect - Plausible if the candidate thinks the Instructions on the Caution Tag would be important enough to place it on top of the Danger Tag.

C. Correct - NMP-AD-003-001 step 6.3.6 states - When a Danger Tag is co-existing with a Caution Tag, the Danger Tag should be “on top” to be most visible

D. Incorrect - A Caution Tag is never removed from a component unless it is directed by the Tagout. Plausible if the candidate thinks only one tag can be placed on a component, and placing a Danger Tag allows a lower priority Caution Tag to be removed.

G2.2.13

2.2 Equipment Control

2.2.13 Knowledge of tagging and clearance procedures.
(CFR: 41.10 / 45.13)
IMPORTANCE RO 4.1 SRO 4.3

Importance Rating:	4.1 / 4.3
Technical Reference:	NMP-AD-003-001 V2
References provided:	None
Learning Objective:	Per NMP-AD-003, "Equipment Clearance and Tagging", DESCRIBE the general rules governing tag placement orientation, tag attachment, and the discovery of tag discrepancies. (S-GE-400.010.A.05)
Question origin:	Modified FNP Bank TAG-SGELP400-T01-L02 02
Basis for meeting K/A:	K/A is met by testing candidate's knowledge of tagging procedures for placement of tags during a Tagout per NMP-AD-003.
SRO justification:	N/A

1.1.1 The existence of multiple active Tagouts may result in multiple tags being attached to the same isolation device, at the same time. This in turn may lead to a conflict due to the tag type, or the specified configuration, or both. The Shift Supervisor should be notified immediately of any conflicts. Do not proceed until the Shift Supervisor determines the status or the position that affords the highest degree of personnel protection.

1.1.2 When a Danger Tag is co-existing with a Caution Tag, the Danger Tag should be "on top" to be most visible.

1.1.3 Breakers

1.1.3.1 Normally, "rackable type" breakers are racked to the DISCONNECT position with the charging spring DISCHARGED. If the breaker is to be racked to the REMOVED position for maintenance, then the breaker must be removed from the cubicle due to seismic considerations and either removed from the room or properly restrained in the room. The tag should be attached to the tie-wrap mount on each breaker cubicle door. The tag does not preclude opening the door. The breaker must be returned to the panel/cabinet in the original tagged configuration.

1.1.3.2 SWGR Breakers should normally have the tag attached to the tie-wrap mount on each breaker cubicle door.

1.1.3.3 MCC Breakers may have the tag attached to the breaker operating mechanism or the tie-wrap mount on each breaker cubicle door. WHEN a MCC breaker cubicle door is open & Tagged AND will be left unattended longer than one (1) shift, EITHER close cubicle door OR secure the cubicle door open with a positive method of restraint (e.g. plastic tie wraps, metal bracing). The open cubicle door will be secured so that they are an integral part of the cabinets.

1.1.3.4 Panel mounted molded case circuit Breakers may have the tag attached to the breaker operating mechanism or the tie-wrap mount beside the bkr cubicle. If panel disassembly is required the tag may be placed on the panel door.

1.1.3.5 The Tagout Restoration Configuration position will be "RACKED IN" or "CONNECT" "RACKED IN" or "CONNECT" is synonymous with the required procedure position (i.e. CONNECTED, CONNECTED/CLOSED, RACKED IN & ON, RACKED IN & OFF, RACKED IN & LOCKED OFF and RACKED IN & OPEN)

1.1.3.6 Certain types of breakers may be placed in their OFF position and do NOT require racking out UNLESS breaker maintenance is to be performed

1. TAG-SGELP400-T01-L02 002 G 2.2.13

A one step Tagout has been issued to place a Danger Tag on an MOV handwheel.

What are the proper tag placement actions if the component is found with a Caution Tag already in place on the component?

A. Place the Danger Tag on the component and move the Caution Tag to a visible nearby location.

B. Place the Danger Tag with the Caution Tag visible on top of the Danger Tag.

C✓ Place the Danger Tag with the Danger Tag visible on top of the Caution Tag.

D. Place the Danger Tag on the component, remove the Caution Tag and return it to the Tagging Official.

1	Equipment Clearance and tagging lesson plan S-GE-LP-400NMP-AD-003-001 Tag Standards Pg 9
2	Step 6.3.6: When a Danger Tag is co-existing with a Caution Tag, the Danger Tag should be "on top" to be most visible
3	C: Correct per above
4	A, B, & D Incorrect per above

63. G2.2.39 063/BANK/RO/C/A 3.9/4.5/G2.2.39/N///A

Unit 2 is shutdown with the following conditions:

- All Reactor Trip breakers are open.
- RCS pressure is 2200 psig.
- RCS temperature is 540°F and slowly decreasing.
- N-31, Source Range NI, is out of service for repairs.
- N-32, Source Range NI, has just failed LOW.

Which ONE of the following describes Tech Spec 3.3.1, Reactor Trip System (RTS) Instrumentation, REQUIRED ACTION due **within one hour** for these conditions?

A.✓ Verify shutdown margin.

B. Verify interlock is in required state.

C. Commence an RCS heatup to 547°F.

D. Place channel N-32 in the tripped condition.

A. Correct - This is the Tech Spec requirement for two Source Range channels inoperable with the Reactor in Mode 3 and Reactor Trip breakers open.

B. Incorrect - Plausible because this would be a correct answer if it was an Intermediate Range NI failure.

C. Incorrect - Although this would be prudent, there is not a requirement to heat up. Stopping the cooldown should be done immediately. (3.3.1 condition L is the requirement to "Suspend operations involving positive reactivity additions", but it's completion time is immediately, not within one hour.) In addition, TS 3.4.2 has a 30 minute requirement to be >541°F when the Reactor is critical. In this instance, the Reactor is shutdown.

D. Incorrect - Plausible because this is a normal action for a Power Range NI failure (although it is not a one hour action).

G2.2.39

2.2 Equipment Control

2.2.39 Knowledge of less than or equal to one hour Technical Specification action statements for systems.
(CFR: 41.7 / 41.10 / 43.2 / 45.13)
IMPORTANCE RO 3.9 SRO 4.5

Importance Rating:	3.9 / 4.5
Technical Reference:	Tech Spec 3.3.1 updated 8-5-10
References provided:	None
Learning Objective:	RECALL AND APPLY the LCO and APPLICABILITY for Technical Specifications (TS) or TRM requirements, and the REQUIRED ACTIONS for 1 HR or less TS or TRM requirements, and the relevant portions of BASES that DEFINE the OPERABILITY and APPLICABILITY of the LCO associated with the Excore Nuclear Instrumentation System (OPS-52201D10). 3.2.3, Axial Flux Difference (AFD) 3.2.4, Quadrant Power Tilt Ratio (QPTR) 3.3.1, Reactor Trip System Instrumentation 3.3.4, Remote Shutdown System 3.9.2, Refueling Operations Instrumentation
Question origin:	FNP BANK EXCORE-62201D01 06 - 2003 FNP NRC Exam
Basis for meeting K/A:	K/A is met by testing candidate's knowledge of one hour or less Tech Specs, and apply that to a given set of plant system conditions.
SRO justification:	N/A

3.3 INSTRUMENTATION

3.3.1 Reactor Trip System (RTS) Instrumentation

LCO 3.3.1 The RTS instrumentation for each Function in Table 3.3.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1-1.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one or more required channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.1-1 for the channel(s).	Immediately
B. One Manual Reactor Trip channel inoperable.	B.1 Restore channel to OPERABLE status.	48 hours
	OR	
	B.2 Be in MODE 3.	54 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
L. Required Source Range Neutron Flux channel inoperable.	L.1 Suspend operations involving positive reactivity additions. AND L.2 Close unborated water source isolation valves. AND L.3 Perform SR 3.1.1.1.	Immediately 1 hour 1 hour AND Once per 12 hours thereafter
M. One channel inoperable.	-----------------NOTE------------------ The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. --- M.1 Place channel in trip. OR M.2 Reduce THERMAL POWER to < P-7.	 72 hours 78 hours

Table 3.3.1-1 (page 2 of 8)
Reactor Trip System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	TRIP SETPOINT
5.	Source Range Neutron Flux	2(d)	2	I,J	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.10	≤ 1.3 E5 cps	≤ 1.0 E5 cps
		3(a), 4(a), 5(a)	2	J,K	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	≤ 1.3 E5 cps	≤ 1.0 E5 cps
		3(e), 4(e), 5(e)	1	L	SR 3.3.1.1 SR 3.3.1.10	N/A	N/A
6.	Overtemperature ΔT	1,2	3	E	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.14	Refer to Note 1 (Page 3.3.1-20)	Refer to Note 1 (Page 3.3.1-20)
7.	Overpower ΔT	1,2	3	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.14	Refer to Note 2 (Page 3.3.1-21)	Refer to Note 2 (Page 3.3.1-21)

(a) With RTBs closed and Rod Control System capable of rod withdrawal.

(d) Below the P-6 (Intermediate Range Neutron Flux) interlocks.

(e) With the RTBs open. In this condition, source range Function does not provide reactor trip but does provide indication.

3.1 REACTIVITY CONTROL SYSTEMS

3.1.1 SHUTDOWN MARGIN (SDM)

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

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

ACTIONS

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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.1.1	Verify SDM to be within limits.	24 hours

64. G2.3.13 064/BANK/RO/M 3.4/3.8/G2.3.13/N///A

Unit 1 is in Mode 5 for a refueling outage. A small accessible area in containment has a general area dose rate of 1150 mrem/hr. The top of this area cannot be enclosed for the purpose of locking the area.

Which one of the following completes the statement below?

In addition to the area being barricaded off, the area must also __(1)__ and __(2)__ .

A.✓ 1) be conspicuously posted

2) a flashing light must be activated

B. 1) have continuous surveillance by closed circuit TV

2) a guard continuously posted in the area

C. 1) be conspicuously posted

2) a guard continuously posted in the area

D. 1) have continuous surveillance by closed circuit TV

2) a flashing light must be activated

Tech Specs 5.7.3

For individual high radiation areas with radiation levels, as measured at 30 cm from the radiation source or from any surface that the radiation penetrates, such that a major portion of the body could receive in one hour a dose greater than 1000 mrem, accessible to personnel, that are located within large areas such as reactor containment, where no enclosure exists for purposes of locking, or that cannot be continuously guarded, and where no enclosure can be reasonably constructed around the individual area, **that individual area shall be barricaded and conspicuously posted**, **and a flashing light** shall be activated as a warning device.

A. Correct - Per Tech Specs section 5.7.3.

B. Incorrect - This would be correct if the entire Containment was affected by radiation level in excess of 1000 mrem/hr, otherwise this would be too restrictive.

C. Incorrect - These actions would result in unnecessary exposure to the guard and would not maintain dose ALARA. In other areas outside Containment, this might be acceptable.

D. Incorrect - This meets all the requirements except posting a flashing light. Plausible because Tech Specs does allow surveillance of personnel by a closed circuit TV for access to Locked High Rad areas for monitoring their exposure, if HP has already granted them access, **NOT** for monitoring to see if anyone is trying to access the area.

G2.3.13

2.3 Radiation Control

2.3.13 Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.
(CFR: 41.12 / 43.4 / 45.9 / 45.10)
IMPORTANCE RO 3.4 SRO 3.8

Importance Rating:	3.4 / 3.8
Technical Reference:	Tech Spec 5.7.3 updated 8-5-10
References provided:	None
Learning Objective:	STATE AND DEFINE the terms listed in Technical Specifications/Technical Requirements Manual (OPS-52302A01)
Question origin:	FNP BANK INTRO TS-52302A03 27 - 2001 FNP NRC Exam
Basis for meeting K/A:	K/A is met by testing candidate's knowledge of Tech Spec radiological requirements pertaining to access to High Radiation areas >1000 mr/hr, during a Containment entry.
SRO justification:	N/A

5.0 ADMINISTRATIVE CONTROLS

5.7 High Radiation Area

5.7.1 Pursuant to 10 CFR 20, paragraph 20.1601(c), in lieu of the requirements of 10 CFR 20.1601, each high radiation area, as defined in 10 CFR 20, in which the intensity of radiation is > 100 mrem/hr but < 1000 mrem/hr, shall be barricaded and conspicuously posted as a high radiation area and entrance thereto shall be controlled by requiring issuance of a Radiation Work Permit (RWP). Individuals qualified in radiation protection procedures (e.g., Health Physics personnel) or personnel continuously escorted by such individuals may be exempt from the RWP issuance requirement during the performance of their assigned duties in high radiation areas with exposure rates ≤ 1000 mrem/hr, provided they are otherwise following plant radiation protection procedures for entry into such high radiation areas.

Any individual or group of individuals permitted to enter such areas shall be provided with or accompanied by one or more of the following:

a. A radiation monitoring device that continuously indicates the radiation dose rate in the area.

b. A radiation monitoring device that continuously integrates the radiation dose rate in the area and alarms when a preset integrated dose is received. Entry into such areas with this monitoring device may be made after the dose rate levels in the area have been established and personnel are aware of them.

c. An individual qualified in radiation protection procedures with a radiation dose rate monitoring device, who is responsible for providing positive control over the activities within the area and shall perform periodic radiation surveillance at the frequency specified by the health physics supervision in the RWP.

5.7.2 In addition to the requirements of Specification 5.7.1, areas accessible to personnel with radiation levels, as measured at 30 cm from the radiation source or from any surface that the radiation penetrates, such that a major portion of the body could receive in one hour a dose greater than 1000 mrem, shall be provided with locked or continuously guarded doors to prevent unauthorized entry and the keys shall be maintained under the administrative control of the Shift Foreman on duty or health physics supervision. Doors shall remain locked

(continued)

5.7 High Radiation Area

5.7.2 (continued)

except during periods of access by personnel under an approved RWP that shall specify the dose rate levels in the immediate work areas and the maximum allowable stay times for individuals in those areas. In lieu of the stay time specification of the RWP, direct or remote (such as closed circuit TV cameras) continuous surveillance may be made by personnel qualified in radiation protection procedures to provide positive exposure control over the activities being performed within the area.

5.7.3 For individual high radiation areas with radiation levels, as measured at 30 cm from the radiation source or from any surface that the radiation penetrates, such that a major portion of the body could receive in one hour a dose greater than 1000 mrem, accessible to personnel, that are located within large areas such as reactor containment, where no enclosure exists for purposes of locking, or that cannot be continuously guarded, and where no enclosure can be reasonably constructed around the individual area, that individual area shall be barricaded and conspicuously posted, and a flashing light shall be activated as a warning device.

65. G2.3.14.065/BANK/RO/C/A 3.4/3.8/G2.3.14/N///B

You have been given a task to perform an inspection of the Containment Equipment Sump. P017A & B, CTMT SUMP PUMP handswitches are in the Pull-to-lock position on the BOP.

Which ONE of the following is a condition that would result in excessive radiation exposure rates in the Containment Equipment Sump Area?

A. Starting or stopping a Reactor Coolant Pump.

B.✓ Withdrawal of the Incore Detectors from the core.

C. Movement of irradiated fuel in the reactor vessel.

D. A leak in the Auxiliary Building results in lowering Reactor Cavity level.

The Incore system moveable detectors are a gas filled neutron detector that uses Uranium 235 to make it sensitive to neutrons. Once it is exposed to a neutron flux, it becomes highly radioactive. The pathway for the moveable detectors goes through the Containment Equipment Sump. To prevent exposure to personnel in the sump area, the detectors must be either in the Reactor vessel, or removed from the vessel and placed in a storage location, prior to entry into the sump.

A. Incorrect - Dose rates do not change significantly on the RCS loops due to an RCP start.

B. Correct - see above.

C. Incorrect - Shielding would be provided by the Reactor Cavity water level. In addition, the distance between a worker in the sump and a fuel assembly in transit would increase as the fuel assembly was removed from the core.

D. Incorrect - A leak in the Aux Building could not cause RCS level to drop below the bottom of the RCS loops. In addition, lowering cavity level would affect dose rates in the region above the vessel flange. Someone in the sump would be in a location below the vessel flange and would be unaffected.

G2.3.14

2.3 Radiation Control

2.3.14 Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.
| (CFR: 41.12 / 43.4 / 45.10)
IMPORTANCE RO 3.4 SRO 3.8

Importance Rating:	3.4 / 3.8
Technical Reference:	FNP-1-RCP-0.2 v4
References provided:	None
Learning Objective:	LIST AND IDENTIFY any special considerations such as safety hazards and plant condition changes that apply to the Incore Nuclear Instrumentation System (OPS-52201C14).
Question origin:	FNP BANK INCORE-52201C14 02
Basis for meeting K/A:	K/A is met by testing candidate's knowledge of conditions that could create a radiation hazard when entering the Containment Equipment Sump while the Reactor is shutdown.
SRO justification:	N/A

FARLEY NUCLEAR PLANT

RADIATION CONTROL AND PROTECTION PROCEDURE

FNP-1-RCP-0.2

UNIT 1 REACTOR VESSEL MAINTENANCE SUMP ENTRY

PROCEDURE USAGE REQUIREMENTS PER FNP-0-AP-6	SECTIONS
Continuous Use	
Reference Use	**ALL**
Information Use	

Approved:

Paul Harlos
Health Physics Manager

Date Issued 9/29/2007

APPENDIX B

NOTE: **MID safe positions are in the shield wall, in the Rx core, removed from the drive unit, or in a position where radiation surveys indicate that no radiological hazards exist to personnel working in containment or in the Rx Vessel Maintenance Sump.**

Storage locations are normally determined by looking at the incore control panel in the Control Room. A caution tag will be on the panel if a MID was not left in storage when it was last operated. In addition, MID drive units that have the MID removed normally have a caution tag on the Main Control Panel indicating that the MID has been removed. If MID locations are questionable, the MID Main Control Panel can be powered up to determine current positions of MIDs.

1.1.5 Verify that **ALL** of the Moveable Incore Detectors (MIDs) are in a safe position. Specify the safe position of each MID:

A [ ] Stored in shield wall
[ ] Stored in the Rx core
[ ] Removed from drive unit
* [ ] Other safe storage position

* Location ____________________

* Basis for considering this as a safe storage position: ________________
____
____
____

B [ ] Storage in shield wall
[ ] Stored in the Rx core
[ ] Removed from drive unit
* [ ] Other safe storage position

* Location__________________

* Basis for considering this as a safe storage position: ________________________
____
____
____

C [ ] Stored in shield wall
[ ] Stored in the Rx core
[ ] Removed from drive unit
* [ ] Other safe storage position

* Location ____________________

* Basis for considering this as a safe storage position: ________________
____
____
____

D [ ] Storage in shield wall
[ ] Stored in the Rx core
[ ] Removed from drive unit
* [ ] Other safe storage position

* Location__________________

* Basis for considering this as a safe storage position: ________________________
____
____
____

66. G2.3.4 066/MOD/RO/M 3.2/3.7/G2.3.4////B

Which of the following completes the following statement below?

The maximum allowable exposure that may be required when performing emergency on-site actions **to protect valuable property is** ____ per EIP-14.0, Personnel Movement, Relocation, Re-entry and Site Evacuation.

A. 5 Rem

B.✓ 10 Rem

C. 25 Rem

D. 100 Rem

EIP-14.0, v25.0 provides the following guidance:

7.10 . "Farley Nuclear Plant (FNP) personnel who have completed the onsite radiation protection training may be required to receive an exposure up to the following 10CFR20 limits: Whole body (TEDE) **- 5 Rem [...]**"

7.12 [...] **10 Rem for Protecting Valuable Property**
[...] **25 Rem for Life saving or Protecting large populations**
[...] **<100 Rem for Life saving or Protecting large populations**

A. Incorrect This is the 10 CFR 20 limit.

B. Correct This for the limit for protecting valuable property.

C. Incorrect This is the limit for LIFE SAVING OR PROTECTION OF LARGE POPULATIONS activities.

D. Incorrect, This actually exceeds the limit for volunteers who are performing LIFE SAVING OR PROTECTION OF LARGE POPULATIONS activities; the LIMIT is **LESS THAN (<)**100 Rem**.**

G2.3.4

2.3 Radiation Control

2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions. (CFR: 41.12 / 43.4 / 45.10) |
IMPORTANCE RO 3.2 SRO 3.7

Importance Rating:	3.2 / 3.7
Technical Reference:	FNP-0-EIP-14 v25
References provided:	None
Learning Objective:	STATE AND DETERMINE the actions to be taken by the re-entry personnel if dose rates during re-entry exceed the dose limits given. (OPS40105B09).
Question origin:	Modified from FNP BANK EPIP PERS-40501B09 11
Basis for meeting K/A:	K/A is met by testing candidate's knowledge of radiation dose limits during an emergency.
SRO justification:	N/A

7.8 Re-Entry is the responsibility of the ED and requires verbal ED approval to execute a re-entry. Re-entries may be authorized and executed by the OSC Manager or Maintenance Supervisor, with ED approval. Approval to exceed 10CFR20 radiation exposure limits listed in step 7.10 must be approved by the ED. Approval to exceed plant administrative dose limits listed in step 7.10 must be approved by the HP Supervisor, or the ED in the HP Supervisor's absence.

7.9 An Emergency Repair Party which functions as a re-entry team shall consist of at least two (2) persons.

7.10 Farley Nuclear Plant (FNP) personnel who have completed the onsite radiation protection training may be required to receive an exposure up to the following 10CFR20 limits:

	10CFR20 Limit	Administrative Limit
Whole body (TEDE)	- 5 Rem	- 2 Rem
Lens of the eyes	- 15 Rem	- 6 Rem
Skin of the whole body	- 50 Rem	- 20 Rem
Extremities	- 50 Rem	- 20 Rem
Internal organs	- 50 Rem	- 20 Rem

7.11 Dosimetry records for potential re-entry team members are available in HIS-20.

CAUTION: EMERGENCY EXPOSURE LIMITS SHALL ONLY BE AUTHORIZED BY THE ED

7.12 Emergency situations may transcend the normal requirement of maintaining personnel exposures below 10CFR20 limits, as noted in step 7.10. Emergency exposures shall be minimized to every degree practicable. FNP personnel who have completed the onsite radiation protection training may be required to receive an exposure up to 25 Rem TEDE for the activity and conditions described below. For those same personnel to receive in excess of 25 Rem, they must voluntarily agree to receive an emergency dose in excess of 25 Rem, but less than 100 Rem. Emergency doses received do not have to take into account the annual dose to date. Persons volunteering to receive in excess of 25 Rem must be made fully aware of the risks involved. Emergency exposure limits are as follows:

TEDE Dose	Activity	Condition
10 Rem	**Protecting Valuable Property**	**Lower Dose Not Practical**
25 Rem	**Life Saving or Protection of Large Populations**	**Lower Dose Not Practical**
>25 Rem <100 Rem	**Life Saving or Protection of Large Populations**	**Volunteers Only That Are Fully Aware of The Risks Involved**

Limit the dose to the lens of the eyes to 3 times the listed value. Limit the dose to other organs, including skin and extremities to 10 times the listed values.

1. EPIP PERS-40501B09 011 G2.3.4

During an emergency, the **maximum** exposure limit for a relocation after the Plant Emergency Alarm has sounded shall be limited to:

A.✓ 5 Rem TEDE including current dose to date.

B. 5 Rem TEDE **not** including current dose to date, with HP Supervisor approval.

C. 10 Rem TEDE including current dose to date.

D. 10 Rem TEDE **not** including current dose to date, with HP Supervisor approval.

EIP-14.0

6.9 Exposure limits for a re-location shall be limited to five rem TEDE, including the current dose to date.

A. Correct - see step above from EIP 14.0

B, C, D. Incorrect per the above

67. G2.4.23 067/NEW/RO/M 3.4/4.4/G2.4.23/N///A.

Unit 1 has entered ESP-1.3, Transfer To Cold Leg Recirculation.

Which one of the following states the action required for implementing the Functional Restoration Procedures (FRP's) while in ESP-1.3, and the basis for the action?

A.✓ FRP's **should not** be implemented until RHR and Charging pumps are aligned for recirculation and flow is stable.

This is because of the limited amount of water in the RWST available for maintaining suction to ECCS pumps.

B. FRP's **should not** be implemented while in ESP-1.3 until RWST level is < 4.5 feet.

This is because insufficient water may be present in the Containment Sump to prevent cavitation while on recirculation.

C. FRP's **should** be implemented immediately at any time while in ESP-1.3.

This is because of the limited amount of water in the RWST available for maintaining suction to ECCS pumps.

D. FRP's **should** be implemented immediately at any time while in ESP-1.3.

This is because they are always the highest priority while in the Emergency Procedures.

There is a note at the beginning of ESP-1.3 that states "No Function Restoration Procedure should be implemented until step 7 has been completed." Step 7 is the completion of alignment of RHR and Charging pump suctions. Containment Spray suctions have not be re-aligned at that point. Candidate should know the basis for this note and the reason why actions in ESP-1.3 take priority over any Red or Orange path FRP. The answer is found in the background documents for ESP-1.3 - *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.* And also the knowledge base for this information - *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.*

A. Correct - see above.

B. Incorrect - RWST level may be greater than 4.5 feet when step 7 is complete. At that point, any Red or Orange path FRP should be implemented. Plausible because Containment Spray is not swapped until 4.5' and candidate may think FRP's are not applicable until Containment Spray suction is aligned to the Containment Sump and adequate level is available in the Containment Sump to prevent cavitation.

C. Incorrect - Plausible because candidate may think that since FRP's are a high priority, they must be implemented immediately while there is still sufficient level in the RWST. This distracter was added at the request of Ron Aiello, NRC Chief Examiner, to provide a set of balanced distracters for this exam question.

D. Incorrect - Plausible because normally FRP's are the highest priority.

G2.3.4

Emergency Procedures / Plan

2.4.23 Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.
(CFR: 41.10 / 43.5 / 45.13)
IMPORTANCE RO 3.4 SRO 4.4

Importance Rating:	3.4 / 4.4
Technical Reference:	FNP-1-ESP-1.3 v21 / FNP-0-ESB-1.3 V3
References provided:	None
Learning Objective:	STATE AND EXPLAIN the basis for all Cautions, Notes, and Actions associated with (1) ESP-1.3, Transfer to Cold Leg Recirculation; (2) ESP-1.4, Transfer to Simultaneous Cold Leg and Hot Leg Recirculation. (OPS-52531G03)
Question origin:	NEW
Basis for meeting K/A:	K/A is met by testing candidate's knowledge of the basis for establishing which procedure takes priority while performing actions in ESP-1.3. FRP's normally have priority, but in this instance, some actions in ESP-1.3 should be completed prior to going to any FRP. Candidate must choose the correct action and also the basis for why it is correct.
SRO justification:	N/A

4.0 Critical Safety Function Status Trees (CSFSTs)

4.1 General

The ERP network is designed to protect the health and safety of the public by maintaining the fission product barriers intact. In the initial stage of ERP performance, if AC power is available, the user ensures that the automatic plant systems are functioning properly to protect these barriers. Afterwards, the CSFSTs are monitored to detect challenges to the barriers due to worsening plant conditions or equipment failure and to direct the user to an appropriate procedure.

4.2 Applicability

CSFT's are normally the highest priority after EEP-0 is exited, but there is an exception in ESP-1.3.

The user should begin monitoring the CSFSTs when directed by EEP-0 or upon transition from EEP-0. The CSFSTs are not monitored initially because the ERPs are already directing the initial action required to protect the barriers. If the user enters ECP-0.0, the CSFSTs should be monitored for information only. The Function Restoration Procedures assume that at least one train of safeguards busses is available. If all AC power has been lost, ECP-0.0 will provide the appropriate actions to protect the barriers.

4.3 Proper Use

The CSFSTs follow a logic tree format. Each CSFST has a single entry point at the left side of the page. When manually monitoring the CSFSTs, the user must enter at this point and then proceed to the right until reaching an endpoint. The endpoint will either indicate that the particular CSF is satisfied or direct the user to an appropriate procedure. The Safety Parameter Display System (SPDS) provides real time monitoring of the CSFSTs. The user should perform CSF-0 to determine if SPDS is functioning properly. If so, it should be used. If not, manual monitoring is required.

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.

****

Step	Action/Expected Response		Response NOT Obtained
___ 1	[CA] Check RWST level - GREATER THAN 4.5 ft.	1	IF alignment for recirculation is NOT imminent, THEN stop any pump taking suction from the RWST. CHG PUMP [] 1A [] 1B [] 1C RHR PUMP [] 1A [] 1B [] CS RESET TRN A(B) containment spray signals - RESET (Annunciator EE4 clear). CS PUMP [] 1A [] 1B

Step	Action/Expected Response	Response NOT Obtained

NOTE: The intent of Step 2 is to differentiate between a steam line break event (with SI terminated and RWST drain down only from containment spray operation) and a loss of reactor coolant event (RWST drain down from one or more ECCS pumps).

___ 2 **Check SI in service.**

- Check HHSI flow - GREATER THAN 0 gpm.

  A TRN
  HHSI FLOW
  [] FI 943

  OR

- Check any RHR PUMP - STARTED IN SI MODE.

Started RHR PUMP	1A	1B
RWST TO 1A(1B) RHR PUMP Q1E11MOV	[] 8809A open	[] 8809B open
1C(1A) RCS LOOP TO 1A(1B) RHR PUMP Q2E11MOV	[] 8701A closed [] 8701B closed	[] 8702A closed [] 8702B closed

2 Perform the following.

2.1 Reset containment sump to RHR valve switches.

CTMT SUMP TO RHR
PUMP RESET
[] A TRN
[] B TRN

2.2 Proceed to step 8.

Step	Action/Expected Response	Response NOT Obtained
___ 3	**Verify SI - RESET.** [] MLB-1 1-1 not lit (A TRN) [] MLB-1 11-1 not lit (B TRN)	3 Perform the following: 3.1 IF any train will NOT reset using the MCB SI RESET pushbuttons, THEN place the affected train S821 RESET switch to RESET. (SSPS TEST CAB.) 3.2 IF a failure exists in SSPS such that SI cannot be reset, THEN reset SI using FNP-1-SOP-40.0, RESPONSE TO INADVERTENT SI AND INABILITY TO RESET OR BLOCK SI, Appendix 2.
___ 4	**Verify at least one train of PRF in operation using FNP-1-SOP-60.0, PENETRATION ROOM FILTRATION SYSTEM in conjunction with the remaining steps of this procedure.**	
___ 5	**Check CCW to RHR heat exchangers MOVs - OPEN.** CCW TO 1A(1B) RHR HX [] Q1P17MOV3185A open [] Q1P17MOV3185B open	5 Open any closed CCW to RHR heat exchanger valve(s) AND continue with this procedure while valves stroke open. CCW TO 1A(1B) RHR HX [] Q1P17MOV3185A open [] Q1P17MOV3185B open
___ 6	**Establish only one CHG PUMP in each train - RUNNING.** [] A Train (1A or 1B) amps > 0 [] B Train (1C or 1B) amps > 0	

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 large break LOCA has occurred as indicated by accumulators discharged.	7.1 Proceed to step 7.4.
7.2	Check containment sump level - GREATER THAN 3.4 ft {3.8 ft}. CTMT SUMP LVL [] LI 3594A POST ACCIDENT CTMT WTR LVL [] LR 3594B	7.2 IF both containment sump level indications less than 3.4 ft {3.8 ft}, THEN go to FNP-1-ECP-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION.
7.3	Proceed to step 7.5.	
7.4	Check containment sump level - GREATER THAN 2.5 ft {2.9 ft}. CTMT SUMP LVL [] LI 3594A POST ACCIDENT CTMT WTR LVL [] LR 3594B	7.4 IF both containment sump level indications less than 2.5 ft {2.9 ft}, THEN go to FNP-1-ECP-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION.
7.5	Verify recirculation valve disconnects - CLOSED USING ATTACHMENT 1.	
7.6	Stop both RHR PUMPs.	

Step 7 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
7.7	Close RWST TO 1A RHR PUMP Q1E11MOV8809A.	7.7 Perform the following. 7.7.1 Stop the running A train CHG PUMP. 7.7.2 Proceed to step 7.12.
7.8	Align CTMT sump to 1A RHR PUMP. CTMT SUMP TO 1A RHR PUMP [] Q1E11MOV8811A open [] Q1E11MOV8812A open	7.8 Perform the following. 7.8.1 Stop the running A train CHG PUMP. 7.8.2 Proceed to step 7.12.
7.9	Close RHR to RCS HOT LEGS XCON Q1E11MOV8887A.	
7.10	Start 1A RHR PUMP. RHR PUMP [] 1A amps > 0	7.10 Perform the following. 7.10.1 Stop the running A train CHG PUMP. 7.10.2 Proceed to step 7.12.
7.11	Verify A Train LHSI flow - STABLE. 1A RHR HDR FLOW [] FI 605A	
7.12	Close RWST TO 1B RHR PUMP Q1E11MOV8809B.	7.12 Perform the following. 7.12.1 Stop the running B train CHG PUMP. 7.12.2 Proceed to step 7.17.
7.13	Align CTMT sump to 1B RHR PUMP. CTMT SUMP TO 1B RHR PUMP [] Q1E11MOV8811B open [] Q1E11MOV8812B open	7.13 Perform the following. 7.13.1 Stop the running B train CHG PUMP. 7.13.2 Proceed to step 7.17.

Step 7 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
7.14	Close RHR to RCS HOT LEGS XCON Q1E11MOV8887B.	
7.15	Start 1B RHR PUMP. RHR PUMP [] 1B amps > 0	7.15 Perform the following. 7.15.1 Stop the running B train CHG PUMP. 7.15.2 Proceed to step 7.17.
7.16	Verify B Train LHSI flow - STABLE. 1B RHR HDR FLOW [] FI 605B	

****

CAUTION: The charging pumps should be stopped if RCS pressure rises to greater than their shutoff head.

****

****

CAUTION: The charging pump miniflows should NOT be reopened to satisfy miniflow criteria while the charging pump suctions are aligned to the RHR pumps.

****

Step	Action/Expected Response	Response NOT Obtained
7.17	Verify charging pump miniflow valves - CLOSED. 1A(1B,1C) CHG PUMP MINIFLOW ISO [] Q1E21MOV8109A [] Q1E21MOV8109B [] Q1E21MOV8109C CHG PUMP MINIFLOW ISO [] Q1E21MOV8106	

Step 7 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

7.18 Verify seal return flow valves - CLOSED.

RCP SEAL WTR
RTN ISO
[] Q1E21MOV8100 closed
[] Q1E21MOV8112 closed

7.19 IF 1A RHR PUMP started, THEN align charging pump suction header isolation valves based on 1B charging pump status.

1B Charging Pump Status	Aligned As A Train pump	Aligned As B Train pump	Not Available
CHG PUMP SUCTION HDR ISO Q1E21MOV	[] 8130A open [] 8130B open [] 8131A closed [] 8131B closed	[] 8130A closed [] 8130B closed [] 8131A open [] 8131B open	[] 8130A closed [] 8130B closed [] 8131A closed [] 8131B closed

Response NOT Obtained:

7.19 IF 1A RHR PUMP NOT started, THEN perform the following.

7.19.1 Verify the A train CHG PUMP stopped.

7.19.2 Proceed to step 7.23.

7.20 Open RHR supply to A train charging pump suction.

1A RHR HX
TO CHG PUMP SUCT
[] Q1E11MOV8706A

Response NOT Obtained:

7.20 Perform the following.

7.20.1 Stop the running A train CHG PUMP.

7.20.2 Proceed to step 7.23.

7.21 Verify VCT level - GREATER THAN 5%.

Step 7 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
7.22	Close A train RWST to charging pump header valve. RWST TO CHG PUMP [] Q1E21LCV115B	7.22 Perform the following. 7.22.1 Stop the running A train CHG PUMP. 7.22.2 Close RHR supply to A train charging pump suction. 1A RHR HX TO CHG PUMP SUCT [] Q1E11MOV8706A
7.23	<u>IF</u> 1B RHR PUMP started, <u>THEN</u> align charging pump suction header isolation valves based on 1B charging pump status.	7.23 <u>IF</u> 1B RHR PUMP <u>NOT</u> started, <u>THEN</u> perform the following. 7.23.1 Verify the B train CHG PUMP stopped. 7.23.2 Proceed to step 7.27.

1B Charging Pump Status	Aligned As A Train pump	Aligned As B Train pump	Not Available
CHG PUMP SUCTION HDR ISO Q1E21MOV	[] 8130A open [] 8130B open [] 8131A closed [] 8131B closed	[] 8130A closed [] 8130B closed [] 8131A open [] 8131B open	[] 8130A closed [] 8130B closed [] 8131A closed [] 8131B closed

Step	Action/Expected Response	Response NOT Obtained
7.24	Open RHR supply to B train charging pump suction. 1B RHR HX TO CHG PUMP SUCT [] Q1E11MOV8706B	7.24 Perform the following. 7.24.1 Stop the running B train CHG PUMP. 7.24.2 Proceed to step 7.27.
7.25	Verify VCT level - GREATER THAN 5%.	

Step 7 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
7.26	Close B train RWST to charging pump header valve. RWST TO CHG PUMP [] Q1E21LCV115D	7.26 Perform the following. 7.26.1 Stop the running B train CHG PUMP. 7.26.2 Close RHR supply to B train charging pump suction. 1B RHR HX TO CHG PUMP SUCT [] Q1E11MOV8706B 7.26.3 Proceed to step 7.27.

****

CAUTION: Injecting through 'A' train and 'B' train flowpaths simultaneously with only one charging pump running could result in pump runout conditions. Therefore, in Step 7.27 RNO the HHSI valves should be closed without delay after MOV8885 is opened.

****

Step	Action/Expected Response	Response NOT Obtained
7.27	Check one CHG PUMP in each train - STARTED. [] A train (1A or 1B) amps > 0 [] B train (1C or 1B) amps > 0	7.27 IF an A train CHG PUMP started, THEN proceed to step 7.29 IF NOT, establish B train injection per the following. 7.27.1 Open charging pump recirculation to RCS cold legs valve. CHG PUMP RECIRC TO RCS COLD LEGS [] Q1E21MOV8885 7.27.2 Close HHSI isolation valves. HHSI TO RCS CL ISO [] Q1E21MOV8803A [] Q1E21MOV8803B 7.27.3 Proceed to step 7.29.

Step 7 continued on next page.

Step | Action/Expected Response | Response NOT Obtained

7.28 Open charging pump recirculation to RCS cold legs valve.

CHG PUMP RECIRC
TO RCS COLD LEGS
[] Q1E21MOV8885

7.29 Align charging pump discharge header isolation valves based on 1B charging pump status.

1B Charging Pump Status	Aligned As A Train pump	Aligned As B Train pump	Not Available
CHG PUMP DISCH HDR ISO Q1E21MOV	[] 8132A open [] 8132B open [] 8133A closed [] 8133B closed	[] 8132A closed [] 8132B closed [] 8133A open [] 8133B open	[] 8132A closed [] 8132B closed [] 8133A closed [] 8133B closed

7.30 Verify SI flow - STABLE.

A TRN
HHSI FLOW
[] FI 943

HHSI
B TRN RECIRC
FLOW
[] FI 940

1A(1B)
RHR HDR
FLOW
[] FI 605A
[] FI 605B

7.30 IF at least one train of flow from the containment sump to the RCS can NOT be established or maintained, THEN go to FNP-1-ECP-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION.

At this point FRP's would be entered if any were applicable. SI flow has be placed on recirculation and flow is stable. FRP's are now the highest priority if any are required. The Caution at the beginning of the procedure states that no FRP should be implemented until step 7 is complete.

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.

TRANSFER TO COLD LEG RECIRCULATION
Plant Specific Background Information

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.

68. G2.4.25 068/BANK//MEM 3.3/3.7/APE067AA1.07////B

The following conditions exist on UNIT 1.

- MH1, FIRE, annunciator on the Unit 1 Main Control Board is in alarm and is LIT solid (NOT flashing).
- The Control Room Fire Alarm Panel has a single window in alarm, which contains the following information:

**"Aux Bldg El 139 W Side
Det 1A-39, 43, 46, 53
1A-55, 59, 106"**

- At the PYR-A-LARM Panel, the window for 1A-59 panel is lit.

Which one of the following describes the **MINIMUM** actions required to enable MH1, FIRE, to reflash for a fire detection system actuation in zone 1A-106 per SOP-0.4, Fire Protection Administration Procedure?

A. The Control Room Fire Alarm Panel must be acknowledged,
and
Zone 1A-59 placed in OVERRIDE at the PYR-A-LARM Panel.

B✓ The Control Room Fire Alarm Panel must be acknowledged,
and
the Local Reflash Panel alarm for detection system 1A-59 must be acknowledged.

C. ONLY the Control Room Fire Alarm Panel must be acknowledged.

D. ONLY the Local Reflash Panel alarm for detection system 1A-59 must be acknowledged.

SOP-0.4, section 3 contains the following Caution:

"To **allow the MCB Fire Alarm MH1 to reflash and inform the operator of subsequent** fire alarms, the reflash panels (T**he one on the 121' AND the Control Room Fire Alarm Panel**) MUST be acknowledged for an alarming DETECTION System."

OPS-52108K - 40103D-ESP-52108K

FIRE ALARM PANELS

The PYR-A-LARM panel [...] provides a local audible alarm [...] and alarms the Control Room Fire Alarm Panel which in turn causes MCB annunciator MH1, FIRE, to alarm. Some alarms on the control room fire alarm panel receive several inputs from the PYR-A-LARM panel. Because of this, local reflash panels are provided [...] to allow individual alarms which input to common fire alarm panel alarms to be acknowledged. **In order for the MCB annunciator MH1 to reflash** [...], **the fire alarm panel alarms must be acknowledged**. Fire alarm panel alarms **with multiple inputs cannot be acknowledged until individual alarms are acknowledged on the reflash panel(s)**. [..]

To alert the operator to another problem the follwoing must occur:

- **The Reflash Panel alarm for detection system 1A-59** must be acknowledged.
- The **control room fire panel must be acknowledged**.
- Once these actions are completed, annunciator MH1, FIRE, will clear and will alarm again if additional smoke/fire is detected.

A. Incorrect Plausible: This switch is operated per Attachment 4 of SOP-0.4, which will attempt to reset the zone. Placing Zone 1A-59 in OVERRIDE will discontinue the Alarm condition out of the PYR-A-Larm panel to the REFLASH panel, **HOWEVER, until the REFLASH panel is acknowledged, the signal remains continuous to the Control Room Fire Alarm panel.** This feature is to prevent momentary actuation of a Fire Zone from becoming a nuisance in the MCR.

B. Correct - The control room Fire Alarm Panel must be acknowledged and the Reflash Panel alarm for detection system 1A-59 must be acknowledged.

C. Incorrect See above; This action will Clear the MH1 annunciator window and allow it to reflash **if a zone OTHER than 1A-39, 43, 46, 53 1A-55, 59, 106**, but MH1 would **not reflash for Zone A106 UNTIL the LOCAL Reflash Panel is ALSO acknowledge** (permitting the CONTROL ROOM Panel to "reflash")

D. Incorrect See above; This action will Clear the input to the Control Room Fire Panel from the REFLASH panels, HOWEVER, the Control Room Fire Panel also "remembers" its LAST Alarm condition until acknowledge by the operator.

G2.3.4

2.3 Radiation Control

2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions. (CFR: 41.12 / 43.4 / 45.10) |
IMPORTANCE RO 3.2 SRO 3.7

Importance Rating:	3.2 / 3.7
Technical Reference:	FNP-0-EIP-14 v25
References provided:	None
Learning Objective:	STATE AND DETERMINE the actions to be taken by the re-entry personnel if dose rates during re-entry exceed the dose limits given. (OPS40105B09).
Question origin:	Modified from FNP BANK EPIP PERS-40501B09 11
Basis for meeting K/A:	K/A is met by testing candidate's knowledge of radiation dose limits during an emergency.
SRO justification:	N/A

2.23 A DOOR CONTROL APPROVAL FORM should be posted on or adjacent to fire doors, propped open for extended periods (Ref. FNP-0-SOP-0.0 for guidance regarding Control of Specific Purpose Doors).

2.24 IF the door to a battery room is left open OR unlocked, THEN continuously station an individual at the door to prevent entry into the battery rooms by unqualified personnel. Reference OSHA requirement "1910.269(u)(4)(iv), entrances to rooms and spaces that are not under the observation of an attendant shall be kept locked." (Ref. FNP-0-SOP-0.0 for guidance regarding Control of Specific Purpose Doors)

2.25 IF desired to place Halon Systems in Override, THEN refer to FNP-1/2-SOP-61.4.Placing the system in override precludes discharge of the Halon, but does not prevent closure of room fire dampers upon actuation of the fire detection system. Disarming the fire dampers can be accomplished by opening the associated supply breakers. For example, the breakers for the Unit 1 and Unit 2 CRDM rooms are N1R19L006-N-BKR1 and N2R19L006-N-BKR1, respectively. (CR2007112794)

2.26 PYRO Panel RESET/OVERRIDE switch manipulation can cause the clapper to trip if relays associated with the system are not given time to complete the action specified by the particular switch position. The 10 second pause specified during reset operation is sufficient to preclude system actuation. The 30 second pause gives the operator time to walk down the panel to determine if systems are tripped before returning the panel to NORMAL.

2.27 Any Fire Protection System / Component that has not been tested IAW the appropriate test procedure (FSP), or within the assigned surveillance period (frequency plus grace), must be treated as if it has failed the surveillance. The system must be declared inoperable and appropriate compensatory actions taken as delineated in this procedure. The Plant Fire Marshall should be contacted to evaluate an exception that may be considered applicable. (CR 2009112288)

2.28 In lieu of fire watch requirements listed in this procedure, alternative compensatory measures for degraded or inoperable fire doors may be employed using the guidance of NMP-ES-035-005 when appropriate. Compensatory measures are intended to be used until permanent corrective actions can be implemented.

2.29 In lieu of writing LCOs, as described in 2.1 and 2.2 of this procedure, for conditions that do not constitute an actual inoperable condition or a significant degradation that could lead to an inoperable condition and as such needs to be tracked by an LCO, a turnover note can be entered in the Fire Protection Administration database. These notes are similar in intent to Admin Tracking Items used by the Shift Supervisor to track general plant conditions.

3.0 Main Control Room Fire Alarm Panel

CAUTION: **To allow the MCB Fire Alarm MH1 to reflash and inform the operator of subsequent fire alarms, the reflash panels (The one on the 121' AND the Control Room Fire Alarm Panel) MUST be acknowledged for an alarming DETECTION System.**

3.1 WHEN a fire alarm is received on the control room fire alarm panel, THEN the PO should immediately check the alarm panel to determine the affected fire alarm zone and acknowledge the panel.
(This allows clearing the MCB MH1 Fire Alarm.)

3.2 IF the fire alarm is any containment fire alarm, THEN proceed to Section 8.5 of this procedure, AND after completing action of 8.5 then return to this section and continue.

NOTE: **Acknowledging the local reflash panel on the 121', allows the operator to acknowledge the Control Room Fire Alarm Panel Window with multiple inputs.**

3.3 Dispatch an SO to the Pyro Panel to determine the alarming fire detection zone and acknowledge the local reflash unit if applicable.
(gray box – N1/2V43L004 or L005).

NOTE: **For a fire alarm within a protected area boundary, per FNP-0-EIP-9.2, HU2, a fire alarm can be disproved by personnel observation of the affected area OR by resetting the Pyro Panel for that alarm when making determinations of a NOUE. To reset the Pyro Panel alarm in a timely manner for NOUE determinations, the Pyro Panel alarm can be reset without the time consuming step of ensuring the clapper is tripped (step 3.4). After NOUE determination is complete, steps not previously performed should be done, if applicable.**

3.4 IF the alarming zone has resulted in the tripping of a fire suppression clapper, THEN prior to resetting the alarm at the Pyro Panel an SO will be dispatched to the tripped clapper in accordance with ATTACHMENT 2.

3.5 The SO should attempt to reset the Pyro Panel Alarm per ATTACHMENT 4 step 2.0.

- IF the fire detection alarm resets, THEN the PO will dispatch personnel to the affected zone to investigate for causes of the spurious alarm.

CAUTION: When dispatching personnel to investigate the cause of a fire alarm, remind them to approach the area using extreme caution and to not enter an area if it is deemed unsafe. Also, they should consider the potential reduced quality of the atmosphere in an area prior to entering. (AI 2009202203)

3.6 IF a Pyro Panel alarm will NOT reset, THEN the PO shall take the following actions:

3.6.1 Immediately dispatch personnel to investigate for causes of the alarm.

3.6.2 Immediately notify the SS and Fire Protection Administrator of the alarm condition for determination of Fire Protection Administrative LCO and fire watch requirements.

3.6.3 The PO will enter the time and fire alarm zone in the Plant Operator's log.

CAUTION: If the normal AC power supply is to be de-energized, the halon systems will be inoperable.

NOTE: Attachment 3 contains a numbered information list concerning the pyro panel power supplies and alarms.

4.0 **Pyrotronics Alarm Panel**

NOTE: For a fire alarm within a protected area boundary, per FNP-0-EIP-9.2, HU2, a fire alarm can be disproved by personnel observation of the affected area OR by resetting the Pyro Panel for that alarm when making determinations of a NOUE. To reset the Pyro Panel alarm in a timely manner for NOUE determinations, the Pyro Panel alarm can be reset without the time consuming steps of (1) ensuring the clapper is tripped (ATTACHMENT 2), and (2) walking down the applicable detection zone of another system alarm occurring while resetting the first alarm (ATTACHMENT 4). After NOUE determination is complete, steps not previously performed should be done, if applicable.

4.1 IF operation of the Pyro Panel is required while performing FSP-307, THEN go to ATTACHMENT 4 step 6.0

4.2 This section assumes that there is no inoperable fire barriers involved with the alarming fire detection zone.

4.3 IF the fire alarm is any containment fire alarm, THEN proceed to Section 8.5 of this procedure, AND after completing action of 8.5 then return to this section and continue.

4.4 WHEN a fire detection zone alarms on the Pyro Panel, THEN the panel should be checked immediately.

NOTE: The local reflash unit must be acknowledged to allow reflash on the control room fire alarm panel for any zones on the local reflash unit that subsequently alarm. (Gray boxes N1V43L004, N1V43L005, N2V43L004 & N2V43L005)

4.4.1 A System Operator (SO) will be dispatched to determine which zone is in alarm and acknowledge the local reflash unit, if applicable

NOTE: For a fire alarm within a protected area boundary, per FNP-0-EIP-9.2, HU2, a fire alarm can be disproved by personnel observation of the affected area OR by resetting the Pyro Panel for that alarm when making determinations of a NOUE. To reset the Pyro Panel alarm in a timely manner for NOUE determinations, the Pyro Panel alarm can be reset without the time consuming step of ensuring the clapper is tripped (step 4.4.2). After NOUE determination is complete, steps not previously performed should be done, if applicable.

4.4.2 IF the alarming zone has resulted in the tripping of a fire suppression clapper, THEN prior to resetting the alarm at the Pyro Panel, a SO will be dispatched to the tripped clapper per ATTACHMENT 2

4.4.3 The SO will attempt to reset the Pyro Panel alarm in accordance with ATTACHMENT 4

4.4.4 IF the alarm will reset, THEN the PO will dispatch personnel to the affected zone to investigate for causes of the spurious alarm. It is realized spurious alarms will occur and repeated investigations will be performed based upon SS judgment. Action may be taken in accordance with section 8.0 to maintain the alarm clear if deemed necessary by the SS.

CAUTION: When dispatching personnel to investigate the cause of a fire alarm, remind them to approach the area using extreme caution and to not enter an area if it is deemed unsafe. Also, they should consider the potential reduced quality of the atmosphere in an area prior to entering. (AI 2009202203)

4.4.5 IF the Pyro Panel alarm will NOT reset, THEN the following actions will be taken:

4.4.5.1 The PO will dispatch personnel to the affected zone to investigate for causes of the alarm.

4.4.5.2 The time and fire detection zone will be recorded in the Plant Operator's log.

4.4.5.3 The PO will immediately inform the SS and Fire Protection Administrator who will determine the Fire Protection Administrative LCO and fire watch requirements based on the area affected and whether or not there are any inoperable fire barriers in the area. Refer to Table 1 to determine the areas affected and fire watch requirements.

ATTACHMENT 4

PYRO PANEL OPERATION

1.0 Purpose: This attachment provides guidance for field operations of the Pyro panel and is generic to both units.

CAUTION:

- **The middle position (marked override) serves as a "MASTER OVERRIDE" for all preaction sprinkler systems connected to the Pyro Panel. In the override position, areas protected by a preaction sprinkler system will have alarm capability only. The sprinkler system will not actuate until the switch is returned to the normal position.**
- **The switch manipulation can cause the clapper to trip if relays associated with the system are not given time to complete the action specified by the particular switch position. The 10 second pause specified below is sufficient to preclude system actuation.**
- **The 30 second pause is just to give the operator time to walk down the panel to determine if systems are tripped.**

2.0 Pyro Panel Operations--Resetting a Pyro Panel Alarm.

2.1 Open the main panel door.

- N1V43G082 for Unit One
- N2V43G082 for Unit Two

2.2 Find the key hanging just below the keyswitch.

2.3 Insert the key and turn to the right to place the switch in the OVERRIDE position.

2.4 Pause at least 10 seconds in the OVERRIDE position.

2.5 Turn the key to the right to place the switch in the RESET position.

2.6 Pause at least 10 seconds in the RESET position.

2.7 Verify that all Pyro Panel light are illuminated.

2.8 IF all Pyro Panel lights are not illuminated, THEN replace any blown bulbs.

2.9 Turn the key to the left to place the switch back in the OVERRIDE position.

2.10 The switch must be maintained a minimum of 30 seconds in the OVERRIDE position.

2.11 While in the OVERRIDE position, walk the pyro panel down to ensure that no additional alarms have been received while the key is in the OVERRIDE position.

NOTE: Taking the system switch from the OVERRIDE position to the NORMAL position will cause the associated clapper to trip if its detection system is in alarm. The intent of the next step is to ensure that if an additional alarm has been received, then its cause is investigated prior to going back to the NORMAL position thus tripping its associated clapper. IF a clapper has already been tripped and the detection system is in alarm, THEN it is permissible to go back to NORMAL since the clapper is already in the tripped condition.

2.12 IF another system alarms during operation of the MASTER OVERRIDE/RESET SWITCH, THEN investigate the cause prior to placing the switch in the NORMAL position.

2.12.1 Observe which annunciator window lit at the Fire Protection Alarm Panel.

NOTE: For a fire alarm within a protected area boundary, per FNP-0-EIP-9.2, HU2, a fire alarm can be disproved by personnel observation of the affected area OR by resetting the Pyro Panel for that alarm when making determinations of a NOUE. To reset the Pyro Panel alarm in a timely manner for NOUE determinations, the Pyro Panel alarm can be reset without the time consuming steps of walking down the applicable detection zone of another system which alarms while resetting the first alarm, to determine which detector fired (step 2.12.2 and first part of step 2.12.3). After NOUE determination is complete, steps not previously performed should be done, if applicable.

2.12.2 Walk down applicable detection zone to determine which detector fired.

2.12.3 AFTER it is noted which detector fired, THEN turn the key to the right to place the switch in the RESET position.

2.12.4 IF the alarm clears, THEN return to Step 2.6.

2.12.5 IF the alarm does not clear, THEN contact the SS or FPA for resolution.

2.13 Turn the key to the left to place the switch back in the NORMAL position.

2.14 Remove the key and return it to original hanging position.

2.15 After resetting, or attempting to reset, the SO will ensure that the affected local reflash unit alarms are acknowledged/reset, as appropriate.

3.0 Pyro Panel Operations-- Placing a Suppression System in Override

3.1 Place the system override key into the appropriate suppression system slot.

3.2 Push Key Inward to Engage the Switch.

3.3. Turn the override key 1/8 turn to the right.

3.4 Check the bulb for that system illuminated, indicating the system is in override.

3.5 <u>IF</u> the system bulb does not illuminate, <u>THEN</u> perform the following:

3.5.1 Stop procedure.

3.5.2 Push Key Inward and THEN turn Override key 1/8 turn to the left to the normal position.

3.5.3 Replace bulb.

3.5.4 Push Key Inward to Engage the Switch.

3.5.5 Turn the override key 1/8 turn to the right.

3.5.6 <u>IF</u> system bulb illuminates, <u>THEN</u> go to Step 3.6.

3.5.7 <u>IF</u> system bulb still does not illuminate, Push the key inward and <u>THEN</u> turn Override key to the left to the normal position.

3.5.8 Place job request on hold.

3.5.9 Resolve the problem.

3.5.10 <u>WHEN</u> the problem is resolved, <u>THEN</u> continue procedure from appropriate step.

3.6 Remove override key.

FIRE ALARM PANELS

Basic Arrangement

Several fire alarm panels working in conjunction with each other ensure that in the event of a fire, plant personnel can effectively identify its location. The PYR-A-LARM panel (also referred to as the "Pyro" panel) on the 121′ non rad side of the Unit 1 and Unit 2 Auxiliary Buildings provides a local audible alarm if a fire occurs as well as a visual indication of which fire protection system is affected.

Alarms from the PYR-A-LARM panel input into a fire alarm panel located in the control room. An alarm on the control room panel causes MCB annunciator MH1, FIRE, to alarm. Some alarms on the control room fire alarm panel receive several inputs from the PYR-A-LARM panel. Because of this, local reflash panels are provided on the 121′ elevation near the PYR-A-LARM panel to allow individual alarms which input to common fire alarm panel alarms to be acknowledged. In order for the MCB annunciator MH1 to reflash if another alarm occurs, the fire alarm panel alarms must be acknowledged. Fire alarm panel alarms with multiple inputs cannot be acknowledged until individual alarms are acknowledged on the reflash panel(s). It is important to remember this fact when responding to a fire alarm (MH1). Alarms on both the fire alarm panel and reflash panel (if applicable) must be acknowledged in order to ensure that all fire detection system alarms are received in the control room.

Example: One of the alarms on the fire panel in the control room is "Aux Building Elev. 139′ West Side". This one alarm receives input from 12 separate detection systems. If smoke were detected outside the 139′ cable spreading room, detector system 1A-59 would come into alarm. This would set off the alarm at the PYR-A-LARM panel, light the 1A-59 window on the PYR-A-LARM panel, and cause the Aux Building Elev. 139′ West Side window to alarm on the control room fire panel, which in turn causes MCB annunciator MH1 to alarm.

In order to allow one of the remaining 11 detection systems, which input to the 139′ West Side alarm, to alert the operator to another problem the following must occur:

- The Reflash Panel alarm for detection system 1A-59 must be acknowledged - usually the Rover's responsibility.
- The Aux Building Elev. 139′ West Side alarm on the control room fire panel must be acknowledged - usually the unit operator's responsibility.

- Once these actions are completed, annunciator MH1, FIRE, will clear and will alarm again if additional smoke/fire is detected.

CR 2008100501 addresses the necessary attention to detail required when responding to fire alarms received in the control room. MH1 fire alarm came in, and it was noted that 1SW-111 was in alarm at the PYR-A-LARM panel. The Outside SO was dispatched to the SWIS and the rover was dispatched to the PYR-A-LARM panel. The Outside SO noted all three clappers tripped at SWIS, and no fire existed. The PYR-A-LARM panel was reset, and this was communicated to the UO. The UO acknowledged the BOP fire protection panel and the MCB MH1 was reset. A few minutes later MH1 alarmed again, and the UO went to the BOP and noted two windows were in alarm, the suppression alarm for 1SW-111 and the detection alarm window for 1SW-111. The UO indicated that he felt both windows were in alarm due to the suppression system clappers being tripped. He did not recognize that the one window was labeled detection, and therefore he did not dispatch the rover to PYR-A-ALARM panel in an attempt to reset the panel again. The UO acknowledged the BOP panel, and cleared MH1. When the second alarm actuated the SO was at SWIS performing actions of the tripped clappers and no fire was noted in the area. During the SS control room walkdown at shift change it was noted that both the suppression and detection windows were both in solid for 1SW-111, and recognized this was different than expected since the SS thought that detection was reset. The Rover was dispatched to the PYR-A-LARM panel and found 1SW-111 detection in alarm and the reflash light for 1SW-111 flashing. An attempt was made to reset the panel and 1SW-111 detection would not reset. At this point 1SW-111 detection was declared inoperable and the appropriate LCO and fire watches were established. The requirement for an hourly fire watch was missed from the time the second fire detection alarm came in until the time it was recognized that the detection alarm was in (~ five hours).

Annunciator MH1 Actions

Automatic Action

Based on the location and magnitude of the fire one or more of the following may occur:

The Low Pressure CO_2 System automatically discharges into the affected area.

Preaction Sprinkler Systems actuate in the affected area.

Halon System automatically discharges into the affected area.

69. G2.4.46 069/NEW/RO/C/A 4.2/4.2/G2.4.46/N///C

Unit 1 has had a Reactor trip and Safety Injection actuation with the following conditions:

- A LOCA has occurred in containment.
- EEP-0, Reactor Trip or Safety Injection, is in progress.
- RCS pressure is 1100 psig and stable.
- Containment pressure is 12 psig and slowly rising.

Which one of the following is an annunciator that is expected to be in alarm at this time?

A. MCB alarm JH1, 1A SG MSIV CLOSED

B. MCB alarm CD1, 1A ACCUM PRESS HI-LO

C.✓ MCB alarm HD2, PRZR PRESS SI PORV BLOCK P-11

D. BOP alarm LB3, RCP THRM BARR ISO HV-3184 AIR PRESS LO

Candidate must evaluate plant conditions to determine what automatic actuations have occurred and what setpoints have been reached to determine the correct answer.

A. Incorrect - A MSIV closure signal would be generated at a Containment pressure of 16.2 psig, Hi Steam Flow w/ Lo Lo Tavg, or 585 psig on 2 of 3 SG's. None of these conditions are present.

B. Incorrect - This alarm comes in at 605 psig decreasing. Candidate may think that Accumulators will dump simply because there is a LOCA, without evaluating RCS pressure.

C. Correct - This alarm comes in at an RCS pressure of 2000 psig decreasing.

D. Incorrect - This alarm occurs when HV-3184 gets an auto close signal. This valve closes on a Phase B actuation (27 psig in Ctmt), but candidate may think it closes on a Phase A (4 psig in Ctmt).

G2.4.46

2.4 Emergency Procedures

2.4.46 Ability to verify that the alarms are consistent with the plant conditions.
(CFR: 41.10 / 43.5 / 45.3 / 45.12)
IMPORTANCE RO 4.2 SRO 4.2

Importance Rating:	4.2 / 4.2
Technical Reference:	FNP-1-ARP-1.8 v35
References provided:	None
Learning Objective:	DEFINE AND EVALUATE the operational implications of normal / abnormal plant or equipment conditions associated with the safe operation of the Plant Design and ESF components and equipment to include the following (OPS-52102J02): Normal Control Methods Abnormal and Emergency Control Methods Automatic actuation including setpoints (examples - SI, Phase A, Phase B, MSLIAS, LOSP or SG level) Actions needed to mitigate the consequence of the abnormality
Question origin:	NEW
Basis for meeting K/A:	K/A is met by testing candidate's ability to determine which alarms are expected for a given set of plant conditions.
SRO justification:	N/A

LOCATION JH1

H1
1A SG MSIV CLOSED

SETPOINT: Not Applicable

ORIGIN: Relay Contact 2X located in solenoid control circuit for the following valves:
a) 1-MS-HV-3369A
b) 1-MS-HV-3370A

If Containment pressure were > 16.2 psig, this alarm would be lit.

PROBABLE CAUSE

1. Handswitch for one or both Main Steam Line 1A Isolation Valves positioned to close.
2. Actuation of a Main Steam Line Isolation Signal.

AUTOMATIC ACTION

1. Turbine Trip.
2. Main Generator Trip after 30 seconds.

OPERATOR ACTION

1. IF below P-9 AND the turbine was on line, THEN perform the actions required by FNP-1-AOP-3.0, TURBINE TRIP BELOW P-9 SETPOINT.
2. IF a reactor trip occurred OR above P-9 setpoint, THEN perform the actions of FNP-1-EEP-0, REACTOR TRIP OR SAFETY INJECTION.
3. Verify 1A SG FRV maintains 1A SG level at the fixed reference level.
4. IF a reactor trip did not occur, THEN:
   A) Verify 1A SG atmospheric maintaining 1A SG Pressure < safety setpoint (1075 PSIG).
   B) IF atmospheric relief unable to maintain 1A SG Pressure < safety setpoint (1075 PSIG), THEN
      Attempt to lower RX power AND Tavg to reseat safety.
   C) IF safety or atmospheric valve stuck open go to AOP-14, SECONDARY SYSTEM LEAKAGE.
5. Notify appropriate personnel to determine and correct the cause of the Main Steam Isolation Valve closure.
6. Shutdown the plant to Hot Standby in accordance with FNP-1-UOP-2.1, SHUTDOWN OF UNIT FROM MINIMUM LOAD TO HOT STANDBY.

References: A-177100, Sh. 431; D-177863; D-177867; D-175033, Sh. 1; D-172722; A-181541, Sh. H2

LOCATION CD1

D1
1A ACCUM PRESS HI-LO

SETPOINT:
1. High Pressure: 645 PSIG
2. Low Pressure: 605 PSIG

ORIGIN:
1. High Pressure
   a) PY/921A from (N1E21PT921)
   b) PY/923A from (N1E21PT923)
2. Low Pressure
   a) PY/921B from (N1E21PT921)
   b) PY/923B from (N1E21PT923)

NOTE: This annunciator has REFLASH capability.

If RCS pressure were < 600 psig, this alarm would be lit.

PROBABLE CAUSE

1. High Pressure
   a) In Leakage from the Nitrogen supply.
   b) In Leakage from the Reactor Coolant System.
   c) Increase in containment temperature (possible seasonal effect)
2. Low Pressure
   a) Accumulator Nitrogen Vent leakage.
   b) Accumulator Sample Valve leakage.
   c) Accumulator Piping leakage.
   d) Decrease in containment temperature (possible seasonal effect)

AUTOMATIC ACTION

NONE

LOCATION HD2

SETPOINT: 1. 2000 PSIG

D2
PRZR PRESS SI PORV BLOCK P-11

ORIGIN: 1. Pressure Bistable PB-455B, PB-456B and PB-457B from Pressure Transmitters PT-455, PT-456, and PT-457.
2/3 Detectors

This alarm is lit because RCS pressure is < 2000 psig.

PROBABLE CAUSE

1. Normal Primary System cooldown.
2. Primary Coolant leak.

AUTOMATIC ACTION

NOTE: Power Operated Relief Valves can be operated in Manual.

1. PRZR PORVs Q1B31PCV444B and Q1B31PCV445A are automatically blocked to prevent opening on decreasing pressure.

OPERATOR ACTION

1. Check pressurizer pressure indications and determine the actual pressure.
2. IF an instrument failure has occurred, THEN go to FNP-1-AOP-100, INSTRUMENT MALFUNCTION.
3. IF the alarm is NOT due to plant cooldown OR a primary coolant leak is indicated, THEN perform the actions required by the appropriate AOP or EEP:
   a) FNP-1-EEP-0, REACTOR TRIP OR SAFETY INJECTION.
   b) FNP-1-AOP-1.0, RCS LEAKAGE.
   c) FNP-1-AOP-2.0, STEAM GENERATOR TUBE LEAKAGE.
4. IF the alarm occurred as a result of reducing pressure during a normal plant cooldown, THEN BLOCK the pressurizer pressure safety injection in accordance with FNP-1-UOP-2.2, SHUTDOWN OF UNIT FROM HOT STANDBY TO COLD SHUTDOWN.

References: A-177100, Sh. 372; U-260610; U-198768; D-177381; U-266647 PLS Document

LOCATION LB3

B3	
	RCP THRM BARR ISO HV-3184 AIR PRESS LO

SETPOINT: 40 PSIG

ORIGIN: Component Cooling Water return from RCP Thermal Barrier valve Control Air Pressure Switch Q1P17PSL3184D-N.

If Containment pressure were > 27 psig, this alarm would be lit.

PROBABLE CAUSE

1. Loss of Instrument Air.
2. Improper Instrument Air valve lineup.
3. Air leak.
4. Valve cycled remotely by operator action.

AUTOMATIC ACTION

NONE

OPERATOR ACTION

1. IF a loss of Instrument Air has occurred, THEN refer to FNP-1-AOP-6.0, LOSS OF INSTRUMENT AIR.
2. Check indications and determine if CCW FROM RCP THRM BARR Q1P17HV3045 is open or closed.
3. IF valve Q1P17HV3184 is closed due to other than OPERATOR action, THEN attempt to open valve.
4. IF valve will NOT open, THEN closely monitor the following
   - seal injection water flows
   - seal injection water temperatures
   - RCP lower bearing temperatures.

NOTE: Proper RCP Seal Injection Water flow and Seal Injection Water temperature should provide adequate cooling for the RCP's Seals and Lower Bearings. The RCP and seals are designed for continued operation under this condition. However, CCW should be restored as quickly as possible to mitigate the risk of a loss of all seal cooling condition.

5. IF a loss of all RCP seal cooling to any RCP has occurred, THEN refer to FNP-1-AOP-4.1, ABNORMAL REACTOR COOLANT PUMP SEAL LEAKAGE.
6. Notify appropriate personnel to determine and correct the cause for the low air pressure.
7. IF an improper Instrument Air valve lineup exists, THEN correct the valve lineup.

LOCATION LB3

OPERATOR ACTION (continued)

8. IF a High ΔP is suspected, THEN refer to Alternate Method of Opening CCW FROM RCP THRM BARR Q1P17HV3045 (Q1P17HV3184) with High ΔP Suspected (OR 2-99-603) in FNP-1-SOP-23.0.
9. Reopen valve Q1P17HV3184 as soon as possible.

References: D-177391, Sh.2; D-177855; D-175002

70. WE03EK2.1 070

The following conditions exist on Unit 1:

- A LOCA has occurred.
- The crew is performing ESP-1.2, Post LOCA Cooldown and Depressurization.
- RCS cooldown to cold shutdown is in progress.
- The crew is reducing RCS pressure to refill the pressurizer.

Which one of the following would indicate to the crew that voiding in the RCS is occurring?

A.✓ LI-460, PRZR LVL, rapidly increasing.

B. PI-402, RCS WR PRESS, rapidly increasing.

C. FI-943, A TRAIN HHSI FLOW, rapidly decreasing.

D. TI-2301, CORE EXIT THERMOCOUPLE MONITOR, rapidly decreasing.

During an RCS depressurization, there is potential for voiding in the RCS, especially while in natural circulation conditions. The voiding is due to the RCS being at or near saturation conditions, and the Core Exit and upper head area at a potentially higher temperature. Void formation causes Pressurizer level to rise rapidly.

A. Correct - Voiding causes water to be displaced in the RCS which shows up as an increase in pressurizer level.

B. Incorrect - Increasing RCS pressure would suppress voiding in the RCS. Plausible for the same reason as A.

C. Incorrect - Decreasing SI flow would be indicative of a pressure increase which is inconsistent with voiding in the RCS. Plausible because candidate may think that the expansion of a void bubble and Pzr level rising would cause pressure to rise, thereby reducing HHSI flow.

D. Incorrect - Plausible because the candidate may think that during void formation, there will be less heat transfer and temperature will go down rapidly. Due to saturation conditions during void formation, temperature should stay approximately the same.

WE03EK2.1

E03 LOCA Cooldown and Depressurization

EK2. Knowledge of the interrelations between the (LOCA Cooldown and Depressurization) and the following:
(CFR: 41.7 / 45.7)
EK2.1 Components, and **functions of control** and safety systems, including **instrumentation,** signals, interlocks, failure modes, and automatic and manual features.
IMPORTANCE RO 3.6 SRO 4.0

Importance Rating:	3.6 / 4.0
Technical Reference:	FNP-1-ESP-1.2 v23
References provided:	None
Learning Objective:	ANALYZE plant conditions and DETERMINE the successful completion of any step in ESP-1.2, Post LOCA Cooldown and Depressurization. (OPS-52531F07)
Question origin:	MOD FNP BANK ESP-1.2-52531F07 01
Basis for meeting K/A:	K/A is met by placing candidate in a situation with a small break LOCA, performing ESP-1.2, Post LOCA Cooldown and Depressurization. The Control Room crew is reducing RCS pressure to refill the Pressurizer. Candidate must determine which Control Room indicator would provide indication of voiding of the RCS.
SRO justification:	N/A

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: To prevent pressurizer PORV failure, cycling of pressurizer PORVs should be minimized.

****

****

CAUTION: The PRT may rupture causing abnormal containment conditions while using pressurizer PORVs.

****

NOTE: Reactor vessel steam voiding may occur during pressure reduction while on natural circulation. This will cause a rapid rise in pressurizer level.

___13 **Reduce RCS pressure to refill pressurizer.**

Action/Expected Response	Response NOT Obtained
13.1 IF normal pressurizer spray available, THEN open all available normal pressurizer spray valves. 1A(1B) LOOP SPRAY VLV [] PK 444C [] PK 444D	13.1 IF any PRZR PORV available, THEN open only one PRZR PORV. IF NOT, THEN proceed to Step 13.2.
13.2 Check pressurizer level - GREATER THAN 25%{50%}.	13.2 Perform the following. 13.2.1 WHEN pressurizer level greater than 25%{50%}, THEN perform Step 13.3. 13.2.2 Proceed to Step 14. OBSERVE NOTES PRIOR TO STEP 14.

Step 13 continued on next page.

___Page Completed

70. WE03EK2.1 070/MOD/RO/C/A 3.6/4.0/W/E03EK2.1/N///A

The following conditions exist on Unit 1:

- A LOCA has occurred.
- The crew is performing ESP-1.2, Post LOCA Cooldown and Depressurization.
- RCS cooldown to cold shutdown is in progress.
- The crew is reducing RCS pressure to refill the pressurizer.

Which one of the following would indicate to the crew that voiding in the RCS is occurring?

A.✓ LI-460, PRZR LVL, rapidly increasing.

B. PI-402, RCS WR PRESS, rapidly increasing.

C. FI-943, A TRAIN HHSI FLOW, rapidly decreasing.

D. TI-2301, CORE EXIT THERMOCOUPLE MONITOR, rapidly decreasing.

During an RCS depressurization, there is potential for voiding in the RCS, especially while in natural circulation conditions. The voiding is due to the RCS being at or near saturation conditions, and the Core Exit and upper head area at a potentially higher temperature. Void formation causes Pressurizer level to rise rapidly.

A. Correct - Voiding causes water to be displaced in the RCS which shows up as an increase in pressurizer level.

B. Incorrect - Increasing RCS pressure would suppress voiding in the RCS. Plausible for the same reason as A.

C. Incorrect - Decreasing SI flow would be indicative of a pressure increase which is inconsistent with voiding in the RCS. Plausible because candidate may think that the expansion of a void bubble and Pzr level rising would cause pressure to rise, thereby reducing HHSI flow.

D. Incorrect - Plausible because the candidate may think that during void formation, there will be less heat transfer and temperature will go down rapidly. Due to saturation conditions during void formation, temperature should stay approximately the same.

WE03EK2.1

E03 LOCA Cooldown and Depressurization

EK2. Knowledge of the interrelations between the (LOCA Cooldown and Depressurization) and the following:

(CFR: 41.7 / 45.7)

EK2.1 Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

IMPORTANCE RO 3.6 SRO 4.0

Importance Rating:	3.6 / 4.0
Technical Reference:	FNP-1-ESP-1.2 v24
References provided:	None
Learning Objective:	ANALYZE plant conditions and DETERMINE the successful completion of any step in ESP-1.2, Post LOCA Cooldown and Depressurization. (OPS-52531F07)
Question origin:	MOD FNP BANK ESP-1.2-52531F07 01
Basis for meeting K/A:	K/A is met by placing candidate in a situation with a small break LOCA, performing ESP-1.2, Post LOCA Cooldown and Depressurization. The Control Room crew is reducing RCS pressure to refill the Pressurizer. Candidate must determine which Control Room indicator would provide indication of voiding of the RCS.
SRO justification:	N/A

WE03EK2.1
~~G.2.3.4~~

1. ESP-1.2-52531F07 001

Unit 1 has experienced a Loss Of Coolant Accident (LOCA). The crew is currently in ESP-1.2, Post LOCA Cooldown and Depressurization. RCS cooldown to cold shutdown is in progress and the crew has just started to reduce RCS pressure to refill the pressurizer.

Which one of the following would indicate to the crew that voiding in the RCS is occurring?

A. Rapidly decreasing Safety injection flow.

B. Rapidly increasing RCS pressure.

C. Rapidly decreasing core exit thermal couple temperature.

D.✓ Rapidly increasing pressurizer level.

A - Incorrect, Decreasing SI flow would be indicative of a pressure increase which is inconsistent with voiding in the RCS.

B - Incorrect, Increasing RCS pressure would suppress voiding in the RCS.

C - Incorrect, This is indicative of increased flow through the core.

D - Correct, Voiding causes water to be displaced in the RCS which shows up as an increase in pressurizer level.

71. WE04EK2.1 071/BANK/RO/C/A 3.5/3.9/WE04EK2.1/N///C

Given the following:

- A LOCA outside containment has occurred.
- The crew is performing the actions in ECP-1.2, LOCA Outside Containment.
- Aux Building radiation levels are stable.
- Safety Injection flow is stable.
- PZR level is offscale low.
- Aux Building sump levels are rising.
- RCS pressure is 1450 psig and lowering.

Which ONE of the following describes the status of the leak and the parameter used to make that determination per ECP-1.2?

A. Leak is isolated based on Auxiliary Building radiation levels.

B. Leak is isolated based on Safety Injection flow.

C✓ Leak is **NOT** isolated based on RCS pressure.

D. Leak is **NOT** isolated based on Auxiliary Building Sump levels.

In ECP-1.2, the only criteria for determining that the leak is isolated is to check RCS pressure rising. For the above situation, RCS pressure is not rising, so the leak is not isolated.

A. Incorrect - AB rad levels are entry conditions for ECP-1.2, but not exit conditions

B. Incorrect - SI flow will lower when leak is isolated but transition criteria is RCS pressure rising.

C. Correct - The only parameter checked to leave ECP-1.2 is RCS pressure rising. If the leak is found, the only other exit is to ECP-1.1 only after RCS pressure is checked and efforts are under way to find the leak.

D. Incorrect - AB Sump levels is not criteria used to determine that the leak is or is not isolated, although level rising is expected if leak is not isolated.

WE04EK2.1

E04 LOCA Outside Containment

EK2. Knowledge of the interrelations between the (LOCA Outside Containment) and the following:

(CFR: 41.7 / 45.7)

EK2.1 Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

IMPORTANCE RO 3.5 SRO 3.9

Importance Rating:	3.5 / 3.9
Technical Reference:	FNP-1-ECP-1.2 v7
References provided:	None
Learning Objective:	ANALYZE plant conditions and DETERMINE the successful completion of any step in ECP-1.2, LOCA Outside Containment. (OPS-52532E07)
Question origin:	Farley BANK ECP-1.2-52532E07 08, identical to question on Harris 2007 NRC Exam.
Basis for meeting K/A:	K/A is met by placing candidate in a situation with a LOCA outside Containment and based on instrumentation and indications, determine if the leak is isolated.
SRO justification:	N/A

FARLEY NUCLEAR PLANT

EMERGENCY CONTINGENCY PROCEDURE

FNP-1-ECP-1.2

LOCA OUTSIDE CONTAINMENT

PROCEDURE USAGE REQUIREMENTS-per FNP-0-AP-6	SECTIONS
Continuous Use	**ALL**
Reference Use	
Information Use	

SAFETY RELATED

Approved:

Jim L. Hunter (for)
Operations Manager

Date Issued: 04/23/07

Table of Contents

A. **Purpose**

This procedure provides actions to identify and isolate a LOCA outside containment.

B. **Symptoms or Entry Conditions**

I. This procedure is entered from the following:

a. FNP-1-EEP-0, REACTOR TRIP OR SAFETY INJECTION, step 27, on abnormal radiation in the auxiliary building due to loss of RCS inventory outside containment.

b. FNP-1-EEP-1, LOSS OF REACTOR OR SECONDARY COOLANT, step 14, if it is determined there is a loss of RCS inventory outside containment.

Step	Action/Expected Response	Response NOT Obtained
___ 1	**Verify proper valve alignment.**	

1.1 Verify RHR loop suction valves - CLOSED.

1C RCS LOOP
TO 1A RHR PUMP
[] Q1E11MOV8701A
[] Q1E11MOV8701B

1A RCS LOOP
TO 1B RHR PUMP
[] Q1E11MOV8702A
[] Q1E11MOV8702B

1.2 Verify RHR hot leg injection valve - CLOSED.

RHR TO RCS
HOT LEGS ISO
[] Q1E11MOV8889

1.3 Verify letdown isolated.

LTDN LINE
CTMT ISO
[] Q1E21HV8152 closed

LTDN ORIF ISO
45 GPM
[] Q1E21HV8149A closed

LTDN ORIF ISO
60 GPM
[] Q1E21HV8149B closed
[] Q1E21HV8149C closed

LTDN LINE
ISO
[] Q1E21LCV459 closed
[] Q1E21LCV460 closed

1.4 Verify RCP seal water return isolation valves - CLOSED.

RCP SEAL WTR
RTN ISO
[] Q1E21MOV8100
[] Q1E21MOV8112

Step 1 continued on next page.

___Page Completed

Step	Action/Expected Response	Response NOT Obtained
1.5	Verify charging pump to regenerative heat exchanger valves - CLOSED. CHG PUMPS TO REGENERATIVE HX [] Q1E21MOV8107 [] Q1E21MOV8108	
1.6	Verify containment sump pump isolation valves - CLOSED. (BOP) CTMT SUMP DISCH [] Q1G21HV3376 [] Q1G21HV3377 CTMT SUMP RECIRC [] Q1G21HV3380	
___ **2**	**Check break isolated.**	
2.1	Check RCS pressure - RISING. 1C(1A) LOOP RCS WR PRESS [] PI 402A [] PI 403A	2.1 Proceed to step 3.
2.2	Go to FNP-1-EEP-1, LOSS OF REACTOR OR SECONDARY COOLANT.	

___Page Completed

Step	Action/Expected Response	Response NOT Obtained
___ 3	**Identify source of leak.**	
3.1	Isolate A train RHR cold leg injection path. 1A RHR HX TO RCS COLD LEGS ISO [] Q1E11MOV8888A closed RHR TO RCS HOT LEGS XCON [] Q1E11MOV8887A closed	
3.2	Check RCS pressure - RISING. 1C(1A) LOOP RCS WR PRESS [] PI 402A [] PI 403A	3.2 Proceed to step 3.4.
3.3	Go to FNP-1-EEP-1, LOSS OF REACTOR OR SECONDARY COOLANT.	
3.4	Restore A train RHR cold leg injection path. 1A RHR HX TO RCS COLD LEGS ISO [] Q1E11MOV8888A open RHR TO RCS HOT LEGS XCON [] Q1E11MOV8887A open	
3.5	Isolate B train RHR cold leg injection path. 1B RHR HX TO RCS COLD LEGS ISO [] Q1E11MOV8888B closed RHR TO RCS HOT LEGS XCON [] Q1E11MOV8887B closed	

Step 3 continued on next page.

___Page Completed

Step	Action/Expected Response	Response NOT Obtained
3.6	Check RCS pressure - RISING. 1C(1A) LOOP RCS WR PRESS [] PI 402A [] PI 403A	3.6 Proceed to step 3.8.
3.7	Go to FNP-1-EEP-1, LOSS OF REACTOR OR SECONDARY COOLANT.	
3.8	Restore B train RHR cold leg injection path. 1B RHR HX TO RCS COLD LEG ISO [] Q1E11MOV8888B open RHR TO RCS HOT LEGS XCON [] Q1E11MOV8887B open	

Step 3 continued on next page.

____Page Completed

Step	Action/Expected Response	Response NOT Obtained

3.9 Verify CCW being supplied to RCP thermal barriers.

3.9.1 Verify at least one CCW PUMP in on service train - STARTED.

[] Train A (1C or 1B)
[] Train B (1A or 1B)

3.9.2 Verify flow indicated in the On-Service train.

HX 1A(1B,1C)
CCW FLOW
[] FI 3043AA
[] FI 3043BA
[] FI 3043CA

3.9.3 Verify CCW to RCP thermal barriers - ALIGNED.

CCW TO
SECONDARY HXS
[] Q1P17MOV3047 open

CCW TO
RCP CLRS
[] Q1P17MOV3052 open

CCW FROM
RCP THRM BARR
[] Q1P17HV3184 open
[] Q1P17HV3045 open

3.10 Isolate RCP seal injection.

3.10.1 Close BKR FEG3. (100 ft, AUX BLDG lower equipment room)

3.10.2 Close seal water injection isolation valve.

RCP SEAL WTR
INJ ISO
[] Q1E21MOV8105

Step 3 continued on next page.

___Page Completed

Step Action/Expected Response	Response NOT Obtained
3.11 Check RCS pressure - RISING. 1C(1A) LOOP RCS WR PRESS [] PI 402A [] PI 403A	3.11 Proceed to step 3.13.
3.12 Go to FNP-1-EEP-1, LOSS OF REACTOR OR SECONDARY COOLANT.	
3.13 Restore RCP seal injection.	
3.13.1 Open seal water injection isolation valve. RCP SEAL WTR INJ ISO [] Q1E21MOV8105	
3.13.2 Open BKR FEG3. (100 ft, AUX BLDG lower equipment room)	
3.14 [CA] Continue efforts to locate leak.	
3.14.1 Direct HP to perform radiation surveys in auxiliary building using FNP-0-RCP-25, HEALTH PHYSICS ACTIVITIES DURING A RADIOLOGICAL ACCIDENT.	
3.14.2 Direct personnel to perform local inspections in auxiliary building.	
3.15 <u>IF</u> unable to identify leak, <u>THEN</u> go to FNP-1-ECP-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION.	

-END-

START	STEP	CONTINUOUS ACTION
☐	3	3.14 [CA] Continue efforts to locate leak.

72. WE05EK1.3 072/MOD/RO/C/A 3.9/4.1/WE05EK1.3/N///D

A loss of ALL feedwater has occurred on Unit 1. The team is implementing FRP-H.1, Response to Loss of Secondary Heat Sink, and the following conditions exist:

- SI has **NOT** actuated.
- RCS temp is 547°F.
- No AFW pump can be started.
- All SG narrow range levels are at 10%.
- 1A SGFP has just been started and has been aligned to feed all SGs.
- Attachment 1, MAIN FEEDWATER BYPASS VALVES AUTOMATIC CLOSURE DEFEAT, has been completed.
- The red light is LIT on the following handswitches:
  — MOV-3232A, MAIN FW TO 1A SG STOP VLV
  — MOV-3232B, MAIN FW TO 1B SG STOP VLV
  — MOV-3232C, MAIN FW TO 1C SG STOP VLV

Immediately upon feeding the SGs, GB5, STM LINE LO PRESS RX TRIP SI, annunciator comes into alarm.

Which one of the following completes the statement below?

The 1A SGFP __(1)__ trip.

MOV-3232A, B, C __(2)__ automatically close.

	(1)	(2)
A.	will NOT	will NOT
B.	will NOT	WILL
C.	WILL	will NOT
D✓	WILL	WILL

FRP-H.1 step 3 NOTE states: **"If SI has not actuated since Reactor Trip**, defeating the feedwater isolation signal to main feedwater regulating bypass valves will ensure the main feedwater flow path remains open. A **subsequent SI will still cause the trip of an operating SGFP**."

Additionally, SI would be blocked (step 7.22) however, only if > P-12. Step 9.10 CAUTION reminds the operator that: "**SI actuation circuits will automatically unblock** if RCS average temperature rises **to greater than 543°F** or PRZR pressure rises to greater than 2000 psig."

MOV-3232A/B/C will auto close upon a trip of BOTH SGFPs AND the handswitch is in the (spring returned) Automatic Position, this closure signal is NOT bypassed by the jumpers installed by Attachment 1 of FRP-H.1.

FRP-H.1, Step 9.7.3, if feeding the SGs using the Condensate system, would de-energize the Main Feed Stop Valves in the open position. This step is only encountered however, if the SGFPs are not available to feed the SGs.

A. Incorrect - 1) incorrect, See step 3 NOTE above; Attachment 1 jumpers out the auto closure of feedwater regulating bypass valves only, NOT the SGFP auto trip.
2) incorrect, MOV-3232 auto-closure is initiated by a SGFP trip and is not prevented by performing Attachment 1.

Plausible: It is a common misconception that Attachment 1 will maintain a complete Feedwater line flowpath, but in effect it only prevents FRV bypasses from closing.

B. Incorrect - 1) incorrect, see A.1.
2) correct, Attachment 1 will not prevent MOV-3232's from closing and they would close on the SGFP trip.

C. Incorrect - 1) correct, The SGFP will trip due to the SI signal noted by GB5 alarm. See step 3 NOTE above; Attachment 1 jumpers out the auto closure of feedwater regulating bypass valves only, NOT the SGFP auto trip.
2) incorrect, see A.2.

Because temperature is > P-12, Blocking of MS Line low Pressure SI is not possible, and results in the trip of the SGFP.

Because the only running SGFP tripped (Both SGFPs tripped by SI), the FW stop valves would close automatically via interlock.

D. Correct. 1) correct, see C.1.
2) correct, see see B.2.

WE05EK1.3

E05 Loss of Secondary Heat Sink

EK1. Knowledge of the operational implications of the following concepts as they apply to the (Loss of Secondary Heat Sink)
(CFR: 41.8 / 41.10, 45.3)
EK1.3 Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Secondary Heat Sink).
IMPORTANCE RO 3.9 SRO 4.1

Importance Rating:	3.9 / 4.1
Technical Reference:	FNP-2-FRP-H.1 v26 D177622, v0
References provided:	None
Learning Objective:	ANALYZE plant conditions and DETERMINE if actuation or reset of any Engineered Safety Features Actuation Signal (ESFAS) is necessary. (OPS-52533F05)
Question origin:	Modified from FRP-H-52533F05 004
Basis for meeting K/A:	K/A is met by testing the knowledge of the **operational consequence (impact) of the SI signal** on the feedwater flowpath while in FRP-H.1. Recognizing what components are NOT jumpered by the implementation of Attachment 1 is required to understand the necessary recovery actions
SRO justification:	N/A

NOTE: The following section is for historical discussion only. This system is still installed but is no longer utilized.

Leading Edge Flow Meter Electronic Console

The leading edge flow meter system operates automatically after the initial system energization and setup. The light emitting diode (LED) display provides flow rate indication (in 10^6 lbm/hr) or a failure indication. A two-position toggle switch (STOP/CYCLE) determines the display operation. In the STOP position, the display stops in the pipe indicated. In the CYCLE position, the display alternately indicates the flow rate for Unit I and Unit II. An LED below the display window indicates the unit selected.

Feedflow Transmitters

Each feed line contains two feed flow transmitters and D/P indicators (referred to as bartons) located in the turbine building. The readouts from these D/P indicators is used in conjunction with STP-109 Power Range Neutron Flux Channel Calibration (caliometric).

Main Feedwater Stop Valves (3232A, B, and C)

(Figure 14)

A three-position handswitch (CLOSE/AUTO/OPEN, spring return to AUTO) on the MCB controls each motor-operated isolation valve. In AUTO, the valve automatically closes on a SGFP trip signal from both pumps. Valve position lights indicate above each switch.

Main Feedwater Regulating Valve and Bypass Valve

The main regulating valve and bypass valve in each feed line to the steam generators automatically control feed flow in response to the SGWLC system. The operation of these valves will be covered in detail in the Steam Generator Water Level Control lesson.

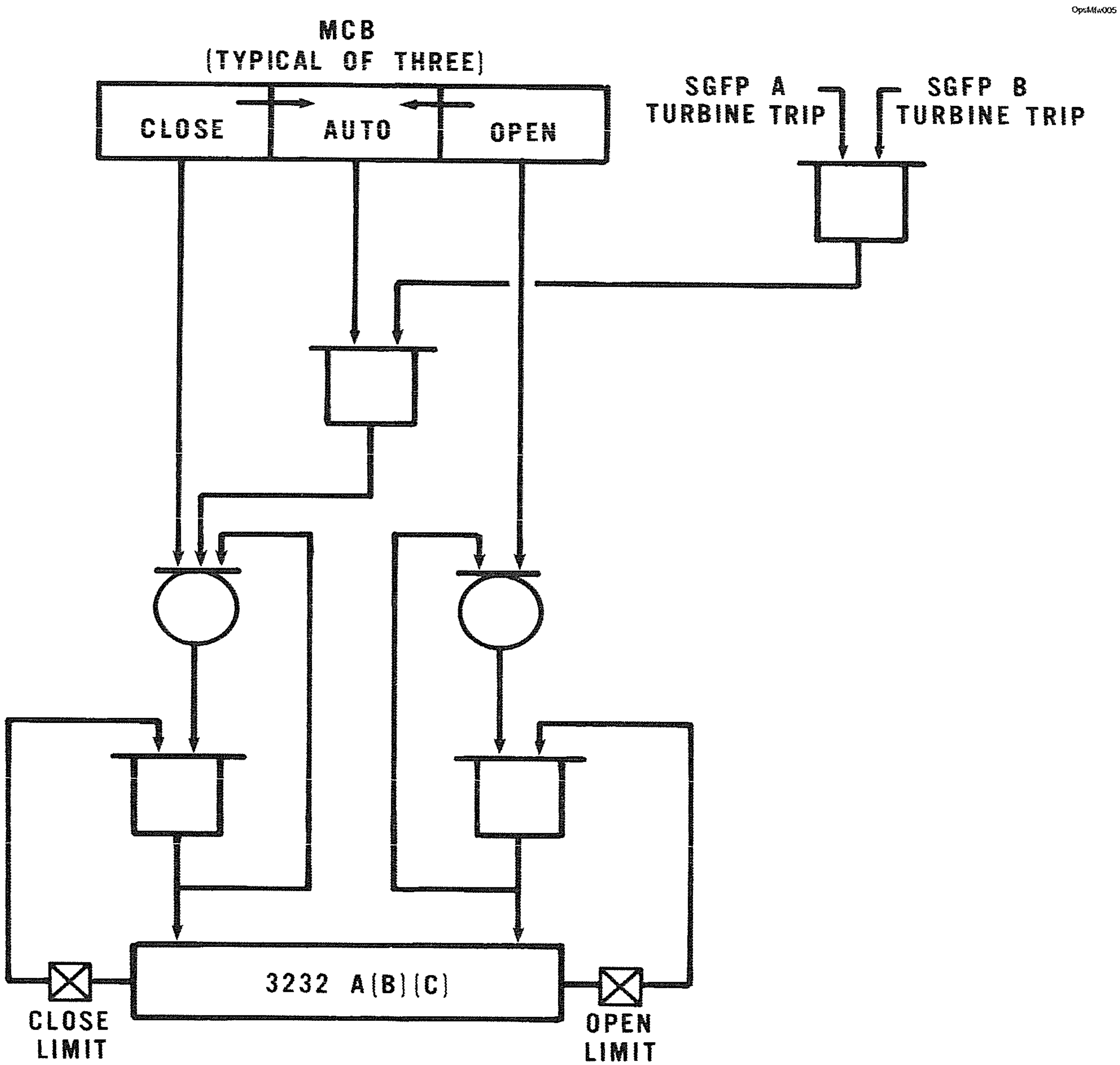

FIGURE 14 - Main Feedwater Stop Valves

Step	Action/Expected Response	Response NOT Obtained

NOTE: If SI has not actuated since Reactor Trip, defeating the feedwater isolation signal to main feedwater regulating bypass valves will ensure the main feedwater flow path remains open. A subsequent SI will still cause the trip of an operating SGFP.

Step	Action/Expected Response	Response NOT Obtained
___ 3	**Direct I&C personnel to defeat the feedwater isolation by installing jumpers stored in the control room emergency locker using ATTACHMENT 1.**	First encounter with this note.
___ 4	**Monitor CST level.**	
4.1	[CA] Check CST level greater than 5.3 ft. CST LVL [] LI 4132A [] LI 4132B	4.1 Align AFW pumps suction to SW using FNP-1-SOP-22.0, AUXILIARY FEEDWATER SYSTEM.
4.2	Align makeup to the CST from water treatment plant <u>OR</u> demin water system using FNP-1-SOP-5.0, DEMINERALIZED MAKEUP WATER SYSTEM, as necessary.	

Step	Action/Expected Response	Response NOT Obtained

7.20 Adjust master speed controller to raise feedwater discharge header pressure to 50 psi greater than steam header pressure.

FW
HDR
PRESS
[] PI 508

STM
HDR
PRESS
[] PI 464A

conditions of stem are here

7.21 Control feedwater regulating bypass valves to supply main feedwater to intact SGs.

Intact SG	1A	1B	1C
1A(1B,1C) SG FW BYP FLOW FK	[] 479 adjusted	[] 489 adjusted	[] 499 adjusted

RNO 7.21 Locally remove seal and control main feedwater regulating valves with handwheels. (127 ft, AUX BLDG main steam valve room)

Intact SG	1A	1B	1C
1A(1B,1C) SG FW FLOW Q1C22FCV	[] 478	[] 488	[] 498

7.22 WHEN P-12 light lit, THEN perform the following.

7.22.1 Block low steam line pressure SI.

STM LINE PRESS SI
BLOCK - RESET
[] A TRN to BLOCK
[] B TRN to BLOCK

P-12 not met, therefore Low Steam Pressure SI has not been satisfied yet.

PRESUMPTION, is that the Feed piping ruptures immediately upon initiation of Feed (potential for rapid cooldown--thermal stress) which causes a rapid depressurization.

7.22.2 Verify blocked indication.

BYP & PERMISSIVE
STM LINE ISOL.
SAFETY INJ.
[] TRAIN A BLOCKED light lit
[] TRAIN B BLOCKED light lit

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: SI actuation circuits will automatically unblock if RCS average temperature rises to greater than 543°F or PRZR pressure rises to greater than 2000 psig.

****

9.10 WHEN pressurizer pressure less than 2000 psig, THEN perform the following.

Procedural reminder of P-12

9.10.1 Block low pressurizer pressure SI.

PRZR PRESS SI
BLOCK - RESET
[] A TRN to BLOCK
[] B TRN to BLOCK

9.10.2 Verify blocked indication.

BYP & PERMISSIVE
PRZR. SAFETY
INJECTION
[] TRAIN A BLOCKED light lit
[] TRAIN B BLOCKED light lit

Step 9 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

9.7 Perform the following.

9.7.1 Dispatch personnel to 1V 600 V MCC. (139 ft, AUX BLDG electrical penetration room)

9.7.2 Place handswitch for main feedwater stop valves to intact SGs to OPEN and hold in that position.

Intact SG	1A	1B	1C
MAIN FW TO 1A(1B,1C) SG STOP VLV Q1N21MOV	[]3232A	[]3232B	[]3232C

9.7.3 WHEN main feedwater stop valves to intact SGs open, THEN direct personnel to open associated breakers. (139 ft, AUX BLDG electrical penetration room)

Intact SG	1A	1B	1C
BKR	[]FV-K2	[]FV-K3	[]FV-L2

9.7.4 WHEN associated breaker open, THEN allow main feedwater stop valve handswitch to spring return.

Response NOT Obtained:

9.7 Perform the following.

a) Direct personnel to open associated breakers. (139 ft, AUX BLDG electrical penetration room)

Intact SG	1A	1B	1C
BKR	[]FV-K2	[]FV-K3	[]FV-L2

b) Locally open main feedwater stop valves to intact SGs with handwheels. (127 ft. AUX BLDG main steam valve room)

Intact SG	1A	1B	1C
MAIN FW TO 1A(1B,1C) SG STOP VLV Q1N21MOV	[]3232A	[]3232B	[]3232C

Reason for MOV-3232A/B/C not stroking when pump trip could be under the assumption that one could make that this step has already been performed.

Step 9 continued on next page.

A loss of ALL feedwater has occurred on Unit 1. The team is implementing FRP-H.1, Response to Loss of Secondary Heat Sink, and the following conditions exist:

- No AFW pump can be started.
- Attachment 1, MAIN FEEDWATER BYPASS VALVES AUTOMATIC CLOSURE DEFEAT, has been completed.
- 1A SGFP has just been Latched.
- All SG wide range levels are at 30% and dropping at 1% per minute.

The following lights are **NOT** lit on the Bypass and Permissive Panel:

- STM LINE ISOL SAFETY INJ TRAIN A BLOCKED
- STM LINE ISOL SAFETY INJ TRAIN B BLOCKED

GB5, STM LINE LO PRESS RX TRIP SI, annunciator comes into alarm. Which one of the following is the correct action to be taken at this time?

A. There is no method now for establishing feed or condensate flow to the SG's, go immediately to bleed and feed.

B. There is no method now for establishing feed or condensate flow to the SG's, continue efforts to establish AFW flow and monitor bleed and feed criteria.

C. Wait 60 seconds, reset the SI signal, latch the SGFP, and continue efforts to feed the SG's using the SGFPs.

D✓ Wait 60 seconds, reset the SI signal, and commence efforts to feed the SG's with the condensate pumps.

References: FRP-H.1 and OPS-52532F

A. Incorrect - the conditions for bleed and feed are not met and the condensate pumps are still available.

B. Incorrect; there is one flow path available, the condensate pumps. If no other flow path were to exist, then this would be correct.

C. Incorrect; the SGFP will not be available due to the MSIVs going closed. If the MSIVs were open, this would be the preferred method. The step to BLOCK the low steam line press SI is later in the procedure after the feeding of the SGs has started. The Low steam line press SI is still active at this point.

FRP-H.1

7.8 IF SI has NOT actuated since reactor trip, THEN reset FW ISO.	7.8 Verify SI reset. [] MLB-1 1-1 not lit [] MLB-1 11-1 not lit

NOTE: If SI has not actuated since Reactor Trip, defeating the feedwater isolation signal to main feedwater regulating bypass valves will ensure the main feedwater flow path remains open. A subsequent SI will still cause the trip of an operating SGFP.

D. Correct; **Wait 60 seconds, reset the SI signal, and continue efforts to commence feeding the SG's with the condensate pumps.**

Attachment 1 does not prohibit the SGFP from tripping, however, it can be reset. With no steam pressure available to the SGFPs due to the STM LINE LO PRESS RX TRIP SI and subsequent MSLI, the next available method in the procedure is condensate flow.

OPS-52532F

The feedwater isolation signal is defeated using Attachment 1. (Maintenance has already been directed to start this step.) When the only feedwater isolation signal is P-4 and low Tave, the isolation can be reset with the main control board (MCB) push buttons. When an SI has occurred, it must be reset and jumpers installed to defeat the feedwater isolation. The jumpers will defeat all three feedwater isolations: SI, Hi-Hi steam generator level, and P-4 with low Tave. A note associated with this step states that if SI has not actuated since reactor trip, defeating the feedwater isolation signal to main feedwater regulating bypass valves will ensure the main feedwater flow path remains open. Also, a subsequent SI will still cause the trip of an operating SGFP.

73. WE08EK3.2 073/BANK/RO/M 3.6/4.0/WE08EK3.2////C

What is the reason for performing the 1 hour temperature soak of FRP-P.1, Response to Imminent Pressurized Thermal Shock Conditions?

A. The soak allows time for any bubble that may have formed in the Reactor Vessel Head area to collapse.

B. The soak allows thermal gradients in the Steam Generator wall to be reduced, thus reducing corresponding stresses.

C✓ The soak allows thermal gradients in the Reactor Vessel wall to be reduced, thus reducing corresponding stresses.

D. The soak gives the operator time to terminate ECCS flow, thereby minimizing the threat of a repressurization accident.

FRB-P.1 (FRP-P.1 background document)

The "soak" is a period of steady state operation during which any temperature decrease or pressure increase are to be avoided. This time period allows thermal gradients in the reactor vessel wall to be reduced, thus reducing corresponding stresses.

The thermal stress due to a rapid cooldown and the pressure stress are additive in the vessel wall. Use of charging and PRZR heaters in subsequent steps should be controlled so as not to increase RCS pressure. Maintaining a stable pressure will ensure that pressure stress in the vessel wall will remain at or below the minimum pressure stress established in the previous step. Stable temperature will result in decreasing thermal stresses as the temperature gradient is reduced by conduction through the wall.

A. Incorrect - The concern with PTS threat is cold temperature with high pressure. The area of concern is the downcomer region, specifically the inner wall of the vessel. Plausible because steam bubbles in the head is a concern with natural circulation cooldowns IAW ESP-0.2.

B. Incorrect - Plausible because the answer is correct for the Reactor Vessel, but not for the Steam Generator.

C. Correct - Per info above in the Westinghouse background documents.

D. Incorrect - Per FRP-P.1, SI flow is terminated and normal charging aligned prior to reaching the step for soak consideration. Plausible because minimizing RCS repressurization is a top concern while in FRP-P.1. For a candidate without detailed procedural knowledge, this would seem like a logical choice.

WE08EK3.2

E08 Pressurized Thermal Shock

EK3. Knowledge of the reasons for the following responses as they apply to the (Pressurized Thermal Shock)

(CFR: 41.5 / 41.10, 45.6, 45.13)

EK3.2 Normal, abnormal and emergency operating procedures associated with (Pressurized Thermal Shock).

IMPORTANCE RO 3.6 SRO 4.0

Importance Rating:	3.6 / 4.0
Technical Reference:	FNP-0-FRB-P.1 v1
References provided:	None
Learning Objective:	STATE AND EXPLAIN the basis for all Cautions, Notes, and Actions associated with (1) FRP-P.1, Response to Imminent Pressurized Thermal Shock Condition; (2) FRP-P.2, Response to Anticipated Pressurized Thermal Shock Condition. (OPS-52533K03)
Question origin:	FNP BANK FRP-P-52533K03 02
Basis for meeting K/A:	K/A is met by questioning a candidates knowledge of reasons for actions taken in the procedure for Response to Pressurized Thermal Shock.
SRO justification:	N/A

RESPONSE TO IMMINENT PRESSURIZED THERMAL SHOCK CONDITIONS
Plant Specific Background Information

Section: Procedure

Unit 1 ERP Step: 28 **Unit 2 ERP Step:** 28 ***ERG Step No:*** *24*

ERP StepText: Establish RCS soak.

ERG StepText: *Determine If RCS Temperature Soak Is Required*

Purpose: To see if a "soak" period is required prior to further cooldown

Basis: If RCS cold leg temperature has decreased more than 100°F in any one hour period, then a "soak" period is required to allow the thermal stresses imposed on the reactor vessel wall to decrease before further cooldown is allowed. The "soak" is a period of steady state operation during which any temperature decrease or pressure increase are to be avoided. This time period allows thermal gradients in the reactor vessel wall to be reduced, thus reducing corresponding stresses. Any actions that will not cause either an RCS cooldown or RCS pressure increase and are specified by any other guideline in effect are permitted during this "soak" period. Following the "soak", a cooldown may be implemented with additional cooldown restrictions required in order to not challenge vessel integrity. Section 2, DESCRIPTION, of this document presents the analyses performed to determine the applicable cooldown restrictions for the three categories of plants (I, II, and IIIb). These restrictions are summarized in Tables 1 through 3. From these tables, a plant specific Figure FRP1-1 can be generated by using either the RED or ORANGE priority safety function status row and the information in the last column ("Allowable RCS Pressure and Temperature Operating Band") for the appropriate plant category (I, II, or IIIb). In addition, the cooldown rate restrictions are summarized in the next to last column of these tables. For the RED or ORANGE priority safety function status, the cooldown rate restriction is 50°F/hr after the soak and the allowable RCS pressure and temperature operating band (Figure FRP1-1) is between the minimum subcooling curve and the 200°F subcooling curve for all three categories of plants as described in Section 2, DESCRIPTION.

Knowledge: Understanding of "soak" period and additional RCS cooldown restrictions.

References:

Justification of Differences:

1 Changed to make plant specific.

2 Split ERG step into two separate steps. This enhances procedure flow and allowing procedure exit if soak not required.

74. WE11EA1.3 074/NEW/RO/M 3.7/4.2/WE04EK2.1/N///C

Unit 1 has experienced a Reactor trip and Safety Injection with the following conditions:

At 10:00:

- EEP-1.0, Loss of Reactor or Secondary Coolant, is entered due to a LOCA.

The following equipment problems have occurred:

- MOV-8827B, CTMT SUMP TO 1B CS PUMP, breaker is tripped.
- 1A RHR pump is tripped.
- MOV-3185A, CCW TO 1A RHR HX, will not open.
- MOV-8706B, 1B RHR HX TO CHG PUMP SUCT, breaker is tripped.
- 1C Charging Pump is tripped (1B Charging Pump is on A Train).

At 10:10:

- ECP-1.1, Loss of Emergency Coolant Recirculation, is entered.

Which one of the following equipment failures, if corrected, will restore Emergency Coolant Recirculation and allow exit of ECP-1.1?

A. Power restored to MOV-8827B.

B. 1A RHR pump returned to service.

C✓ Power restored to MOV-8706B.

D. 1C Charging pump returned to service.

Equipment failures have resulted in an entry into ECP-1.1, Loss of Emergency Coolant Recirculation. Either A Train or B Train recirc needs to be restored to exit ECP-1.1. The following equipment is required to be operable or functional per ECP-1.1 step 3:

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

OR

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

A. Incorrect - MOV8827B is not required by ECP-1.1, but plausible because this MOV is required for recirc of Containment sump contents by the Containment Spray system.

B. Incorrect - Plausible because the 1A RHR Pump is required by ECP-1.1, but this action alone will not restore Recirc Capability. The CCW MOV3185A must also be able to be opened to provide cooling to the RHR Hx for Recirculation capability of the A Train.

C. Correct - This is the only B Train Recirc component that has to be restored to ensure Recirc Capability for B Train. If either Train is available, ECP-1.1 can be exited.

D. Incorrect - ECP-1.1 does not specifically require a Charging Pump to be available, although it does require an MOV8706 for RHR HX TO CHG PUMP SUCT to be available. Plausible because it would be logical to require the B Train Charging Pump to be available.

WE11EA1.3

E11 Loss of Emergency Coolant Recirculation

EA1. Ability to operate and / or monitor the following as they apply to the (Loss of Emergency Coolant Recirculation)
(CFR: 41.7 / 45.5 / 45.6)
EA1.3 Desired operating results during abnormal and emergency situations.
IMPORTANCE RO 3.7 SRO 4.2

Importance Rating:	3.7 / 4.2
Technical Reference:	FNP-1-ECP-1.1 v27
References provided:	None
Learning Objective:	LIST AND DESCRIBE the sequence of major actions, when and how continuous actions will be implemented, associated with (1) ECP-1.1, Loss of Emergency Coolant Recirculation; (2) ECP-1.3, Loss of Emergency Coolant Recirculation, Caused by Sump Blockage. (OPS-52532D04)
Question origin:	NEW
Basis for meeting K/A:	K/A is met by placing candidate in a situation with a Loss of Recirculation in progress, and a number of equipment failures. Candidate must monitor and evaluate the equipment failures and determine which one of the equipment failures, if corrected, would restore Recirc Capability (desired result).
SRO justification:	N/A

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.

___ 1 **Verify ECCS pumps not affected 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

Response NOT Obtained:

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.

___ 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

75. WE15EG2.4.2 075/NEW/RO/C/A 4.5/4.6/WE15EG2.4.2/N///C

Unit 1 has experienced a Large Break LOCA with the following conditions:

- Containment pressure is 32 psig.
- Containment sump level is 8.2 feet.
- ONLY 1B Containment Spray pump is running.
- Containment Spray flow is 1600 gpm.

Which one of the following completes the statement below?

A Containment CSF Status Tree ORANGE path exists for ____ .

A. **BOTH** FRP-Z.1, Response To High Containment Pressure

AND FRP-Z.2, Response To Containment Flooding

B. **NEITHER** FRP-Z.1, Response To High Containment Pressure

NOR FRP-Z.2, Response To Containment Flooding

C✓ **ONLY** FRP-Z.2, Response To Containment Flooding

D. **ONLY** FRP-Z.1, Response To High Containment Pressure

For these conditions, an Orange path would exist for Ctmt pressure if Containment Spray flow were <1000 gpm. As given, there is no Orange path for Ctmt pressure. An Orange path does exist for Ctmt sump level >7.6 feet.

A. Incorrect - Plausible since containment pressure is above adverse value and greater than 27 psig. If Containment Spray flow were less than 1000, this distracter would be correct.

B. Incorrect - Plausible because Orange path entry conditions for Containment sump level is 7.6 feet. If level was less than 7.6 feet there would be no Orange path entry and this distracter would be correct.

C. Correct - Sump level is above the threshold of 7.6 feet.

D. Incorrect - Plausible because a candidate would pick this distracter if he didn't recognize sump level orange path and thought Containment Spray flow was insufficient.

WE15EG2.4.2

E15 Containment Flooding

2.4.2 Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.
(CFR: 41.7 / 45.7 / 45.8)
IMPORTANCE RO 4.5 SRO 4.6

Importance Rating:	4.5 / 4.6
Technical Reference:	FNP-1-CSF-0.5 V17
References provided:	None
Learning Objective:	EVALUATE plant conditions and DETERMINE if entry into (1) FRP-Z.1, Response to High Containment Pressure; or (2) FRP-Z.2, Response to Containment Flooding; or (3) FRP-Z.3, Response to High Containment Radiation Level is required. (OPS-52533M02)
Question origin:	NEW
Basis for meeting K/A:	K/A is met by giving candidate a set of conditions to evaluate for Functional Restoration Procedure entry conditions. Procedure FRP-Z.2 entry conditions are met due to Containment Sump level greater than 7.6 feet. This requires entry into FRP-Z.2 for Response to Containment Flooding.
SRO justification:	N/A

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