ST. LUCIE EXAM 2002-301

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DRAFT Submittal

SRO Written Exam & Supporting Documentation

St. Lucie NRC SRO

Written exam

Question 1 - 50

St. Lucie Plant
April 2002 NRC Exam

Q Num	K/A	Source	Exam	Level	Key
1	051.AA2.02	New	RO/SRO	1	D
2	057.AA1.05	New	RO/SRO	1	A
3	068.Ak3.13	New	RO/SRO	2	C
4	026.AK3.02	Bank 2001 NRC Exam	RO/SRO	2	C
5	076.AA2.02	New	RO/SRO	1	A
6	059.G2.3.10	Bank 2000 NRC Exam	RO/SRO	1	C
7	015.AA2.10	New	RO/SRO	2	B
8	063.K3.02	Bank	RO/SRO	2	A
9	015.K4.07	New	RO/SRO	2	B
10	072.A3.01	Bank	RO/SRO	2	D
11	003.AK3.06	New	RO/SRO	1	A
12	013.K1.15	New	RO/SRO	2	C
13	103.K3.03	New	SRO Only	1	C
14	008.K4.02	New	RO/SRO	2	D
15	011.K6.03	Bank 2000 NRC Exam	RO/SRO	2	C
16	010.A3.02	New	RO/SRO	2	C
17	012.A1.01	New	RO/SRO	2	D
18	059.K6.12	New	RO/SRO	1	B
19	006.K1.04	Bank	RO/SRO	1	D
20	079.A2.01	Bank 2000 NRC Exam	RO/SRO	2	B
21	033.K4.01	Bank	RO/SRO	1	D
22	078.K1.05	New	RO/SRO	2	B
23	086.A3.01	New	RO/SRO	2	C
24	005.A2.02	New	RO/SRO	2	B
25	041.K6.03	Modified	RO/SRO	2	A
26	028.AK2.02	Modified	RO/SRO	1	B
27	061.K2.01	Modified	RO/SRO	2	A
28	061.G2.4.11	New	RO/SRO	1	A
29	039.K3.05	New	RO/SRO	2	C
30	004.K2.05	Modified	RO/SRO	2	A
31	003.A2.01	Bank	SRO Only	2	C
32	001.K1.05	Modified	RO/SRO	2	A
33	071.K5.04	Bank	RO/SRO	1	B
34	G2.2.27	New	SRO Only	1	A
35	G2.1.11	New	SRO Only	2	D
36	026.K4.07	Bank	RO/SRO	1	D
37	056.A1.08	New	RO/SRO	1	A
38	G2.1.29	Bank 2000 NRC Exam	RO/SRO	1	A
39	065.AA2.06	New	RO/SRO	1	A
40	037.AA2.16	New	SRO Only	2	B
41	029.K4.03	Bank	RO/SRO	2	A
42	CE/A13.AK2.2	Bank	RO/SRO	1	C
43	054.AA1.02	New	RO/SRO	1	C
44	009.AK3.10	New	RO/SRO	2	A
45	027.AA2.10	New	RO/SRO	2	A
46	008.AK1.01	Bank	RO/SRO	2	A
47	G2.2.3	New	SRO Only	2	C
48	CE/A16.G2.4.4	Bank	SRO Only	1	C
49	G2.3.10	New	RO/SRO	1	C
50	G2.1.22	Bank	RO/SRO	1	C

Question: 1

Unit 1 is performing a downpower with the following conditions:

- Condenser A reads 2.5" backpressure Hg absolute.
- Power level at 58%

Which of the following requires the Unit to be manually tripped?

Condenser B reads:

A. 4.4" backpressure Hg absolute, at current power level.

B. 4.9" backpressure Hg absolute, at 39% power.

C. 3.4" backpressure Hg absolute at 29% power.

D. 3.6" backpressure Hg absolute at 29% power.

A. Incorrect, Condenser ΔP is < 2.5" Hg

B. Incorrect, Condenser ΔP is < 2.5" Hg

C. Incorrect, 3.5" trip setpoint <30% power

D. Correct, >3.5" <30% power

Question level: 1
Question source: New
Exam: RO/SRO
K/A: 051.AA2.02
Importance: 4.1
References: Loss of Condenser Vacuum ONP-1-0610031, LP 0702812-38
10CFR55.41.b(10)

7.0 OPERATOR ACTIONS

INSTRUCTIONS	CONTINGENCY ACTIONS
1. VERIFY proper SJAE operation.	
2. If vacuum continues to decrease, Then PERFORM Appendix A, Placing Hogging Ejectors in Service.	
3. VERIFY vacuum is being maintained.	**3. If vacuum cannot be maintained, Then GO TO NOP-1-0030125, Turbine Shutdown, Full Load to Zero Load to initiate a turbine shutdown in a controlled manner (approximately 5%/minute).**

CAUTION

Exceeding backpressure limits at low load conditions can cause cracking of low pressure turbine last row blades and rotor (disc) attachment areas due to harmful vibratory stress levels.

INSTRUCTIONS	CONTINGENCY ACTIONS
¶1 **4.** If Unit load is less than or equal to 30% of rated, Then VERIFY backpressure less than or equal to 3.5 inches Hg absolute.	**4.** If backpressure is greater than 3.5 inches Hg absolute, Then PERFORM the following: **A.** TRIP the Unit. **B. GO TO 1-EOP-01, Standard Post Trip Actions.**

7.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
¶1 **5.** If Unit load is greater than 30% of rated, Then VERIFY backpressure less than or equal to 5.5 inches Hg absolute.	**5.** If backpressure is greater than 5.5 inches Hg absolute, Then PERFORM the following: **A.** TRIP the Unit. **B. GO TO 1-EOP-01, Standard Post Trip Actions.**
6. VERIFY differential pressure between the following indicators is less than 2.5 inches Hg: • PI-10-7, 1A Condenser Back Pressure. • PI-10-6, 1B Cndsr Vac Press Manometer.	**6.** If greater than or equal to 2.5 inches Hg differential, Then PERFORM the following: **A.** TRIP the Unit. **B. GO TO 1-EOP-01, Standard Post Trip Actions.**
7. VERIFY reactor NOT tripped.	**7. If reactor is tripped, Then GO TO 1-EOP-01, Standard Post Trip Actions.**
8. VERIFY PI-22-21, Gland Stm HP Press, is approximately 120 to 130 psig.	**8.** If pressure is NOT approximately 120 to 130 psig, Then ADJUST MV-08-878, PCV-08-879 Gland Seal Bypass, to maintain desired pressure. /R2

Question: 2

The 1A QSPDS plasma display is out of service (blank). All other parts of the QSPDS system are operable.

Which of the following parameters CANNOT be accessed from inside the QSPDS cabinets with the display out of service?

A. Incore nuclear instrumentation (self powered neutron detector).

B. CET's

C. Pressurizer pressure

D. HJTC's.

A. Correct, although part of the Incore assembly are the CET's, only the CET's from the Incore system can be read on the QSPDS cabinets.

B. Incorrect, can be calculated

C. Incorrect, can be calculated

D. Incorrect, can be calculated

Question level: 1
Question source: New
Exam: RO/SRO
K/A: 057.AA1.05
Importance: 3.4
References: LP 0702407-07 QSPDS and Incore Instrumentation system, OP 1-1150020 QSPDS Display System Operation.

counted in the detectors have enough initial energy to make it to the cathode (detector housing) without any additional "push" from an external voltage potential. From here, the electrons are directed to external circuitry and turned into useful data. In addition, enough electrons are produced from the detector emitters (i.e., rhodium detectors) where secondary ionizations from the gas (i.e., gas amplification) is not required.

Ruggedness/Use of Data

The small size of the incore detectors, particularly the inconel wires that connect to the rhodium detectors, results in a design that is relatively fragile. Therefore, incore detectors have a higher incidence of failure as compared to excore detectors.

Removal and replacement each refueling adds wear and tear due to the resistance placed on the assemblies as they move through the instrument conduits. Excluding mechanical damage, incore detectors can last up to 3 fuel cycles before being replaced.

Although highly accurate, incore detector data is typically used for data collection only. Their slightly delayed response to neutron flux level changes, as well as their greater failure rate (as compared to excore detectors) make them less desirable for component actuations such as a reactor trip.

The rhodium detectors are calibrated in lots, in a fast flux test facility before being shipped to the site. They are regularly corrected for rhodium burnup using DDPS power history data. The raw signal from the detectors is in milivolts, converted by and and printed out on the DDPS as nv (neutron volts) X 10^{12}.

They are used for linear heat rate monitoring as required by technical specifications.

Thermocouples

The core exit thermocouples (CETs) are chromel-alumel grounded junction thermocouples. Refer to Figure 7. They too are self-powered and work on the principle of a voltage potential existing between dissimilar metals proportional to a change in temperature.

Installed as part of the Incore Instrument Assembly, the output goes to QSPDS and the

Digital Data Processing System (DDPS).
Accumulative radiation exposure contributes to CET degradation resulting in potentially inaccurate data. CETs are replaced as required during refuelings.

COMPUTER PROCESSING

The SPND output is sent to the Digital Data Processing System (DDPS) for manipulation and display.

A millivolt-to-neutron flux conversion is performed. This processing applies a sensitivity factor (K_s) to the signal. Each detector has a unique K_s, provided by the vendor when shipped, used to provide uniform output values.

Two additional factors must be applied. One factor corrects for background noise (K_b). It accounts for signals generated on the signal wiring (not the emitter). The other is a burnup constant (K_{bu}) that corrects for Rhodium depletion and is used to adjust K_s as the detector ages.

SUPPORT HARDWARE

Guide Structure

The incore instrumentation assemblies enter the reactor vessel through eight [ten] instrumentation nozzles located on the reactor vessel head. Refer to Figure 9. The detectors then go into guide tubes and finally into zircaloy thimbles passing through the support plate. Figures 10, 11 and 12 show details of the instrument plate within the reactor vessel. The detectors have to be bent to reach the required thimbles. The degree of bending depends on the assembly position. Each nozzle can accept up to six incore detector assemblies, which are fastened to the nozzle by their seal plugs.

Removal and Installation

Replacement of the incore instrumentation assemblies takes place during refueling.

Before the refueling cavity is flooded, the assemblies are electrically and mechanically

APPENDIX B

1. If the Control Room Plasma Display Unit for a train of QSPDS is out of service, the following information can be obtained inside the QSPDS cabinets:

   Top Chassis

   Depressing the Temp/Press pushbutton will display RCS subcooling in degrees Fahrenheit and psia.

   Bottom Chassis

   Depressing the Level/TCETC pushbutton will display the reactor vessel level (from RVLMS) and the representative CET temperature.

> NOTE
> **Section 2 of this appendix is to be used when the QSPDS Plasma Display Unit is out of service (blank).** Completion of Section 2 of this appendix and Data Sheet 26 of OP 1-0010125A satisfies Technical Specification requirements.

2. Purpose:

   This appendix provides instructions for operating the pushbuttons on the top and bottom chassis inside the QSPDS cabinets to obtain binary coded data, convert the binary coded data into millivolts, and convert the millivolts into actual temperature and/or pressurizer pressure using the conversion charts.

> NOTE
> **The top chassis calculates hot and cold leg temperatures and pressurizer pressure. The bottom chassis calculates** HJTC, UHJTC, and CET **temperatures.**

   A. Place the top or bottom chassis into TEST by depressing the TEST pushbutton. (The tens digit number 0 will be flashing.)

Question: 3

Unit 2 Control Room has been evacuated due to a fire in the cable spreading room. The 2B BAMT was the Technical Specification tank prior to the evacuation. The 2B BAMT is 91% full with 3.0% wt. Boric acid concentration and two Charging pumps are currently operating. What is the minimum time to maintain the Charging pumps aligned to the BAMT?

A. 102 minutes

B. 86 minutes

C. 76 minutes

D. 27 minutes

A. Incorrect, this is the time to inject all of 2B BAMT

B. Incorrect, this is the 7500 gallon figure

C. **Correct 6650 gallons at 88 gpm (two charging pps running)**

D. Incorrect, this is the difference between 9000 gal and 6650 gallons

References required (2-ONP-100.02 Appendix E and Figure 8)

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 068.AK3.13
Importance: 3.9
References:2-ONP-100.02 Control Room Inaccessibility, LP 0702812-5 Control room inaccessibility.

APPENDIX E

PLANT COOLDOWN & SHUTDOWN COOLING OPERATION

(Page 1 of 11)

NOTE

Supplemental portable lighting may be obtained for component manipulations outside the Control Room.

- Dedicated portable lanterns are available at the following locations:
  - Storage Locker 1: Walkway to Containment Personnel Hatch
  - Storage Locker 2: RAB Hallway West End (-0.5' elevation)
  - Storage Locker 3: RAB M.G. Set Room (19.5' elevation)
  - Storage Locker 4: RAB HVAC Room West (43.0' elevation)
- Temporary portable lanterns are available at the following locations:
  - Field Operator Facility (FOF)
  - Steam Trestle (Inside Mezzanine level door)
- Additional guidance may be found in OP 2-0030127, Reactor Plant Cooldown - Hot Standby to Cold Shutdown or ONOP 2-0120039, Natural Circulation Cooldown.
- Performing an RCS cooldown with the charging pump suctions aligned to the BAMTs for Pressurizer makeup due to shrinkage will ensure adequate shutdown margin is maintained
- Cooldown and Boration are performed simultaneously.

INITIAL

1. ENSURE at least **ONE** of the following valves is positioned as indicated to align charging pump suction from the BAMTs:

   - V2508, 2B BAMT Outlet to Gravity Feed MOV, is OPEN ______
   - V2509, 2A BAMT Outlet to Gravity Feed MOV, is OPEN ______

CAUTION

Pressurizer heaters will NOT automatically deenergize due to Pressurizer low level

2. MAINTAIN Pressurizer level 30 to 70% during plant cooldown. ______

APPENDIX E
PLANT COOLDOWN & SHUTDOWN COOLING OPERATION
(Page 2 of 11)

INITIAL

CAUTION

- BOTH 2A and 2B BAMT level indications may NOT be reliable.
- BAM tanks contain approximately 99 gallons per %.
- BAM tank usage must be closely monitored to prevent gas binding of the charging pump.
- The charging pump low suction pressure trip is removed from the trip circuit when the charging pump NORMAL / ISOLATE switch is in ISOLATE.

NOTE

- Cooldown and Boration are performed simultaneously.
- Continue with this appendix while borating and cooling down.
- Perform Step 3 when the required BAMT volume has been injected.

3. When an amount greater than the minimum required Technical Specifications volume, in accordance with Figure 3.1-1, St. Lucie 2 Min BAMT (attached), has been injected into the RCS from the BAM tank(s), Then ALIGN the RWT for makeup as follows:

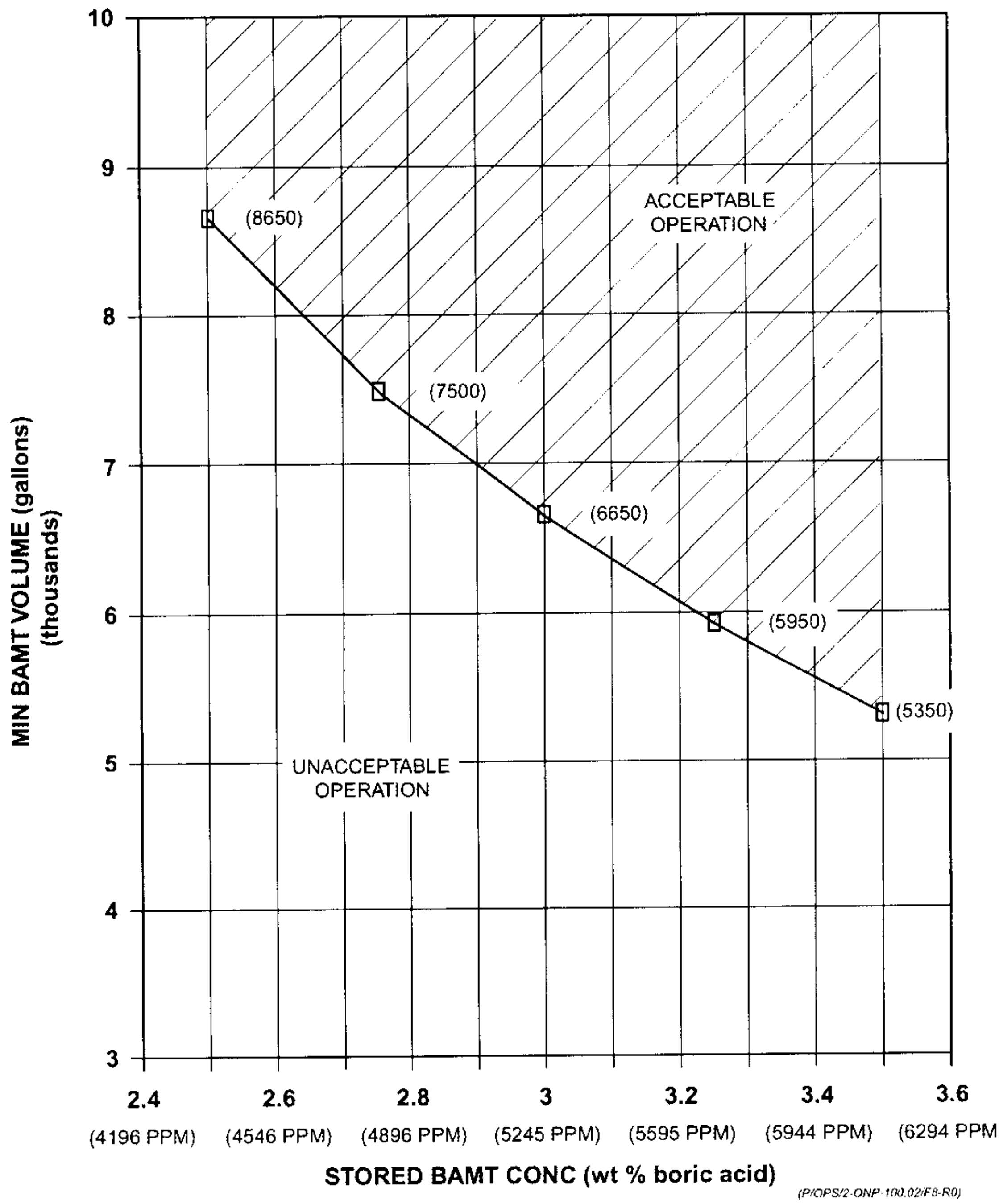
A. STOP **ALL** Charging Pumps.

B. POSITION the following components as indicated:

COMPONENT ID	COMPONENT NAME	POSITION	PERF INITIAL
V2504	RWT to Chg Pump Suction	OPEN	
V2508	1B BAMT Outlet to Gravity Feed MOV	CLOSED	
V2509	1A BAMT Outlet to Gravity Feed MOV	CLOSED	

C. OPERATE the available Charging Pump(s) as required to maintain Pressurizer level 30 to 70%.

FIGURE 8
FIGURE 3.1-1
ST. LUCIE 2 MIN BAMT VOLUME VS STORED BAMT CONCENTRATION
(Page 1 of 1)



(P/OPS/2-ONP-100.02/F8-R0)

Question: 4

Unit 2 has the following CCW alignment at 100% power:

- 2A CCW pump running
- 2C CCW in normal standby alignment
- 2B CCW pump running

Which of the following states the response of the 2C CCW pump if a LOOP and LOCA (SIAS) were to occur?

The 2C CCW pump will:

A. automatically start to augment CCW flow to both A and B CCW headers.

B. automatically start to augment CCW flow to the header it is currently lined up to.

C. not automatically start due to Diesel loading considerations.

D. not automatically start due to the possibility of exceeding the CCW header flow rates.

A. Incorrect, will not auto start (normal standby alignment is start switch in pull to lock)

B. Incorrect, will not auto start (normal standby alignment is start switch in pull to lock)

C. Correct

D. Incorrect, plausible, header flow max designed is 14600 gpm.

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 026.AK3.02
Importance: 3.9
References: CCW Lesson text 0711209, LP 0702209-8

{PRIVATE }2A 2A3 4160 volt AC bus{tc \l 1 "2A 2A3 4160 volt AC bus"}

2B 2B3 4160 volt AC bus

2C 2AB 4160 volt bus (normally aligned to the 2A3 4160 volt AC bus)

The CCW pumps can be operated from two locations:

- **NORMAL** operation by the respective control switch at the RTGB 106 [206] in the control room. The circuit NORMAL/ISOLATE switch, located at the 4160 VAC switchgear, is in the NORMAL position. Each pump control switch has five positions:

  - **START** which starts the pump
  - **STOP** which stops the pump
  - **PULL TO LOCK**

    The **standby** CCW pump (normally 'C') controls at RTGB 106 [206] is maintained in **the PULL TO LOCK** position. **This configuration prevents the standby pump from AUTO starting for a SIAS and/or LOOP condition, thereby ensuring that only one CCW pump would be loaded to one EDG and preventing an overload condition.** The time that a standby pump is not in PULL TO LOCK is minimized to the time just prior to starting it. The standby pump would be taken from PULL TO LOCK to AUTO GREEN FLAG for a very short time prior to starting the standby pump. Once the running pump is stopped, its control switch would be taken to PULL TO LOCK.

  - **Green Flag after STOP**

    This position enables the control circuit to enable certain AUTO start conditions. For example, if the 'A' CCW pump was stopped and the 'C' pump was in PULL TO LOCK and a SIAS were to occur, the 'A' pump would AUTO START.

  - **Red Flag after START**

    This position enables the control circuit to enable certain AUTO start conditions. For example, if the 'A' and 'B' pumps were running and the 'C' pump was in PULL TO LOCK, and a LOOP and/or a LOOP/SIAS occurred, the 'A' and 'B' pumps would restart once the load sequencing time delays met the start conditions.

Excessive Activity" off normal operating procedure.

- CCW surge tank level should be controlled by LCV-14-1 between 36" and 48".
- The CCW supply header must not exceed 120°F [108°F].
- During full core offload, the maximum CCW supply header temperature is 95°F.
- The maximum design temperature for the shell side of the CCW heat exchangers is 185°F.
- Initial valve settings should be conservative enough to avoid any possibility of causing heat exchanger tubes to rattle.
- During normal operating conditions the 'A' and 'B' headers will be tied together only through the non-essential header supply valves which will automatically close on receipt of a SIAS [and/or Low-Low CCW Surge Tank Level].
- Pump bearing temperature shall not exceed 185°F.
- During normal operation, the standby CCW pump RTGB control switch shall be maintained in the PULL TO LOCK position.
- Do not exceed any single CCW pump flow of 10,800 gpm.
- Ensure the CCW system is adequately vented following refueling outages and major system maintenance.
- Containment fan coolers SHALL NOT be operated with chilled water for RCB A/C when RCS temperature is greater than 325°F.
- When the 'C' CCW pump is being used to satisfy the requirements of either the 'A' or 'B' CCW pump, the alignment of the suction and discharge valves shall be consistent with the appropriate power supply.
- [The full open limit switches for MV-14-20, Header A From Fuel Pool HX, and MV-14-19, Header B From Fuel Pool HX, are set to stop valve opening at approximately 20% open. The valves will also indicate full open when the 20% open position is reached. In Mode 6, Refueling, these valves may be manually opened as

OPERATION

{PRIVATE }{tc \l 5 ""}
{PRIVATE }INITIAL ALIGNMENT{tc \l 5 "INITIAL ALIGNMENT"}

The CCW System initial alignment procedure provides initial valve, breaker, and switch alignments. Other systems needed for operation of CCW include:

- ICW system to provide cooling water to the CCW HXs
- Instrument Air
- Fire Protection and/or Demineralized Water System should be available to supply make-up water to the CCW Surge Tank

{PRIVATE }NORMAL OPERATION{tc \l 5 "NORMAL OPERATION"}

The CCW System normal operation procedure provides instructions for operating the system under normal plant operating conditions, during cooldown, and during decay heat removal conditions. During normal operation, the 'A' and 'B' CCW pumps are running and supplying the 'A' and 'B' headers, with the 'N' header being supplied from both headers. The 'N' header will automatically isolate from the 'A' and 'B' headers upon receipt of a SIAS [or Low-Low level in the CCW Surge Tank]. One side of the 'C' CCW pump suction and discharge motor valves are open, and the alignment of the valves is consistent with the appropriate power supply. Individual component throttle valves are manually adjusted to obtain desired flow rates, with the exception being TCV-2223, which automatically controls flow through the letdown heat exchanger.

Precautions and Limits include:

- Do not exceed the design flow of the heat exchangers:
  - Shell side: 14,600 gpm
  - Tube side: 17,000 gpm
- Verify that the pumps have a flow path before starting.
- Verify that the pumps and system are filled and vented prior to starting the pumps.
- Care should be used in the handling of molybdated water.
- If high activity or in-leakage is noted in the CCW system, refer to the "CCW

Question: 5

Unit 1 is at 100% power steady state. Letdown has been aligned to the flash tank.

Which of the following off-normal conditions exist that required this lineup?

A. High RCS activity

B. Waste gas system is out of service

C. Hydrogen concentration in RCS below limits

D. Oxygen concentration in RCS above limits

A. Correct

B. Incorrect, flash tank usage generates large amounts of gaseous waste.

C. Incorrect, flash tank strips all gasses.

D. Incorrect, if oxygen is high the VCT is purged.

Question level: 1
Question source: New
Exam: RO/SRO
K/A: 076.AA2.02
Importance: 3.4
References: 1-ONP-01.06 Excessive RCS Activity, ONOP LP-0702812-05

4.1 Excessive RCS Activity (continued)

INSTRUCTIONS

6. If current RCS activity is NOT significantly increased, Then PERFORM the following:

A. MONITOR the following parameters for indications of steady or lowering RCS activity:

- Channel #40, Letdown Gross
- Channel #41, Ltdn Iodine
- RR-2202, Process Radiation, Gross Coolant Activity
- RR-2202, Process Radiation, Selected Isotope

B. Whenever RCS Activity is greater than 0.1 uCi/gram DEQ I-131, as determined by Chemistry, the Flash Tank Divert valve V6307 shall be positioned to divert flow to the Flash Tank. /R2

C. If the RCS Activity is less than or equal to 0.1 uCi/gram DEQ I-131, but it is believed that some fuel failure has occurred, use of the Flash Tank should be considered. /R2

D. With letdown flow to the Flash Tank, Chemistry shall be notified to provide influent and effluent noble gas sampling of the Flash Tank. The sample points for Chemistry sampling are located at valves V6120 and V6136. /R2

CONTINGENCY ACTIONS

A.1 CONTINUE with Step 7.A.

the flash tank. However, the output can be directed, if necessary, to three other locations by the manual operation of normally closed valves. The other available output locations are the refueling water tank, the equipment drain tank or the boric acid concentrator pre-concentrator filter.

There are no alarms associated with the reactor drain pumps. A high level in the reactor drain tank with the pumps running would be indicative of a failure of the reactor drain pump. It is not uncommon to have the suction strainer clogged during refueling outages. The only indication, other than Run (red) and Stop (green) off lights above the pump control switch, is local discharge pressure gages for each pump.

Flash Tank

The Flash Tank, as shown on <u>Figure 19</u>, is a 424-gallon capacity, stainless steel tank. It is designed to operate at a pressure of 15 psig and a temperature of 250°F. Its purpose is to strip the dissolved hydrogen and fission gases from influent water. It accomplishes this by a counter-current flow of nitrogen gas. The nitrogen blanket also prevents air introduction into the system.

NOTE: The flash tank is not normally used because of the large amount of gaseous waste generated. The influent is normally directed into the holdup tanks.
The flash tank receives water from the reactor drain pumps, letdown from the CVCS, or fluid from the holdup tank recirculation pumps. Flow to the flash tank is controlled by an air-operated valve. As water enters the flash tank, a flow switch will automatically open the nitrogen supply valve and start the flash tank pumps at 14 gpm. At a flow of less than 10 gpm, the nitrogen supply valve will close and the flash tank pumps will stop. A switch for operating the nitrogen supply valve, as well as position indication, is provided in the control room. The flash tank pumps can be controlled remotely from the control room or locally by START - STOP pushbuttons. The hydrogen and fission gases stripped from the flash tank are vented to the gas decay tanks.

Several indications and controls are provided for the flash tank. Tank pressure is measured to provide a high/low pressure alarm in the control room. Flash tank level instrumentation provides the following:

Question: 6

The following conditions exist on Unit 1:

- 1A Waste Monitor Tank is being released to the discharge canal
- Liquid Release monitor channel #43 is in high alarm
- Liquid release flow indicator indicates full flow

Which of the following describes the FIRST action that should be taken based on the above indications?

A. Stop the Waste Monitor Pump.

B. Close the final effluent valve V-21462.

C. Close final effluent discharge valve FCV 6627X.

D. Contact Chemistry to determine the validity of the alarm.

A. Incorrect, subsequent action

B. Incorrect, subsequent action

C. Correct

D. Incorrect, subsequent action

Question level: 1
Question source: Bank (year 2000 NRC exam)
Exam: RO/SRO
K/A:059.G2.3.10
Importance:3.3
References:ONOP 1-0510030 Uncontrolled Release of Radioactive Liquids, ONOP LP 0702812-2

5.0 INSTRUCTIONS:

5.1 Excessive release through liquid release discharge header:

1. Symptoms:

   A. High radiation alarm on liquid release monitor channel #43.

   B. Closure of Flow Control Valve FCV-6627X during release.

   C. Liquid Radwaste Local Annunciator

2. Automatic actions:

   A. FCV-6627X closes if HI-RATE alarm is received on channel #43.

3. Immediate operator action:

   A. Ensure FCV-6627X, final effluent discharge flow control valve, is closed.

4. Subsequent operator action:

   A. Stop waste monitor pump associated with liquid release.

   B. Close and lock V21462 final effluent discharge valve to discharge canal.

   C. Complete appropriate sections of liquid release permit.

   D. Inform the control room of action taken.

   E. Implement the Emergency Plan as necessary in accordance with EPIP-01, Classification of Emergencies.

   F. Notify the Health Physics Supervisor and Chemistry Supervisor.

Question: 7

Instrument air Containment isolation valve has failed closed. Which of the following states the Unit and the reason for actions taken in response to loss of instrument air to the Containment?

A. Unit 2, all RCP's are required to be stopped within 30 minutes due to RCP seal heat exchanger valves failing closed.

B. Unit 2, all RCP's are required to be stopped within 10 minutes due to CCW Containment isolation valves failing closed.

C. Unit 1, all RCP's are required to be stopped within 30 minutes due to RCP seal heat exchanger valves failing closed.

D. Unit 1, all RCP's are required to be stopped within 10 minutes due to CCW Containment isolation valves failing closed.

A. Incorrect, seal heat exchanger valves fail open on loss of IA.

B. Correct, only Unit 2 has a containment isolation CCW valves (2) inside containment, which fails closed on loss of IA.

C. Incorrect, seal heat exchanger valves fail open on loss of IA

D. Incorrect, Unit 1 CCW valves are outside containment.

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 015.AA2.10
Importance: 3.7
References: 1(2)-1010030 Loss of Instrument air, CCW LP 0702209-6

'N' Header Containment Penetrations

The 'N' header supplies several components located inside containment. 'N' header flow to containment is controlled by four air-operated, fail close valves. These valves are designed to fail close upon a loss of instrument air or control power to ensure containment isolation in the event of a DBA.

The 'N' header enters the containment through penetration 23, which has two air-operated valves; and leaves through penetration 24, which also has two air-operated valves, as shown on Figure 8. The two supply valves are HCV-14-1 and HCV-14-7. The two return valves are HCV-14-6 and HCV-14-2. On Unit 1, all four valves are outside containment in the pipe penetration room. On Unit 2, one supply and return are inside containment and one supply and return are outside containment in the pipe penetration room.

The 'N' header to containment valves are operated by three position individual control switches (OPEN-AUTO-CLOSE [OPEN RESET-AUTO-CLOSE]) at RTGB 106[206]. A SIAS will automatically close these valves. The operator has the ability to restore CCW to the RCPs and other containment CCW loads in a SIAS configuration by placing each control switch for HCV-14-1, HCV-14-2, HCV-14-6, and HCV-14-7 to OPEN [OPEN RESET], which will "override" SIAS and open the valves. An alarm, RCP CCW ISOL HCV-14-1/2/6/7 SIAS OVRD, informs the operator that SIAS has been overridden. In addition, in order to restore CCW flow to the RCPs following a SIAS the 'N' header valves HCV-14-8A, HCV-14-8B, HCV-14-9, and HCV-14-10 will have to be overridden as described previously in the 'N' header section of this text. [On Unit 2, the instrument air to containment air-operated valves will also have to be taken to OVERRIDE to restore CCW to the RCPs.]

A backup to the instrument air system is provided by nitrogen to operate the supply and return valves on Unit 1 during off-normal conditions. RCP off-normal operational procedural guidance nitrogen can be used for two scenarios:

- If the loss of CCW is due to an air supply failure, local restoration of CCW to the RCPs is accomplished by:
  - Closing the instrument air supply valve to the affected HCV(s),
  - Attaching the nitrogen flex hose to the male quick disconnect fitting in the air supply to each affected HCV,
  - Verifying that the HCV has opened.

APPENDIX B
AIR ACTUATED COMPONENTS
(Page 6 of 8)

10. (continued)

COMPONENT	DESCRIPTION	FAIL POSITION
HCV-14-1	RCP Isolation Valve	Closed
HCV-14-2	RCP Isolation Valve	Closed
HCV-14-6	RCP Isolation Valve	Closed
HCV-14-7	RCP Isolation Valve	Closed
HCV-14-8A	"N" Header Supply from A Header	Closed
HCV-14-8B	"N" Header Supply from B Header	Closed
HCV-14-9	"N" Header Return to A Header	Closed
HCV-14-10	"N" Header Return to B Header	Closed
TCV-14-4A	2A CCW HX ICW Flow Control	Open
TCV-14-4B	2B CCW HX ICW Flow Control	Open
TCV-2223	LTDN HX Flow Control	Closed

11. **Instrument Air**

HCV-18-1	IA Supply to RCB	Closed
PCV-18-3	Maintenance Hatch Door Seal A Supply	Open
PCV-18-4	Maintenance Hatch Door Seal B Supply	Open

12. **Blowdown**

FCV-23-3	2A S/G Blowdown Outside	Closed
FCV-23-4	2A S/G Blowdown Inside	Closed

APPENDIX B
AIR ACTUATED COMPONENTS
(Page 5 of 8)

9. **Feedwater - Condensate - Heater Vents & Drains**

COMPONENT	DESCRIPTION	FAIL POSITION
LCV-11 Series	Feedwater Heater Normal Drains	Closed
LCV-11 Series	Feedwater Heater Alternate Drains	Open
FCV-9011	1A S/G Main Feed Reg Vlv	As Is
FCV-9021	1B S/G Main Feed Reg Vlv	As Is
LCV-9005, 9006	15% Feedwater Bypass Valves	Closed
FCV-12-3A, B, C	Cond. Pump Recirc. Valves	Open
FCV-09-1A2 & 1B2	FW Pump Flow	Open
FT-09-1A1	1A FW Pump Flow	Indicates Low
FT-09-1B1	1B FW Pump Flow	Indicates Low

10. **Component Cooling Water**

HCV-14-3A	1A SDC HX to Return Hdr A	Open
HCV-14-3B	1B SDC HX to Return Hdr B	Open
HCV-14-1	CCW Supply Hdr N to Penetr 23 Isol	Closed
HCV-14-2	Penetr 24 CCW Return to Return Hdr N Isol	Closed
HCV-14-6	Penetr 24 CCW Return to Return Hdr N Isol	Closed
HCV-14-7	CCW Supply Hdr N to Penetr 23 Isol	Closed
HCV-14-8A	1A CCW HX Outlet Crossover to Supply Hdr N	Closed

ALL OUTSIDE CONTAINMENT

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
7. If **BOTH** of the following conditions exist: • Loss of CCW to the RCPs, due to loss of Instrument Air pressure • CCW can NOT be restored within 10 minutes Then PERFORM **ALL** of the following: A. TRIP the Reactor. B. TRIP the Turbine. C. TRIP **ALL** the RCPs. D. **GO TO** 2-EOP-01, Standard Post Trip Actions.	
8. If instrument air is lost to a feedwater regulating valve, Then take local control of valve as follows: A. Line up the hole in the jacking device with the hole in the valve stem. B. Insert the coupling pin. C. Use handjack to control valve position as directed by control room personnel.	

/R18

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
7. (continued)	
¶5 D. If CCW flow is lost and CBO is isolated, Then BEGIN natural circ cooldown in accordance with ONP 1-0120039 within 4 hours.	
E. If low CCW flow to RCPs is due to degraded instrument air pressure, Then: 1. Refer to Appendix A, Local Restoration of CCW to RCPs. 2. Refer to Off-Normal OP 1-1010030, "Loss of Instrument Air."	
F. If the loss of CCW to RCPs is due to failure of CCW containment isolation valves, Then refer to Appendix A.	
8. Ensure the following RCP seal cooler CCW valves on RTGB 103 are open: HCV-14-11A1, HCV-14-11A2, HCV-14-11B1, HCV-14-11B2.	8. If valves are closed, Then attempt to reset and open.

Question: 8

The following conditions exist:

- 1A 125V DC bus has been deenergized due to an electrical fault
- A steam line break has developed on the 1A Steam Generator
- 1A Steam Generator pressure is 570 psig
- 1B Steam Generator is 890 psig
- No other failures exist

Which of the following describes the status of the Main Steam isolation valves?

A. The A MSIV is open, the B MSIV is closed.

B. The B MSIV is open, the A MSIV is closed.

C. Both A and B MSIV's are open.

D. Both A and B MSIV's are closed.

A. Correct, loss of DC bus results in loss of two inst. Inverters and MSIS actuation. Due to loss of DC on the A side, A MSIV failed to close. (fails open on loss of DC power). B MSIV closed on MSIS actuation signal.

B. Incorrect, backwards

C. Incorrect, B MSIV closed

D. Incorrect, only B MSIV closed

Question level: 2
Question source: Bank
Exam: RO/SRO
K/A:063.K3.02
Importance: 3.7
References: 1-ARP-01-Q47 Annunciator Response Procedure, ESFAS Lesson Text 0711401, ESFAS LP 00702401-8E

measurement channel in bypass, the appropriate bypass key is placed in the bypass position. This places the system logic to 2/3. **It is important to note that the Unit 1 bypass key switches do NOT always align with the associated module.** On Unit 1 in September of 1996, 1A S/G Low Pressure bistable was bypassed when the 1B S/G Low pressure bistable had failed. This was attributed to the misalignment of key switches and bistable modules. Independent verification did not catch this error. Refer to LER 335-96-013 for more details.

For RAS while the T.S. allow either bypassing or tripping a inoperable channel T.S. guidance per AP 0010120 places a 72 hour time limit (minus the time in bypass) the inoperable channel is allowed to be in trip. This restriction is to minimize the probability of a single failure resulting in a premature transfer of suction of the ECCS pumps' (HPSI , LPSI & CS) from the RWT to the CB sump during accident conditions.

<u>Other ESFAS Anomalies</u>

A failed ESFAS input would not hamper actuation because of the 2/4 logic where the design is that a failed channel can neither cause nor prevent an actuation. System logic would either result in1/3 or 2/3 depending on the type of failure.

A failed ESFAS component can not prevent fulfilling the design safety function of ESFAS assuming T.S. adherence at the time of actuation (single failure criteria). System logic, as was the case for a failed ESFAS input, would either result in1/3 or 2/3 depending on the type of failure.

Loss of a single 120VAC instrument power supply would not cause an actuation unless one ESFAS channel was in "Trip" at the time of actuation (here system logic would be 1/3) nor would it prevent a valid actuation (in this case system logic 2/3). Loss of multiple 120VAC instrument power supplies would cause both a reactor trip and every ESFAS actuation except RAS and CSAS (also DSS). Energize to trip ESFAS systems like CSAS and RAS (also DSS) will auto bypass and system logic will depend on the number of remaining energized channels.

Loss of a single vital DC bus would have the same effect as the loss of two or more 120VAC instrument power buses for those ESFAS systems that deenergize to trip. Energize to trip ESFAS systems like CSAS and RAS (also DSS) will auto bypass and system logic will be 2/2 on the remaining two energized channels.

REVISION:	PROCEDURE TITLE:	PANEL:
1	ANNUNCIATOR RESPONSE PROCEDURE	Q
PROCEDURE NO:		WINDOW:
1-ARP-01-Q47	ST. LUCIE UNIT 1	47

ANNUNCIATOR PANEL Q

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

MSIV
HCV-08-1A
AIR PRESS LOW/
DC FAILURE
Q-47

DEVICE:	**LOCATION:**	**SETPOINT:**
PS-08-12A	TRSL/40/N-T3/E-TB	100.7 psig
74/312	RTGB-106	De-energized
74B	SB Termination Cabinet	De-energized

/R1

ALARM CONFIRMATION:

1. If air pressure is lost, Then HCV-08-1A, Main Steam Hdr A Isolation Valve, closed or closing.
2. HCV-08-1A will NOT CLOSE.
3. Both HCV-08-1A status lights NOT LIT.

OPERATOR ACTIONS:

NOTE

- MSIVs Fail OPEN on Loss of Power with air pressure available.
- MSIVs Fail CLOSED on Loss of Air.
- If 74B fuses are blown, A train MSIS components will fail to actuate on MSIS B. /R1

1. DISPATCH an operator to perform the following:
   A. ENSURE V18444, Instr Air 1A1 MSIV Accum Isol, is OPEN.
   B. CHECK PI-18-43A, Instrument air to 1A1 MSIV Accum.
   C. CHECK for air leaks on the MSIV.
2. **If PI-18-43A indicates less than 100 psig or air leaks are detected, Then GO TO ONOP 1-1010030, Loss of Instrument Air.**
3. If the annnunciator remains in alarm or indicating lights for HCV-08-1A are NOT LIT, Then ENSURE the following fuses are checked and replaced as necessary:
   - RTGB-106 TB CCC Fuse F19
   - RTGB-106 TB CCC Fuse F20
4. ENSURE 74B fuses are checked and replaced as necessary, 74B fuse are located in SA/SB Isolation Cabinet B101F; Fuse F1, F2, F3 and F4 and RTGB 105 Fuses HH F62, F63. /R1
5. If the annuciator remains in ALARM, Then DIRECT EM and I&C to troubleshoot alarm circuit.

CAUSES: Low air pressure in the accumulator or a loss of DC control power.

REFERENCES:
1. CWD 8770-B-327 SH 312, 647, 329, 645 /R1
2. TEDB

Question: 9

Unit 2 is at 18% reactor power with an automatic transfer from the 2A 15% Feedwater bypass valve to the 2A Main feed regulating valves in progress using the low power Feedwater control system (LPFWCS).

Which of the following will cause the automatic transfer to terminate?

A. RPS channel A linear range NI failing high.

B. Control channel 9 NI power (JR-009) failing low.

C. 2A Feedwater temperature failing high.

D. 2A Feedwater flow transmitter FT 9011 failing low.

A. Incorrect, RPS linear range not an input to LPFWCS

B. Correct, control channel 9 is only NI input to A side LPFWCS

C. Incorrect, feedwater temperature an input but not an interlock for auto transfer

D. Incorrect, feedwater flow 9021 an input to Main Feedwater automatic control, not 15% control.

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 015.K4.07
Importance: 3.8
References: 2-GOP-502 Data Sheets Required for Heatup Appendix Z, FWCS LP 0702408-13

APPENDIX Z

TRANSFER OF FEED FROM THE 15% BYPASS VALVES TO THE MAIN FEED REGULATING VALVES

(Page 1 of 6)

INITIAL

Date____/____/____

2A STEAM GENERATOR

> **NOTE**
> If the following conditions can NOT be met or maintained, SG level control must be manually transferred.

1. ENSURE the following conditions are met:

A. Reactor Power is being maintained between 13% and 22% as indicated by:

1. Control Channel NI Recorders JR-009/-010, Power Range % Power, on RTGB-204. ______

OR

2. The Percent Power meters on the Nuclear Instrumentation Start-up and Control Panel on the back of RTGB-204. ______

B. Steam Generator Level is being MAINTAINED between 55% and 75% as indicated on LIC-9005, 2A 15% Bypass. ______

C. LIC-9005, 2A 15% Bypass, is in automatic control. ______

2. ENSURE FIC-9011, 2A Feed Reg Valve, is in MANUAL as follows:

A. TURN the knurled knob on the face of FIC-9011, 2A Feed Reg Valve, to the full counter-clockwise position. ______

B. DEPRESS and RELEASE the yellow pushbutton on the face of FIC-9011, 2A Feed Reg Valve. ______

APPENDIX Z

TRANSFER OF FEED FROM THE 15% BYPASS VALVES TO THE MAIN FEED REGULATING VALVES

(Page 2 of 6) INITIAL

2. (continued)

C. VERIFY the yellow pushbutton on the face of FIC-9011, 2A Feed Reg Valve, becomes LIT. ______

D. DEPRESS and HOLD the yellow switch marked DEC on the face of FIC-9011, 2A Feed Reg Valve, until the output meter indicates zero, Then RELEASE. ______

3. VERIFY the Xfer To Main light is LIT on CS-673-1, 2A FWCS Transfer SW. ______

4. OPEN MV-09-5, Stm Gen 2A Reg Block Valve. ______

5. ALLOW the 2A SG level, feed rate and 15% Bypass Valve position to stabilize. ______

CAUTION

If, at any time, during the transfer the conditions stated in Step 1 are NOT satisfied, the automatic transfer will be terminated as indicated by CS-673-1, 2A FWCS Transfer SW, lights extinguishing. If this occurs, SG level control will be automatically controlled by either the MFWCS or the LPFWCS. Either the Main Feed Regulating Valve or the 15% Bypass Valve will be in automatic control and the other valve will be in manual control and remain in its current position. The valve in manual control can be positioned by the operator and the rest of the transfer should be completed manually.

6. TURN and HOLD CS-673-1, 2A FWCS Transfer SW, to the XFER TO MAIN position until the Xfer In Progress light becomes LIT.

7. RELEASE CS-673-1, 2A FWCS Transfer SW. ______

Question: 10

The following are Unit 2 Fuel Pool Area Radiation Monitors:

SA	SB
GAG-007	GAG-008
GAG-009	GAG-010
GAG-011	GAG-012

Which of the following is the minimum condition that would initiate a FHB ventilation transfer to the Sheild Building Ventilation system?

A. GAG-007 in ALERT, GAG-009 in ALARM

B. GAG-009 in ALARM, GAG-012 in ALARM

C. GAG-007 in ALERT, GAG-011 in ALERT

D. GAG-008 in ALARM, GAG-010 in ALARM

A. Incorrect, must have 2 of 3 channels in same train in ALARM

B. Incorrect, must have 2 of 3 channels in same train in ALARM

C. Incorrect, must have 2 of 3 channels in same train in ALARM

D. Correct

Question level: 2
Question source: Bank
Exam: RO/SRO
K/A: 072.A3.01
Importance: 3.1
References: Radiation System Lesson Text 0711411, Radiation LP 0702411-9A

the 18 safety-related monitors, monitor locations, detector types, and detector locations and Tech Spec required area. Table 4 identifies the non safety-related area monitor monitor/detector specifics.

The safety-related monitors are those which are:

- Required for safe shutdown of the plant
- Powered by a safety bus
- Part of a redundant system for reliability
- Seismically mounted

SAFETY-RELATED AREA MONITORS

The 18 safety-related area monitors are grouped as follows:

- Containment Isolation Actuation Signal (CIAS) Radiation Monitors – Four monitoring stations
- Spent Fuel Pool Monitors – Six monitoring stations
- Containment Hi Range Radiation Monitors – Two monitoring stations
- Containment Post Accident Radiation Monitors – Two monitoring stations
- Control Room Outside Air Intake Radiation Monitors – Four monitoring stations

Containment Isolation Actuation Signal (CIAS) Radiation Monitors

Four (4) Containment Isolation Actuation Signal (CIAS) Radiation Monitor detectors are spaced 90 degrees apart in containment and provide continuous radiation monitoring. Their associated RM-80s are located in the RAB. If two of the four CIAS monitors reach their preset high alarm setpoint, they will initiate a Containment Isolation Actuation Signal (CIAS). Each monitoring station uses a gamma sensitive ion chamber GM detector. One out of four detectors in pretrip will actuate the containment evacuation alarm. Each CIAS RM is powered from an instrument power supply. The setpoints are $\leq$ 10R/hr in Modes 1-3 and $\leq$ 90 mR/hr in Mode 6.

Spent Fuel Pool Monitors

The Spent Fuel Pool Monitors use GM detectors to indicate problems around the Spent Fuel Pool. They are grouped into 2 groups, group SA and group SB, each having 3 channels. Refer to the Functional Diagram (Figure 4) for the arrangement. Redundant logic assemblies provide alarm output signals when either of the two circuits (groups) have high radiation alarm signals. Two out of three channels (in the same group) alarming will initiate a FHB ventilation transfer to the Shield Building Ventilation System (SBVS). This action "scrubs" the spent fuel pool exhaust through the SBVS HEPA and Charcoal Filters prior to discharge to the atmosphere. The ventilation component actuation sequence is discussed in the RAB Ventilation Lesson Text 0711601. The setpoint for alarm and actuation is ≤ 15mR/hr.

Containment High Range Radiation Monitors

The two (2) Containment High Range Post-Accident Radiation Monitors provide post-accident monitoring of containment levels. They are located on the 90 ft elevation of the containment spaced 180 degrees apart. The detectors are gas filled gamma ion chambers which are capable of detecting high intensity radiation up to 10^7 R/hr. They are also used as a backup source of information for calculating off-site dose during an accident. These RMs do not have an initiating alarm setpoint.

Both monitors utilize a Digital High Range Monitoring System. Each digital high range monitoring system consists of an RD-23 gamma radiation detector (ion chamber), an RM-80 microprocessor, an RM-23 control/display module, and an RL-10 local indication/alarm assembly.

Containment Post-Accident Radiation Monitors

Additionally, two (2) Containment Post-Accident Radiation Monitors, located outside the Containment Building, also provide post-accident monitoring of containment levels. They read up to 10^5 mR/hr and are the last resort for obtaining information for calculating off-site dose during an accident.

These monitors are high-range area monitors consisting of an RD-8 ion chamber detector assemblies. The RM-80 microprocessors used with the monitors are provided with operate, alert alarm, and high alarm indicating lamps, an alarm horn and alarm acknowledge pushbutton. The RM-80 microprocessor is also provided with an analog meter to provide radiation information in mR/hr.

TABLE 1
(continued)

MONITOR	MONITOR TYPE[1]	INSTRUMENT NO.	CD[2]	CHANNEL NO.
ECCS Exhaust Duct	W.R.G.M.	RS-26-70	Low Mid High Eff.	AAL-611 AAM-612 AAH-613 AAE-614
Plant Stack Accident	W.R.G.M.	RS-26-90	Low Mid High Eff.	AAL-621 AAM-622 AAH-623 AAE-624
Main Steam Line #1	S.L.M.	RIM-26-71		AS1-631
Main Steam Line #2	S.L.M.	RIM-26-72		AS2-632
Main Steam Line Bkgd	S.L.M.	RIM-26-73		ASB-633
Control Room	AREA	RIM-26-1		GAG-001
CIAS A	AREA	RIM-26-3		GAG-003
CIAS B	AREA	RIM-26-4		GAG-004
CIAS C	AREA	RIM-26-5		GAG-005
CIAS D	AREA	RIM-26-6		GAG-006
Spent Fuel Pool A	AREA	RIM-26-7		GAG-007
Spent Fuel Pool B	AREA	RIM-26-8		GAG-008
Spent Fuel Pool C	AREA	RIM-26-9		GAG-009
Spent Fuel Pool D	AREA	RIM-26-10		GAG-010
Spent Fuel Pool E	AREA	RIM-26-11		GAG-011
Spent Fuel Pool F	AREA	RIM-26-12		GAG-012
Containment Post Accident A	AREA	RIM-26-38		AAG-638
Containment Post Accident B	AREA	RIM-26-39		AAG-639
Personnel Lock Area	AREA	RIM-26-32		GAG-032
Refueling Canal Area	AREA	RIM-26-33		GAG-033
Fuel Pool Pump Area	AREA	RIM-26-34		GAG-034
Boric Acid Preconcentrator Filter Area	AREA	RIM-26-35		GAG-035

Question: 11

On Unit 2 CEA group 5 is 8" withdrawn during a startup. A CEA in group 5 slips to the lower electrical limit (LEL).

Which of the following describes the indicated position of the slipped CEA.

The ADS will indicate 1", the DDPS will indicate

A. 8" until CEA position is reset by the Operator.

B. 8" until the Automatic CEDM timer Module (ACTM) is reset by the Operator.

C. 1" due to the LEL resetting the DDPS position.

D. 1" due to the Automatic CEDM timer Module (ACTM) resetting the DDPS position.

A. **Correct, the DDPS counts pulses and only the dropped rod contact resets the DDPS position to '0' inches. Any other position due to a slipped CEA, must be reset by the Operator.**

B. Incorrect, ACTM module provides timing pulses to the CEA, not position indication.

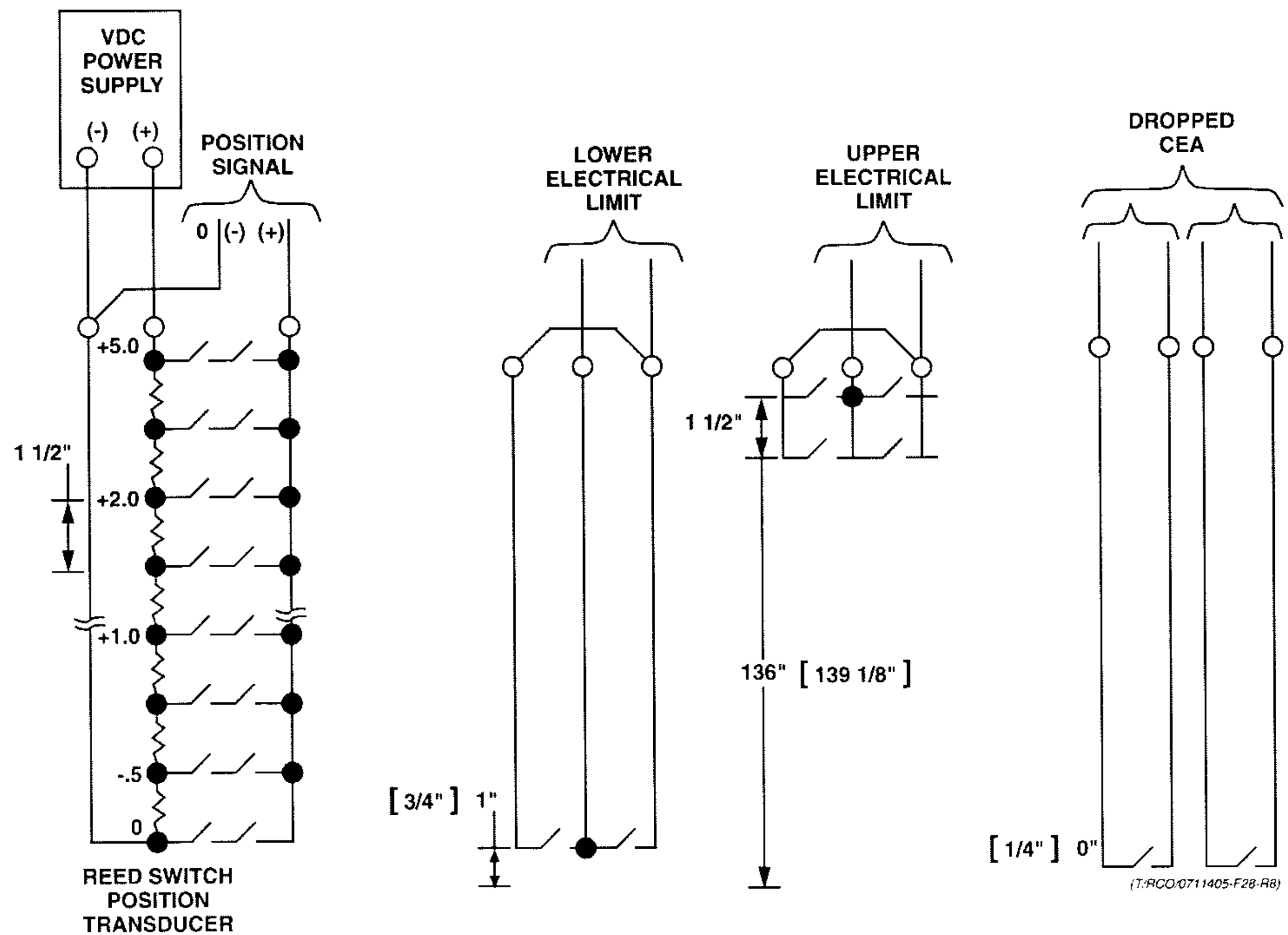
C. Incorrect, the dropped rod contact not the LEL contact resets the CEA position.

D. Incorrect, ACTM not position indication.

Question level: 1
Question source: New
Exam: RO/SRO
K/A: 003.AK3.06
Importance:3.0
References: CEDM lesson text 0711405, LP 0702405-7

FIGURE 16

REED SWITCHES



6.0 INSTRUCTIONS (continued)

6.5 Changing CEA Position and Status

NOTE

- Viewing values for individual CEAs may be accomplished by performing the following:
  - Depressing the POINT ID pushbutton.
  - Entering the corresponding number for the CEA from Table 4 on the numeric keyboard
  - Depressing the ROD pushbutton.

1. DEPRESS the DELETE SUMMARY pushbutton.

2. DEPRESS the POINT ID pushbutton.

3. ENTER 57 on the numeric keyboard.

4. DEPRESS the DEMAND LOG pushbutton.

5. TURN the KEYSWITCH to ENABLE.

NOTE

Steps 6.5.6 through 6.5.11 may be repeated if multiple CEAs are being changed.

6. DEPRESS the POINT ID pushbutton.

7. ENTER the corresponding number for the CEA from Table 4 on the numeric keyboard.

8. DEPRESS the ROD pushbutton.

9. PERFORM the following to delete a CEA:

A. DEPRESS the DELETE/RESTORE pushbutton.

B. DEPRESS the ENTER pushbutton.

C. Using the DDPS printer, VERIFY the correct CEA was deleted.

4) Red – UEL 136"

c. RSPT Operation

1) 0-5 volt position signal sent to CEAPDS and backup digital display

2) Reed switches close as actuating magnet passes them (1-1/2 inch intervals).

3) Two redundant upper elec. limit signals (contact closure).

4) If the first one fails, the second actuates, and blocks further raise signals.

5) Independent dropped CEA contacts:

a) Resets DDPS pulse counters.

b) Dropped CEA light and alarm.

6) On a LOOP, LEL and RBL will indicate if reed switch is actuated.

3. Control Element Assembly Position Display System Provides (CEAPDS) **EO-2**

a. Graphical representation of CEA position. Fig. 17, 18

b. Receives power from QSPDS Inverter 1A **EO-6**

c. T.S. Timer info to track CEA misalignment and LTSSIL times.

d. Generates:

1) Alarm indication.

2) Motion inhibit signals to CEDS.

e. Major Components

1) IBM PC AT-386

a) Accepts information from RSPTs, Rx Pwr, Reed Switch Pwr Supply, other digital inputs, operator keyboard

CEDMCS Logic Cabinet

The CEDMCS logic cabinets consist of four multi-bay cabinets located in a climate controlled enclosure in the Cable Spreading Room on the 43-foot elevation of the RAB. Refer to Figure 33. The logic cabinets provide for the synchronization of CEA subgroup and group motion, and the compatibility of mode and group selections. In doing so, the logic cabinets perform the following operations:

- Provide the system timing required for single or multi-group operation.
- Transfers raise or lower commands to the appropriate subgroup logic housing.
- Ensures that no more than a single subgroup is assigned to the holding bus circuit at one time.
- Provides local and remote annunciator activation.

Automatic CEDM Timer Module (ACTM)

The ACTM responds to logic signals to initiate cycle time (CT) signal output, with the additional ability to conduct self diagnosis tests. The ACTM utilizes non-intrusive current sensors to monitor the characteristics of the currents going to the CEDM coils. In this manner, the ACTM can detect unacceptable operation of the CEDM and take corrective action to prevent a CEA from dropping or slipping.

Each ACTM card performs the following functions:

- Provides the timing pulses used to control the high current, low current, and off times of the five coils for a single CEA.
- Sets the cycle time for CEA speed control. (This is the same cycle time used by a single CEA during MI mode of operation).
- Generates an ACTM card failure alarm and a continuous gripper high voltage alarm to the plant annunciator, and generates an upper gripper hold signal coincident with the card failure alarm.
- Produces the cycle time and Lift Coil high and low signals.

- The ACTM bases the start of the next step in the sequence on whether the previous step was correctly completed.

The ACTM monitors UG and LG timing pulses during insertion and withdrawal. If, during a cycle time, neither a high nor low level UG or LG timing pulse is present, the ACTM generates a Timer Failure Alarm (TFA) and simultaneously sends a hold signal to the LED driver and TFA latch circuit card. This hold signal ultimately provides a holding voltage for the affected CEA's UG coil, thereby preventing CEA drop.

Power Switches

Power switch assemblies provide coil voltages directly to interconnected CEDM coils. A power switch assembly is provided for each CEA subgroup. CEA subgroups contain four CEAs (with the exception of Subgroup 23 with two CEAs and Subgroup 15 with five CEAs). CEA-1, a part of Subgroup 15, is also a special case in that it has an individual power switch assembly. The Unit 2 power switch houses four individual switching units that operate in the same manner as the Unit 1 power switching module.

A major difference is that each Unit 2 power switch moves two or four CEAs at the same time (with the exception of CEA-1), while Unit 1 only moves one CEA.

The voltage rectification on Unit 2 is identical to Unit 1. Each subgroup power switch assembly services all of the CEDM coils for the subgroup. The power switches are located in the logic cabinets in the Cable Spreading Room.

POWER TRAIN

Motor Generator Power Distribution

The power train, as shown on Figure 34, includes the CEDM MG sets, the Diverse Scram System (DSS) contactors, the TCBs, the power switches, and the CEDMs.

The 2A(B) CEDM MG sets are located on the 19.5 foot elevation of the RAB as shown on Figure 21. The MG sets have 480 VAC, 273 amp motors that drive 240 VAC, 515 amp, 150 KW, 100% capacity, flywheeled generators. They ensure that adequate power is available to hold all CEAs and sustain the motion of any CEA already being stepped during a 1 second loss of power to the MG set's motor. The MG sets are

Question: 12

Unit 1 has been manually tripped from 100% power due to low Steam Generator level. The following Containment conditions are observed:

- Containment pressure is 3.8 PSIG
- 1A Steam Generator pressure is 520 psia, 1B Steam Generator pressure is 840 psia.

Immediately upon the trip and assuming no Operator action, which of the following, if any, will be feeding the Steam Generators?

A. Main feedwater only.

B. Auxiliary feedwater only.

C. No main or auxiliary feedwater.

D. Both Main and Auxiliary feedwater.

A. Incorrect, MSIS has terminated Main feedwater, would be correct if no MSIS

B. Incorrect, Auxiliary feedwater has a time delay

C. Correct

D. Incorrect, would be correct if no MSIS and after time delay.

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 013.K1.15
Importance: 3.8
References: ESFAS Lesson Text 0711401, 1-EOP-99

SYSTEM DATA

ESFAS DATA TABLE

SIGNAL	PARAMETER	APPROXIMATE SETPOINT UNIT 1	APPROXIMATE SETPOINT UNIT 2	DESIGN BASES EVENT
SIAS	LO Pzr Pressure	1600 psia	1736 psia	LOCA
	HI Cntmt Pressure	5.0 psig	3.5 psig	
CIS	HI Cntmt Pressure	5.0 psig	3.5 psig	LOCA
[CIAS]	SIAS Actuation	---	---	
	HI Cntmt Radiation	10 R/hr	10 R/hr	
	(Refueling)	90 mr/hr	90 mr/hr	
MSIS	LO S/G Pressure	600 psia	600 psia	Stm Line Break
	[HI Cntmt Pressure]	N/A	3.5 psig	
CSAS	HI Cntmt Pressure...	10 psig	5.4 psig	LOCA
	with SIAS Actuation	w/SIAS	w/SIAS	Stm Line break
RAS	LO RWT Level	4 ft.	6 ft.	LOCA
DSS*	HI Pzr Pressure	2450 psia	2450 psia	ATWS total loss of FW with No RPS trip

NOTE: The AFAS-1 and AFAS-2 signals are considered by the FSAR and Technical Specification to be part of the ESFAS. For instructional purposes, due to the difference in flowpath and operational design, they are taught in the AFAS/Auxiliary Feedwater Lesson Text.

Loss of power to safety related buses is addressed in the ESFAS Technical Specifications, but is addressed instructionally in Main Power Distribution text.

* The DSS is <u>not</u> an ESFAS signal, but is functionally identical to other ESFAS signals. Since the DSS equipment is located in the ESFAS cabinets, it is described in this text.

Operation of the RAS circuitry is similar to the operation of the CSAS. Refer to Figure 16. The RAS output relays are energized to actuate in order to prevent spurious actuation. It is essential that the RWT outlet valves remain open and the sump outlet valves remain closed to ensure that the required quantity of borated water is injected into the RCS (therefore the cntmt sump) prior to recirculation.

RAS is arranged in groups for testing purposes. Control switches for manual initiation are located on RTGB 106 [206], and operate the same as those previously described.

- RAS is NOT provided with blocking modules.

Several annunciators associated with RAS actuation on RTGB 106 [206] are:

- R-13 [S-19], RWT LEVEL RAS CHANNEL TRIP
- R-3 [S-9], RAS CHANNEL ACTUATION A / B

Main Steam Isolation Signal (MSIS)

The MSIS terminates blowdown of steam from both S/Gs and stops the normal feedwater flow to both S/Gs by closing the main steam and main feedwater isolation valves. In accordance with Unit 1 PCM 99101, an MSIS signal will trip the main feedwater pumps and the heater drain pumps. A list of the components activated by the MSIS is given in EOP-99.

- MSIS is actuated by 2-out-of-4 low S/G pressure **(600 psia)** signals [and/or 2-out-of-4 high cntmt pressure **(3.5 psig)** signals.]

- MSIS is a **de-energize to actuate** signal.

There are four independent channels of S/G pressure transmitters for each S/G (PT-8013A, B, C, and D and PT-8023 A, B, C, and D). [On Unit 2, the cntmt pressure trips for MSIS come from a common cntmt pressure bistable used for SIAS.]

As shown in Figure 17, an initiation signal, generated by either channel, will actuate the isolation of both S/Gs. It should be noted, however, that the ESFAS system does not "auctioneer" S/G A & B pressures. The 'A' actuation channel looks only at 'A' S/G pressure and actuates 'A' train MSIS on 'A' S/G low pressure only. The same is true for B actuation

Question: 13

Unit 2 is in Mode 6 performing fuel movement with the containment equipment hatch open. Maintenance has reported the hoist used to open/close the containment equipment hatch is inoperable, but they have demonstrated they can close and bolt the hatch manually in 35 minutes if needed.

Which of the following explains the impact, if any, this will have on containment integrity and continuation of fuel movement?

A. No impact, as long as the hatch can be closed and bolted within 45 minutes if needed.

B. No impact, as long as the hatch can be closed and bolted (no time limit).

C. Fuel movement must be stopped until the hatch can be proven to be able to be closed and bolted within 30 minutes.

D. Fuel movement must be stopped until the hoist can be repaired even if the hatch can be manually closed and bolted in any time frame.

A. Incorrect, hatch must be closed and bolted within 30 minutes.

B. Incorrect, hatch must be closed and bolted within 30 minutes.

C. Correct

D. Incorrect, hoist not specifically required as long as hatch can be closed and bolted within 30 minutes.

Question level: 1
Question source: New
Exam: SRO only
K/A: 103.K3.03
Importance: 4.1
Reference: Technical Specifications 3.9.4, SRO T.S. Lesson plan 0902723-1

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

LIMITING CONDITION FOR OPERATION

3.9.4 The containment building penetrations shall be in the following status:

a. The equipment door closed and held in place by a minimum of four bolts, or the equipment door may be open if:

   1. It is capable of being closed with four bolts within 30 minutes,

   2. The plant is in MODE 6 with at least 23 feet of water above the reactor pressure vessel flange, and

   3. A designated crew is available at the equipment door to close the door.

b. A minimum of one door in each airlock is closed, or both doors of each containment airlock may be open if:

   1. At least one door of each airlock is capable of being closed,

   2. The plant is in MODE 6 with at least 23 feet of water above the reactor pressure vessel flange, and

   3. A designated individual is available outside each open airlock to close the door.

c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere shall be either:

   1. Closed by an isolation valve, blind flange, or manual valve, or

   2. Be capable of being closed by an OPERABLE automatic containment isolation valve.

APPLICABILITY: During CORE ALTERATIONS or movement of irradiated fuel within the containment.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or movement of irradiated fuel in the containment building.

Question: 14

Unit 2 is at 100% power when a 'B' side CCW leak occurs. A low level alarm (LA-10,LB-10) on both compartments has occurred in the CCW surge tank. The leak has been isolated and the surge tank level has returned to normal.

Assuming no Operator actions, other than isolating the leak, which of the following describes the configuration of the CCW system?

A. Only the 'N' header valves from the 'A' side closed separating the 'A' CCW header from the 'B' side CCW header. The 'N' header valves automatically re-opened when the low level cleared.

B. Only the 'N' header valves from the 'B' side closed separating the 'A' CCW header from the 'B' side CCW header. The 'N' header valves will have to be manually re-opened.

C. All the 'N' header valves closed separating the 'A' CCW header from the 'B' CCW header. The 'N' header valves automatically re-opened when the low level cleared.

D. All the 'N' header valves closed separating the 'A' CCW header from the 'B' CCW header. The 'N' header valves will have to be manually re-opened.

A. Incorrect, both CCW 'N' header valves closed. The valves have no feature to automatically re-open

B. Incorrect, surge tank will lower on both headers, closing all 'N' header valves.Correct

C. Incorrect, the valves have no feature to automatically re-open.

D. Correct

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 008.K4.02
Importance: 2.7
References: CCW LP 0702209-08, CCW Lesson Text 07111209, CCW ONOP 2-0310030

5.0 INSTRUCTIONS: (continued)

5.3 (continued)

4. (continued)

B. (continued)

7. Quickly reduce the CCW flow through the 2A CCW HX to less than 11,100 GPM, as read on FIS-14-1A (A CCW Header Flow), by isolating CCW flow to the following components, as necessary:

   a. One Shutdown Cooling HX (approx. 4000 GPM).

   b. Fuel Pool HX (approx. 3500 GPM).

   c. Non-running Containment Cooler (approx. 1300 GPM)

   These are only very short term fixes for CCW flow. Locally isolate flow to other components and restore flow to the ones listed above as soon as possible.

8. Consult Tech Spec 3.7.3 due to loss of a Heat Exchanger.

5. If a CCW Header is ruptured, Then perform the following:

NOTE
Annunciators LA-10, "CCW Surge Tank Compartment A Level Low", and LB-10, "CCW Surge Tank Level High/Compartment B Level Low", will alarm on a rupture of either the "A", "B", or "N" CCW Header, or failure of the makeup system.

A. Verify that the "N" Header automatically isolates from the "A" and "B" Headers due to low levels in both compartments of the CCW Surge Tank by closure of the following:

HCV-14-8A
HCV-14-8B
HCV-14-9
HCV-14-10

5.0 INSTRUCTIONS: (continued)

5.3 (continued)

5. (continued)

CAUTION

Loss of component cooling water flow through any of the heat exchangers listed below can result in severe thermal stress and flashing upon re-admittance of cooling flow:

2A HPSI Pump
2A and 2B Containment Fan Coolers
2A SDC Heat Exchanger
3A and 3C Control Room A/C Units
Fuel Pool Heat Exchanger, if aligned to "A" Essential Header

NOTE

CCW has been isolated to the following "A" Essential Header Components:
2A HPSI Pump
2A and 2B Containment Fan Coolers
2A SDC Heat Exchanger
3A and 3C Control Room A/C Units
(Fuel Pool Heat Exchanger, if aligned to "A" Essential Header)

B. If Annunciator LB-10, "CCW Surge Tank Level High/Compartment B Level Low", alarm clears, indicating that the rupture is in the "A" Essential CCW Header, Then perform the following:

1. Stop the 2A CCW Pump.

2. Restore CCW to the "N" Header from the "B" Essential Header by performing the following:

   a. Close HCV-14-8B.

   b. Close HCV-14-10.

   c. Open HCV-14-8B.

   d. Open HCV-14-10 (5 second time delay to open).

5.0 INSTRUCTIONS: (continued)

5.3 (continued)

5. (continued)

CAUTION
Loss of component cooling water flow through any of the heat exchangers listed below can result in severe thermal stress and flashing upon re-admittance of cooling flow: 2B HPSI Pump 2C and 2D Containment Fan Coolers 2B SDC Heat Exchanger 3B Control Room A/C Unit 3C Control Room A/C Unit, if aligned to "B" Essential Header Fuel Pool Heat Exchanger, if aligned to "B" Essential Header

NOTE
CCW has been isolated to the following "B" Essential Header Components: 2B HPSI Pump 2C and 2D Containment Fan Coolers 2B SDC Heat Exchanger 2B Control Room A/C Unit Fuel Pool Heat Exchanger

C. If Annunciator LA-10, "CCW Surge Tank Compartment A Level Low", alarm clears, indicating that the rupture is in the "B" Essential CCW Header, Then perform the following:

1. Stop the 2B CCW Pump.

2. Restore CCW to the "N" Header from the "A" Essential Header by performing the following:

a. Close HCV-14-8A.

b. Close HCV-14-9.

c. Open HCV-14-8A.

d. Open HCV-14-9 (5 second time delay to open).

- **Low at 29"** as sensed by LS-14-1B (COMPARTMENT B LEVEL LOW). This alarm can alert the operator to an off-normal condition such as a failure of the makeup system to begin makeup flow and/or a leak or rupture in the CCW system. The off-normal procedure cautions the operator that the fire water system should be used as a makeup source as a last resort.

- Each side of the surge tank has a water level sight glass for local indication.

- Unit 2 has two additional level switches associated with the CCW surge tank:
  - **at 29"** LS-14-6A causes the following 'A' side 'N' header valves to **CLOSE**:
    - ➢ HCV-14-8A, 'A' side supply
    - ➢ HCV-14-9, 'A' side return
  - **at 29"** LS-14-6B causes the following 'B' side 'N' header valves to **CLOSE**:
    - ➢ HCV-14-8B, 'B' side supply
    - ➢ HCV-14-10, 'B' side return

    A **leak** in one of the **essential** headers would affect the level in both compartments of the surge tank due to their being cross-connected via the 'N' header. After both sides 'N' header valves close, the side without the leak would have its low level alarm clear. The 'N' header supply and return valves for that "good" side could then be re-opened.

    A **leak** in the '**N**' header would also affect the level in both compartments of the surge tank. After both sides 'N' headers valves close, both low level alarms would clear, indicating that the leak was in the 'N' header.

- Overflow or draining from the CCW surge tank is collected by the Reactor Auxiliary Building drain system and is routed to the Chemical Drain Tank.

- The CCW surge tank is vented:
  - Normally to atmosphere via RCV-14-1
  - CCW Surge Tank Vent RCV-41-1 diverts from atmosphere to the Chemical Drain Tank on high radioactivity in the CCW system as detected by at least one in line process radiation monitor.

Question: 15

Given the following conditions:

- Unit 1 tripped 15 minutes ago
- Pressurizer pressure is 2100 psia and slowly increasing
- Pressurizer level lowered to 25% and has slowly recovered to 29%
- All systems are in automatic and have actuated as required

Which of the following is the correct condition for the Pressurizer heaters at this time? (ASSUME NO OPERATOR ACTION)

A. All heaters are energized

B. Only the proportional heaters are energized.

C. All heaters are de-energized.

D. Only the proportional heaters are de-energized.

A. All heaters de-energized at 28% and must be restored manually.

B. All heaters de-energized at 28% and must be restored manually.

C. Correct

D. All heaters de-energized at 28% and must be restored manually.

Question level: 2
Question source: Bank (year 2000 NRC exam) u-15
Exam: RO/SRO
K/A: 011.K6.03
Importance: SRO 3.3
References: Pressurizer Pressure and Level Control LP 0702206- 6

A3 and B3 Pressurizer Heater 480V Load Centers. They are operated from RTGB 101 [201].

- **Undervoltage (LOOP) interlock** will load shed the 4160V PZR feeder breakers, but they can be reclosed after verifying adequate EDG load capacity.

- [Unit 2 **SIAS interlock** will lockout the 4160V breakers. The breaker cannot be reclosed until SIAS is reset.]

- [Unit 2 **PZR LO-LO level 27% interlock** locks out the 4160V breakers.]

- Each 4160V PZR heater load center supply breaker has a "NORMAL-ISOLATE" selector switch, located on an isolation panel in the associated cable spreading room.

  - In "NORMAL" the breaker receives its control signal from the control room, but can be locally tripped at the breaker.

  - Locally operated at the Hot Shutdown Control Panel in "ISOLATE", but **still receives UV bus strip signal. [SIAS and LO-LO level blocked in ISOLATE.]**

<u>480V Heater Breaker Control Features</u> (<u>Figures 9, 10, 11, and 12</u>)

Eight 480V heater bank control switches are provided on RTGB-103 [203] for control of proportional and backup heaters through contactors.

- **Interlocked with pressurizer level 28 [27]%** to prevent energizing the heaters.

- **480V heater bus undervoltage/loss of control power** also locks out the supply contactor.

- Reset heater controls by turning the control switch to OFF, then back to ON for each heater bank.
- [All Unit 2 480 V heater banks are also provided with a **high pressure heater cutoff**, as a backup to the normal pressure control signals. This cutoff:

  - Opens the contactors if pressure reaches **2340 psia**.

  - Automatically restores heater bank control when pressure below setpoint; control

Question: 16

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

- Pressurizer pressure controller PIC-1100Y is selected for control
- Pressurizer backup heaters B-1 and B-5 are energized

HIC-1100 Pressurizer spray controller fails to 100% output

Which of the following explains the expected response?

Pressurizer spray valves:

A. closed, all backup heaters on

B. closed, proportional heater output to maximum

C. open, proportional heater output to minimum

D. open, all backup heaters off

A. Incorrect, spray valves open. HIC-1100 does not control backup heaters, only proportional heaters.

B. Incorrect, spray valves open

C. Correct

D. Incorrect, HIC-1100 does not control backup heaters

Question Level: 2
Question Source: New
Exam: RO/SRO
K/A: 010.A3.02
Importance: 3.5
References: 0711206-11C Pressurizer Pressure and Level RCO Text,
1-0120035 Pressurizer Pressure and Level Off Normal Operating Procedure.

pushbutton on the controller, normally set at **2250 psia**.

- The analog output control signal of PIC-1100X & Y, in percent of maximum, is determined by pressure deviation from setpoint.
- When actual pressure is at setpoint, the output signal of PIC-1100X (Y) is **16.6%**.
  - With 16.6% control signal applied to the SCR's, the heaters produce 50% of their maximum thermal output.
- Controller output is indicated by an horizontal output [bar graph] meter on the controller.
- Actual pressure and pressure setpoint are displaced on the vertical portion of the controller.

By design, approximately a 150 KW thermal input is required to offset pressurizer heat losses to ambient and the pressurizer cooldown caused by continuous bypass spray.

Since the pressure setpoint is normally 2250 psia, analog control points are frequently given in psia (as shown in Figure 31.

As actual pressure deviates from setpoint, controller output (and heater thermal output) vary in a linear fashion: (See Figures 32 and 33.)

- At -25 psi from setpoint, controller output is 0% and proportional heater output is maximum.
- At +25 psi, controller output is 33.3% and proportional heater thermal output reaches zero.
- There is a 25 psi dead band of no heater or spray operation from +25 psi to +50 psi. [Unit 2 does not have this dead band.]

Hand indicator controller HIC-1100, is a proportional controller, located on RTGB-103 [203], that receives as its input signal, the selected analog output signal from PIC-1100X (Y):

- HIC-1100 is commonly referred to as the spray valve controller.
- Output is indicated by an output vertical [bar graph] meter on the controller.

- As shown in Figure 32, the full 100% output range of HIC-1100X (Y) overlaps, in a linear fashion, the upper 33.3% of PIC-1100X & Y output.

- Thus, as the output signal of PIC-1100X (Y) varies between 50% and 83% [33.33 and 66.6%] of maximum, the output of HIC-1100 and the percentage of spray valve opening vary from 0% to 100% of maximum in a direct, linear fashion.

  - Heater and spray proportional control are both related to PIC-1100X & Y output (given in % output), as shown in Figure 33.

- The electrical output of HIC-1100 is passed to the electro-pneumatic signal converters for either or both spray valves, depending upon the position of HS-1100-3 (E - BOTH - F), which was discussed under the section on "Heaters And Sprays." Signals to the spray valve are displayed on the **horizontal** meter on the controller HIC-1100. The signal corresponds to the 0 to 100% spray valve position displayed on the **vertical** graph on HIC 1100.

PRESSURIZER LEVEL CONTROL SYSTEM{tc \l2 "Pressurizer Level Control System}

Overview (Figure 34)

The pressurizer level control system (PLCS) is composed of two totally redundant control channels, LT-1110X and LT-1110Y, which perform the following functions:

- Maintains PZR level at programmed setpoint during steady state operation,

- Reduces letdown flow during a decreasing pressurizer level transient,

- Increases letdown flow during an increasing level transient,

- Provides signals to start and stop the standby charging [pump]s,

- Provides alarms to warn of channel failure or misoperation of the system,

- Energizes all pressurizer heaters on a high level deviation,

HEATER AND SPRAY PROPORTIONAL CONTROL

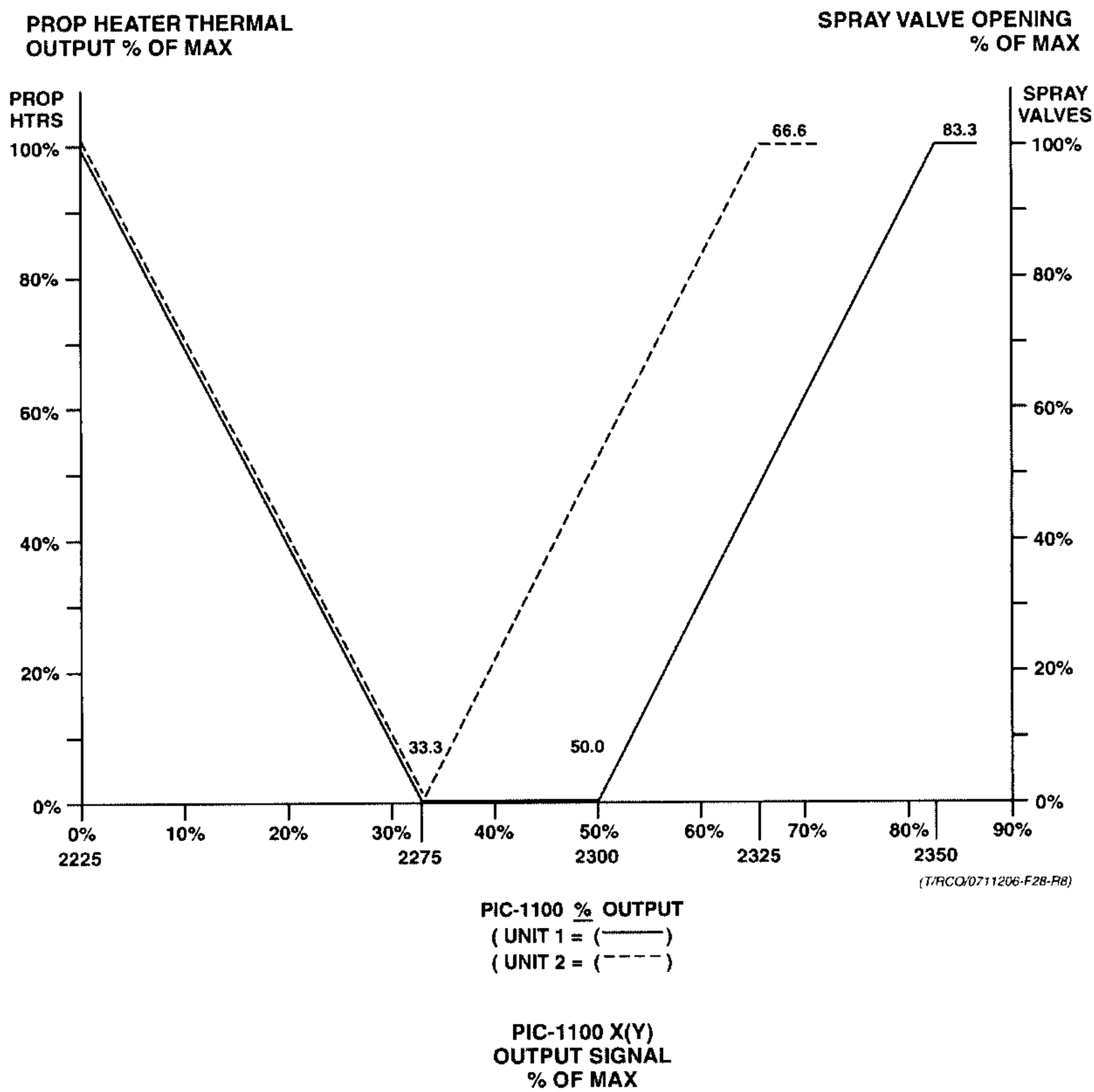


FIGURE 33

Question: 17

Unit 1 is at 30% power performing a Nuclear power and ΔT power calibration. As Nuclear power and ΔT power are adjusted downward, which of the following trip setpoints will change?

A. High Startup Rate, LPD, TMLP, Loss of Load

B. Low Flow, LPD, TMLP

C. High power, LPD, Pressurizer Pressure

D. High power, LPD, TMLP

A. Incorrect, not Loss of Load, High Startup rate bypassed >15% power.

B. Incorrect, not Low Flow

C. Incorrect, not Pressurizer Pressure

D. Correct

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 012.A1.01
Importance: 3.4
References: RPS Lesson Text 0711404, RPS LP 0702404-1C

CORE PROTECTION CALCULATOR INTERFACE BLOCK DIAGRAM

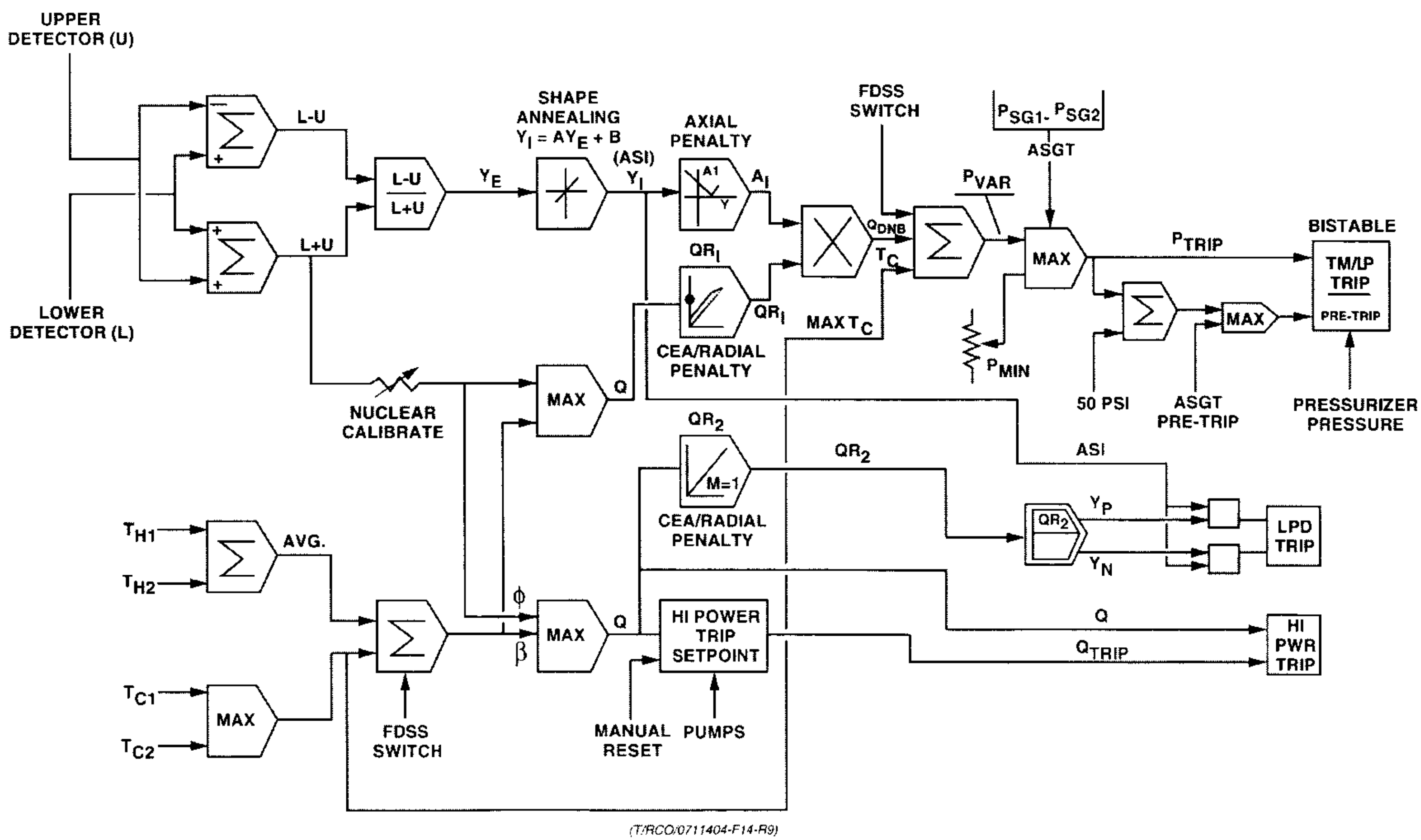


FIGURE 11

Question: 18

Unit 2 is at 80% power with all systems in automatic when the 2A Steam Flow transmitter FT 8011 that feeds 2A S/G level control, fails high. Assuming no operator actions, which of the following will occur FIRST?

A. Turbine trip on high S/G level.

B. 2A Main Feedwater regulating valve closes on high S/G level.

C. Both Main Feedwater pumps trip on high S/G level.

D. 2A Main Feedwater pump trips on high S/G level.

A. Incorrect, Turbine trips at 90% level (after Feedwater valve closes)

B. Correct, Main Feedwater regulating valve closes at 82% S/G level.

C. Incorrect, Both Feedwater pumps trip at 90% level.

D. Incorrect, Both Feedwater pumps trip at 90% level.

Question level: 1
Question source: New
Exam: RO/SRO
K/A: 059.K6.12
Importance: 2.5
References: Lesson Text 0711408, LP 0702408-13

UNIT 1 - FEEDWATER CONTROL

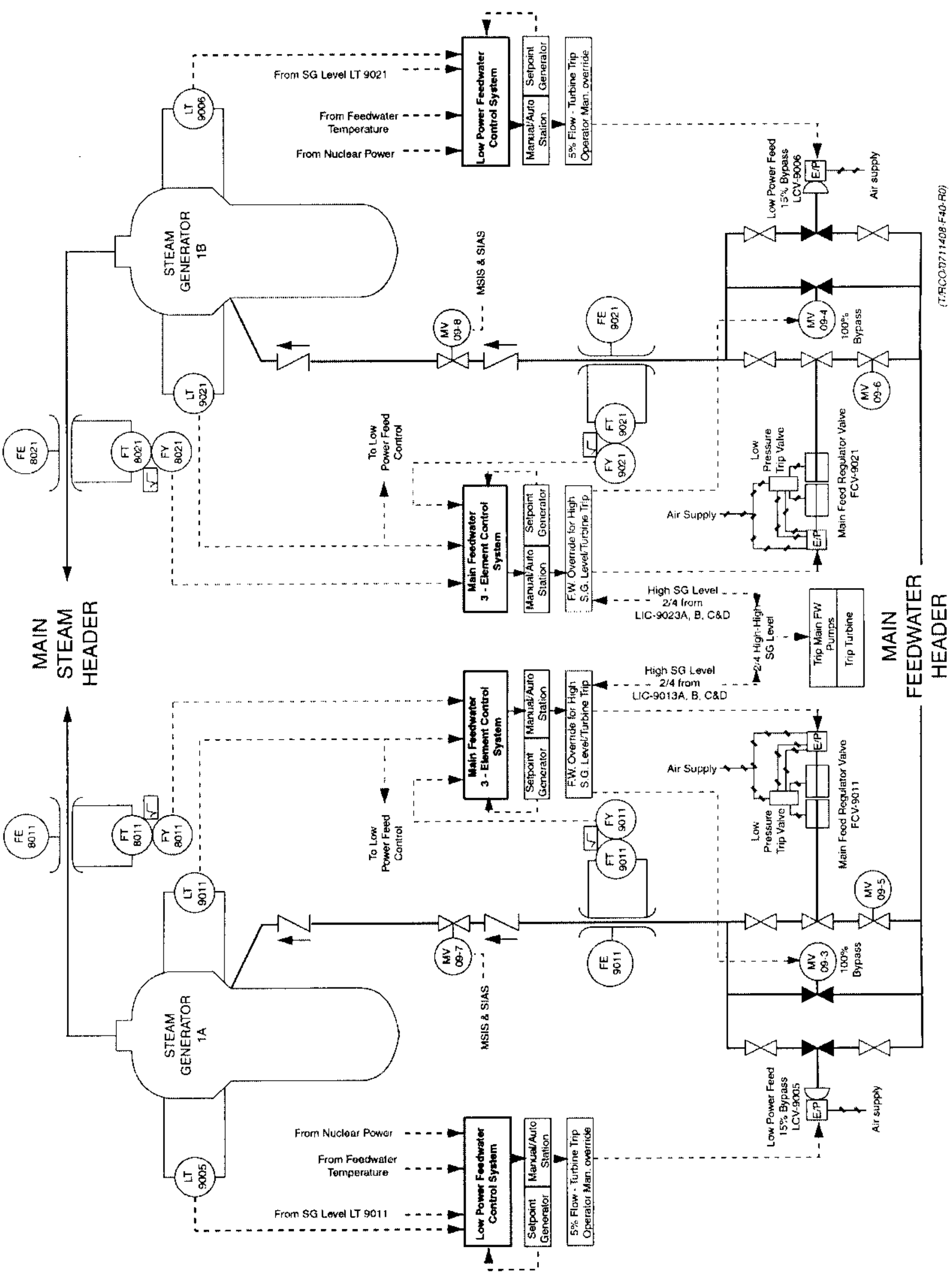


FIGURE 15

('B' S/G). They provide input signals to their respective level indicator controller (LIC) located on RTGB 102 [202], which provides indication of level span, from 0 to 100%.

The LIC also provides a level input to the feedwater high level override and turbine trip protection circuitry, to the Reactor Protection System (RPS) for low S/G level trip, and to the Auxiliary Feedwater Actuation System (AFAS) for AFW initiation.

Individual level channel output signals may be blocked with [key] switches on the front [back] of RTGB 102 [202].

High level override (HLO) occurs when 2/4 level channels for a particular S/G exceed **82% [80%]**. High level override **shuts the affected main feed regulating valve (and the Unit 1 100% bypass valve for 35 seconds, if open).** The two high level override channels are located behind RTGB 102 [202].

A high level override cancel pushbutton, located at the high level override channel, allows overridding the high level override signal and restores control of the main feed regulating valve to the MFWCS. This button has no effect on the turbine trip signal to the main feed regulating valve (and the Unit 1 100% bypass).

The high S/G level turbine trip provides protection against possible water slugging of the turbine due to excessive water level transients. The inputs feed a 2/4 coincidence logic matrix, one for each steam generator. At a Hi-Hi level of **90% [88%]** in 2/4 indicators for a particular S/G, the **turbine is tripped, and both FW pumps are tripped**.

As illustrated in <u>Figures 20, 21 and 22</u>, on a turbine trip, the feedwater control system will shunt its signal to ground via relay K-2. Grounding the signal forces the E/P converter to close the main feed regulating valve; this prevents overfeeding and overcooling the S/G. A turbine trip signal (or High Level Override) also closes the Unit 1 100% bypass valve for 35 seconds, via relay K-2, to limit overfeeding the S/Gs.

At the same time, relay K-3 initiates a 5% flow bias signal that maintains the 15% bypass valve in the 5% flow position, to limit overfeeding the S/Gs. K-3 also fails open the FW pump recirc valve, to prevent the FW pump from tripping on low flow. Following a turbine trip, the K-3 relay can be reset to restore LIC output control of the 15% bypass

Question: 19

In accordance with 1-EOP-03, "Loss of Coolant Accident", which of the following is a method of establishing hot leg injection during a LOCA event on Unit 1?

A. Containment Spray pumps discharging through the pressurizer auxiliary spray valves.

B. Containment Spray pumps discharging through the normal pressurizer spray valves.

C. HPSI pumps discharging through the normal pressurizer spray valves.

D. HPSI pumps discharging through the pressurizer auxiliary spray valves.

A. Incorrect, Containment spray pumps can be used for hot leg injection, but not via auxiliary spray valves.

B. Incorrect, Containment spray pumps can be used for hot leg injection, but not via auxiliary spray valves.

C. Incorrect, HPSI pumps are used for hot leg injection, but not through normal spray valves.

D. Correct

Question Level: 1
Question Source: Bank
Exam: RO/SRO
K/A: 006.K1.04
Importance: 2.8
References: 1-EOP-03 Loss of Coolant Accident

APPENDIX O
HOT AND COLD LEG INJECTION
(Page 4 of 11)

2. (continued) INITIAL

D. PLACE FCV-3306, SDC Return Flow, keyswitch in AUTO. ________

E. PLACE FIC-3306, SDC Return Flow, in MAN and SET to 5% OPEN output. ________

> **CAUTION**
> Limit LPSI Pump operation in simultaneous Hot and Cold Leg Injection alignment to 3500 gpm.

F. START 1B LPSI Pump. ________

G. ADJUST FIC-3306 to control LPSI flow between 250 to 3500 gpm. ________

3. Aligning HPSI Pump for Hot and Cold Leg Injection

A. ENSURE BOTH HPSI Pumps are RUNNING AND ALL HPSI Header Injection valves are fully OPEN unless this configuration conflicts with HPSI run-out considerations (640 gpm maximum per pump). ________

B. STOP ALL Charging Pumps. ________

C. PERFORM ALL of the following local operations:

COMPONENT ID	COMPONENT NAME	POSITION	PERF INITIAL
V2336	1C Charging Pump Disch Isol	LOCKED CLOSED	
V2337	1B Charging Pump Disch Isol	LOCKED CLOSED	
V2339	1A Charging Pump Disch Isol	LOCKED CLOSED	
V2340	Charging Pump Disch Hdr to Aux HPSI Hdr Isol (1A Charging Pump room)	LOCK OPEN	

APPENDIX O
HOT AND COLD LEG INJECTION
(Page 5 of 11)

3. (continued) INITIAL

D. PERFORM **ALL** of the following RTGB operations:

> **NOTE**
> SE-02-03 is a non-EQ valve. During a LBLOCA and initiation of Hot and Cold Leg injection, this valve MAY NOT operate. The required flow path for Hot and Cold Leg injection is still available and adequate through SE-02-04.

COMPONENT ID	COMPONENT NAME	POSITION	PERF INITIAL
SE-02-1	1B1 Loop Charging Isol	CLOSED	
SE-02-2	1A2 Loop Charging Isol	CLOSED	
PCV-1100E	[Pzr] Spray Valve 1B2	CLOSED	
PCV-1100F	[Pzr] Spray Valve 1B1	CLOSED	
SE-02-03	Pressurizer Auxiliary Spray Valve	OPEN	
SE-02-04	Pressurizer Auxiliary Spray Valve	OPEN	

> **NOTE**
> The 1B HPSI will need to be running for Core Heat Removal post RAS while the 1A HPSI is aligned for Hot Leg Injection.

E. PERFORM **ALL** of the following RTGB operations:

COMPONENT ID	COMPONENT NAME	POSITION	PERF INITIAL
HCV-3627	Aux HPSI Hdr to Loop 1A1 Valve	CLOSED	
HCV-3617	Aux HPSI Hdr to Loop 1A2 Valve	CLOSED	
HCV-3637	Aux HPSI Hdr to Loop 1B1 Valve	CLOSED	
HCV-3647	Aux HPSI Hdr to Loop 1B2 Valve	CLOSED	

F. MAINTAIN minimum flow at 150 gpm, as indicated on Charging flow indicator FIA-2212 (RTGB 105).

Question: 20

Given the following conditions:

- Unit 2 is in Mode 6 with fuel movement in progress
- The only available Instrument Air Compressor, 2C, has tripped and been off line for 90 minutes.
- The Service Air Compressor has been lined up to Instrument air since the loss of the 2C compressor.
- Current Instrument air pressure is 98 PSIG and steady.

Which of the following describes the action to be taken as a result of Service Air being lined up to Instrument Air?

A. Stop fuel movement until a redundant source of instrument air can be established.

B. Blowdown the Instrument air header drains to remove oil, water, and crud build-up.

C. Install Diesel air compressor to augment the installed Service Air compressor.

D. Manually cross tie Instrument air to Unit 1 and isolate the Service Air to Instrument air cross tie.

A. Incorrect, although the refueling machine requires Instrument air, stopping refueling is not a requirement.

B. Correct, the service air system has no dryer, or filters

C. Incorrect, 98 PSIG air pressure, although a little low is adequate

D. Incorrect, auto closure for the cross tie valves is 95 PSIG

Question level: 2
Question Source: Bank (year 2000 NRC exam)
Exam: RO/SRO
K/A: 079.A2.01
Importance: 3.2
References: 2-1010030 Loss of Instrument Air

7.0 <u>OPERATOR ACTIONS</u>: (continued)

7.1 Immediate Operator Actions: (continued)

3. (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
B. OPEN SH18718, Service Air Cross-tie to Instrument Air Isol.	
C. <u>If</u> the Instrument Air header is fed from the Service Air header for greater than 1 hour, <u>Then</u> BLOW DOWN the Instrument Air header low point drains hourly to remove oil, water and crud build-up.	
4. <u>If</u> the Instrument Air header pressure indicates less than 60 psig <u>and</u> is still lowering, <u>Then</u> PERFORM the following:	
A. TRIP the Reactor and Turbine.	
B. GO TO 2-EOP-01, Standard Post Trip Actions.	

Question: 21

The following conditions exist on Unit 1:

- A severe leak has occurred in the Fuel pool
- Level in the pool has dropped 8 feet and continues to decrease
- Makeup capability from the RWT has been lost and ONP 1-0350030 has been implemented

Which of the following is available as a last resort for Fuel pool makeup?

A. Fire Water system

B. Demin Water system

C. Primary Water system

D. Intake Cooling Water system

A. Incorrect, could be used but not referenced in ONP

B. Incorrect, could be used but not referenced in ONP

C. Incorrect, could be used but not referenced in ONP

D. Correct

Question level: 1
Question source: Bank
Exam: RO/SRO
K/A: 033.K4.01
Importance: 3.2
References: 1-ONP-0350030 Fuel Pool Cooling System, ONP LP 0702812-18

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
5. (continued)	
B. If low level is indicated, Then:	
1. Determine if leakage is from the cooling pump, purification loop, or evaporation.	
2. Verify no open vent(s) or drain(s) on the demineralizer and filters.	
3. Isolate the source of leakage and restore level to normal per Appendix B.	

CAUTION

Make-up capability from the Intake Cooling Water System is available ONLY as a last resort.

INSTRUCTIONS	CONTINGENCY ACTIONS
6. If Fuel Pool cooling capability has been lost and cannot be reestablished, Then perform the following:	
A. Determine the cause of failure and estimate the time necessary to make repairs.	

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS | **CONTINGENCY ACTIONS**

6. (continued)

   B. Verify the availability of makeup from the RWT.

   C. Verify Fuel Pool ventilation is in service.

   D. Ensure Fuel Pool Ion Exchangers are isolated.

   E. Notify the Operations Supervisor, Chemistry Supervisor and Health Physics Supervisor.

   F. Provide makeup from the RWT as required to maintain level.

CAUTION

Plant Management or Technical Support Center must approve any use of the Intake Cooling Water System for makeup to the Fuel Pool.

   G. Provide makeup from the Intake Cooling Water System using the flex hose connections only as a last resort. These connections are located on the East Side of the Fuel Handling Bldg. and on the West Side of the CCW platform.

Question: 22

Unit 1 is in Mode 3 with all CEA's inserted. Both Main Steam Isolation Valves (MSIV's) are open.

The following alarm is received:

- Q47 Main Steam Isol HCV-08-1A Low Air Press/DC Failure.

Assuming no Operator actions, which of the following would you expect to see as the alarm condition continues?

HCV-08-1A to:

A. close on either low air pressure or DC failure.

B. close on low air pressure.

C. stay open on either low air pressure or DC failure.

D. stay open on low air pressure.

A. Incorrect, only closes on loss of air

B. Correct

C. Incorrect, will stay open on DC failure only

D. Incorrect, closes on loss of air.

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 078.K1.05
Importance: 3.5
References: LP 0702304-6b, 1-ARP-01-Q47

REVISION: 1	PROCEDURE TITLE: ANNUNCIATOR RESPONSE PROCEDURE	PANEL: Q
PROCEDURE NO: 1-ARP-01-Q47	ST. LUCIE UNIT 1	WINDOW: 47

ANNUNCIATOR PANEL Q

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

MSIV
HCV-08-1A
AIR PRESS LOW/
DC FAILURE
Q-47

DEVICE:	LOCATION:	SETPOINT:
PS-08-12A	TRSL/40/N-T3/E-TB	100.7 psig
74/312	RTGB-106	De-energized
74B	SB Termination Cabinet	De-energized

/R1

ALARM CONFIRMATION:
1. If air pressure is lost, Then HCV-08-1A, Main Steam Hdr A Isolation Valve, closed or closing.
2. HCV-08-1A will NOT CLOSE.
3. Both HCV-08-1A status lights NOT LIT.

OPERATOR ACTIONS:

NOTE
- MSIVs Fail OPEN on Loss of Power with air pressure available.
- MSIVs Fail CLOSED on Loss of Air.
- If 74B fuses are blown, A train MSIS components will fail to actuate on MSIS B. /R1

1. DISPATCH an operator to perform the following:
   A. ENSURE V18444, Instr Air 1A1 MSIV Accum Isol, is OPEN.
   B. CHECK PI-18-43A, Instrument air to 1A1 MSIV Accum.
   C. CHECK for air leaks on the MSIV.
2. **If PI-18-43A indicates less than 100 psig or air leaks are detected, Then GO TO ONOP 1-1010030, Loss of Instrument Air.**
3. If the annnunciator remains in alarm or indicating lights for HCV-08-1A are NOT LIT, Then ENSURE the following fuses are checked and replaced as necessary:
   - RTGB-106 TB CCC Fuse F19
   - RTGB-106 TB CCC Fuse F20
4. ENSURE 74B fuses are checked and replaced as necessary, 74B fuse are located in SA/SB Isolation Cabinet B101F; Fuse F1, F2, F3 and F4 and RTGB 105 Fuses HH F62, F63. /R1
5. If the annuciator remains in ALARM, Then DIRECT EM and I&C to troubleshoot alarm circuit.

CAUSES: Low air pressure in the accumulator or a loss of DC control power.

REFERENCES:
1. CWD 8770-B-327 SH 312, 647, 329, 645 /R1
2. TEDB

Question: 23

Unit 1 was manually tripped due to a suspected fire on the 1A1 RCP. The RCP was manually tripped. A Pressurizer spray valve stuck open and RCS pressure is currently 1690 psia.

Which of the following states the Fire Fighting capability for this event?

Hose stations:

A. in the Containment supplied from the primary water system.

B. in the Containment with the Fire Pumps automatically starting on low Fire header pressure.

C. outside the Containment with the Fire Pumps automatically starting on low Fire header pressure.

D. outside the Containment, but the Fire Pump will have to be manually started.

A. Incorrect, would be correct on Unit 2 only

B. Incorrect, no hoses available in Containment, Fire pumps will not auto start on SIAS.

C. Correct

D. Incorrect, would be correct if Unit 2 (SIAS @1736 psia)
1600 for UNIT 1

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 086.A3.01
Importance: 3.3
References: 1-1800023 Unit 1 Fire Fighting Strategies, 0-NOP-15.12 Fire Protection System Operation

3.0 PREREQUISITES

INITIAL

3.1 0-NOP-15.11, Fire Protection System Initial Alignment, is complete. ______ ANPS

3.2 Domestic Water System is in operation in accordance with 0-OI-15-01, Domestic Water System – Normal Operation. ______ ANPS

4.0 PRECAUTIONS / LIMITATIONS

4.1 Both Fire Pumps should be properly aligned and operational at all times.

4.2 §1 Level in the City Water Tanks shall be maintained above 16' 10.5" at all times.

4.3 Fire Pump operation following a SIAS:

- SIAS – Overrides Fire Pump automatic start. Permissive to manually start.
- LOOP coincident with SIAS – Pump receives a TRIP signal. Permissive to manually start after the associated bus is energized.

5.0 RECORDS REQUIRED

5.1 Completed copy of this procedure shall be maintained in the plant files in accordance with QI-17-PSL-1, Quality Assurance Records.

- Initial attack should be made with portable extinguishers backed up by hose lines. For hose lines to be used, the interlock on the personnel lock inner/outer doors must be defeated.

- Search entire area for possible victims.

- De-energize electrical equipment if possible.

- Ventilate area - utilize fixed ventilation system or portable smoke ejectors (See Section 6.0).

- Overhaul entire fire area; check for extension.

- Provide a fire watch until detection system is returned to service.

- Activate the First Aid and/or the Radiation Teams, if required.

- Security will be responding to the fire scene for assistance in entering locked areas and for crowd control.

- When the fire is out, secure the area until an investigation can be conducted to determine the cause of the fire.

6.0 Ventilation:

6.1 Fixed System:

a. Supply:

Cont. Fan Coolers, HVS-1A, HVS-1B, HVS-1C: 60,000 cfm each
Rx Cavity Cooling System, HVS-2A, HVS-2B: 20,000 cfm each

b. Exhaust:

Containment Purge, HVE-8A, HVE-8B, 42,000 cfm each
Airborne Radioactive Removal Units, HVE-1, HVE-2: 10,000 cfm each
Hydrogen Control System, HVE-7A, HVE-7B: 500 cfm each
Reactor Support Cooling, HVE-3A, HVE-3B: 11,400 cfm each
Shield Building Ventilation, HVE-6A, HVE-6B: 42,000 cfm each
Elevator Machinery Room, HVE-22: 2,000 cfm
CEDM Cooling System, HVE-21A, HVE-21B: 55,200 cfm each

6.2 Fire Damper Closure Actions:

None

d. Reactor vessel head, machine shop area, cask storage and decontamination areas.

e. Boric Acid Batching Tank for mixing boric acid solutions.

f. Volume Control Tank, via the CVCS System, to maintain desired primary coolant boron concentration.

g. Charging Pump suctions, via the CVCS System, to maintain desired primary coolant boron concentration.

h. Refueling Water Tank.

i. Cask washdown area.

MV-15-1 (UNIT 1)

Motor valve 15-1 is located outside containment and it is the isolation valve for primary water to the containment. The piping enters containment through penetration 7 and provides primary water to the quench tank, reactor drain tank, and the reactor vessel head (for decontamination purposes only). MV-15-1 power supply is the 480V MCC 1B6. On a loss of power it will fail as is.

The control for MV-15-1 is located in the control room on RTGB-106. MV-15-1 will automatically close on a CIS. The alarm associated with MV-15-1 is: "Primary Water Isol MV-15-1 Ovrld". Refer to 1-ARP-01-Q56.

Although the PMW System is designated non-nuclear safety, the piping downstream of, and including MV-15-1 has been designed to meet seismic Category I specifications.

HCV-15-1 (UNIT 2)

HCV-15-1 is located outside containment and it is the isolation valve for primary water to the containment. The piping enters containment through penetration 7 and provides primary water to the Quench Tank, Reactor Drain Tank, and the Reactor Vessel Head (for decontamination purposes only). It also provides fire-fighting water to four hose stations inside containment. There is one hose station on the 23', two on the 45', and one on the 62' elevations.

The control for HCV-15-1 is located on RTGB-206. It is an air operated valve and it will fail close on a loss of instrument air or power to the solenoid. Power is supplied from the 125V DC Bus 2B, Ckt. 31.

Although the PMW System is designated non-nuclear safety, the piping downstream of, and including HCV-15-1 has been designed to meet seismic Category I specifications.

HCV-15-2 (UNIT 2)

HCV-15-2 is an air operated valve located inside containment on the primary water header and is the isolation valve for primary water to the quench tank. The control for HCV-15-2 is located on RTGB 203. It will fail close on a loss of instrument air or loss of power to the solenoid. Power to the solenoid is supplied from 120VAC PP-220, Ckt-15.

DEMINERALIZED MAKEUP WATER

Water from the Demineralized Water Storage Tank supplies the following:

1. Unit 2
2. Component Cooling Water Surge Tank
3. Closed Blowdown Cooling Surge Tank
4. Turbine Cooling Water Surge Tank
5. Both Units Emergency Diesel Generators (for expansion tanks)
6. Heater Drain Pumps seals (quench water)
7. Condensate Recovery Tank
8. Decontamination room
9. Cold lab
10. Radio chem. lab
11. Sample room
12. Instrument calibration and repair shop
13. Steam Generator Blowdown Treatment Facility

PRIMARY MAKE-UP WATER

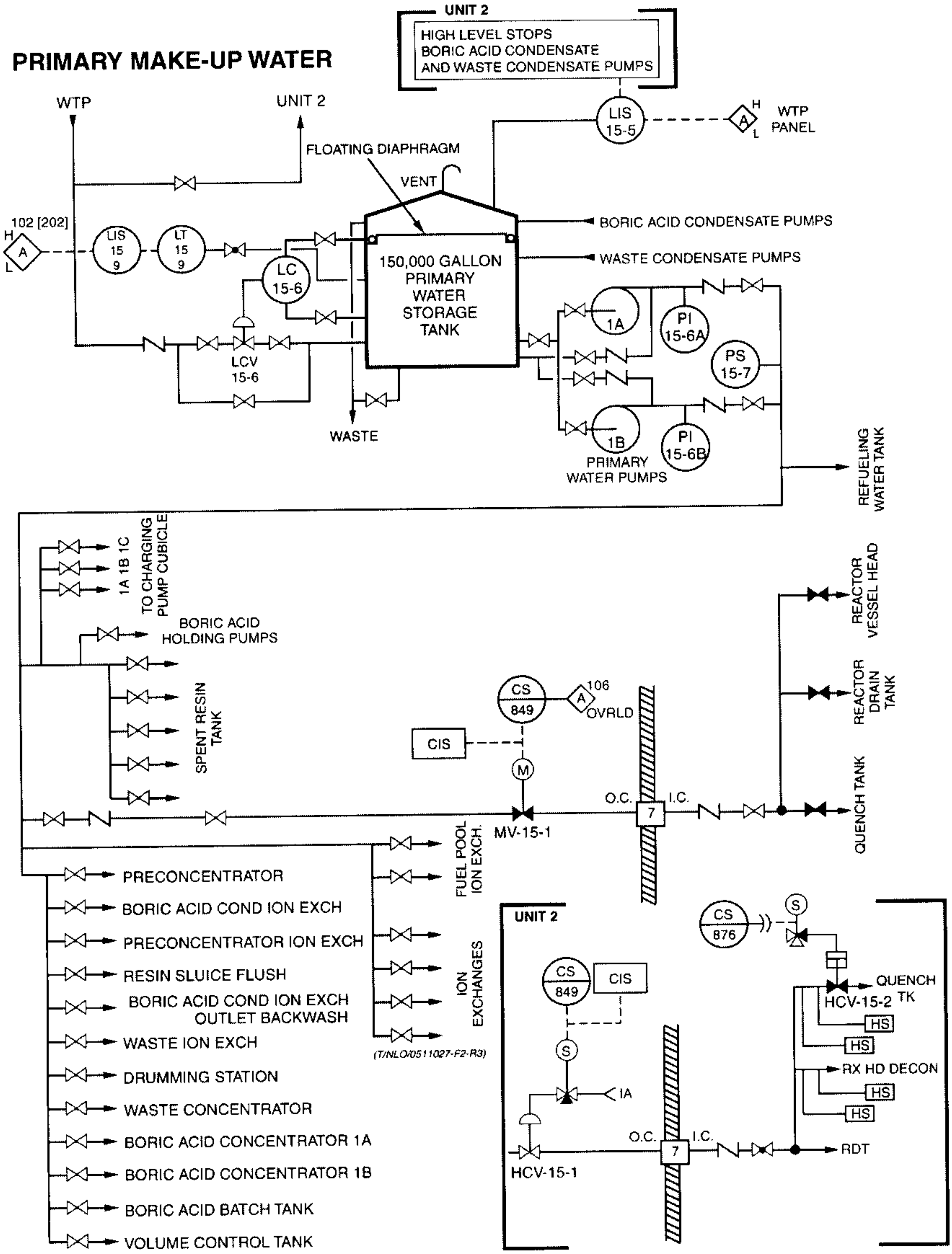


FIGURE 1

Question: 24

Unit 2 is in Mode 5 on Shutdown Cooling, cooling the Pressurizer (Pressurizer solid). A pressure transient increases RCS pressure to 513 psia.

Which of the following states the Shutdown Cooling (SDC) response and the required Operator actions?

The SDC:

A. Hotleg suction valves will close, but the LPSI pumps can continue to operate due to the Hotleg suction crosstie valve (V-3545) remaining open.

B. Hotleg suction valves will close, and the LPSI pumps must be stopped even though the Hotleg suction crosstie valve (V-3545) remains open.

C. Hotleg suction valves and the crosstie valve (V-3545) will close requiring the LPSI pumps to be stopped.

D. Overpressure suction valve closure interlock has been manually defeated in this condition, but the LPSI pumps must be secured.

A. Incorrect, the LPSI pumps will lose suction

B. Correct

C. Incorrect, V-3545 does not receive a high pressure closure signal

D. Incorrect, interlock cannot be defeated until Pressurizer manway off and 30% level.

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 005.A2.02
Importance: 3.7
References: Lesson Text 0711207, LP 0702207-10A, SDC ONP 1-0440030, SDC NOP 2-NOP-03.05

To satisfy both requirements, a cross-tie had to be installed between the two trains which could be operated from either the "A" or "B" bus.

- Each SDC suction isolation will receive an open permissive signal to open at 275 psia as indicated on Pressurizer low range pressure instruments PT-1103 (V3652), PT-1104 (V3481), PT-1105 (V3480) and PT-1106 (V3651).

- Each SDC suction isolation will close on RCS pressure exceeding 500 psia as indicated on Pressurizer low range pressure instruments PT-1103 (V3652), PT-1104 (V3481), PT-1105 (V3480) and PT-1106 (V3651). Like the SITs, each valve is controlled by a separate pressure transmitter. Refer to Figure 13 and the SDC Off Normal procedure.

In addition to the full flow SDC relief valves mentioned above, there are several other relief valves in the Unit 2 SDC system. Refer to Figure 2.

- V3483 and V3468; 350 psia and 155 gpm
- V3482 and V3469; 2500 psia and 5 gpm
- V3439 and V3507; 550 psia and 45 gpm

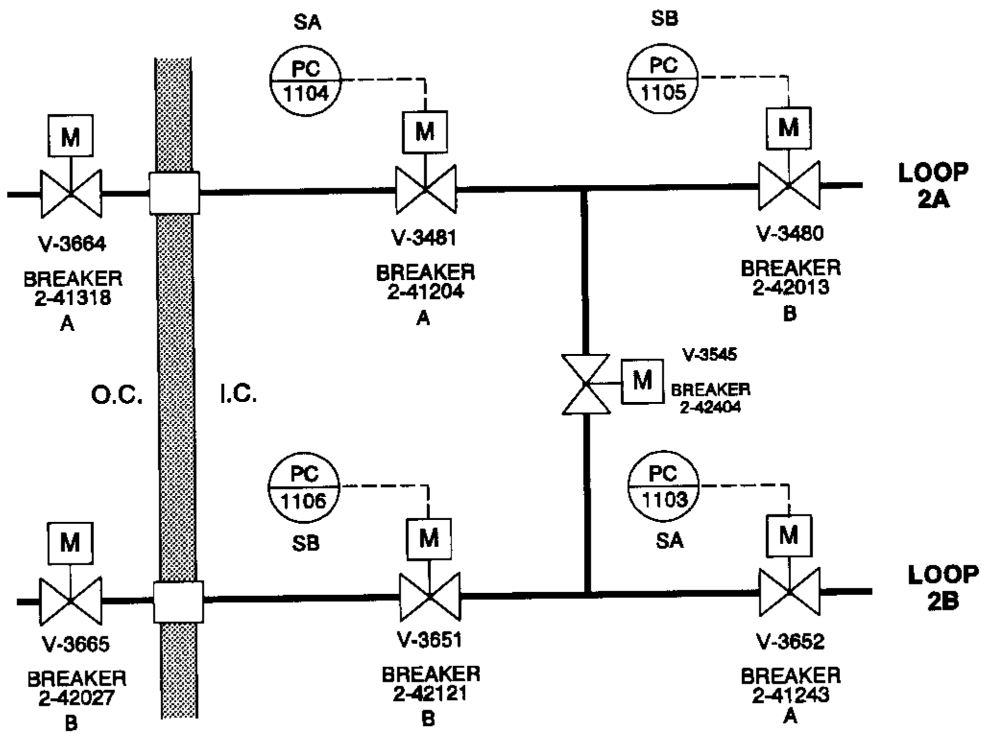
Unit 2 shutdown purification has the same basic flowpath as Unit 1, with the exception that the SDC line enters the CVCS downstream of both the Letdown HX and TE-2224. Therefore, there is no automatic protection of purification ion exchangers in the event of the introduction of high temperature SDC flow. For this reason, shutdown purification cannot be placed in service on Unit 2 until RCS temperature is below 140°F. Purification flow must be controlled by local valve manipulation. On both Units, shutdown purification flow is indicated on FT-2202, letdown flow indicator, located on RTGB 105[205]. Refer to Figure 19.

- Refer to the Unit 1 Detailed Description section for a description of the Unit 2 Reactor Vessel Level Monitoring System (RVLMS).

FIGURE 3

HOT LEG SUCTION VALVE CONFIGURATION

(Page 1 of 1)



(0440030C.WPG)

4.28 SDC Suction Cross Tie Valve, V3545, Tie Isolation Valve

1. §8 When the Pressurizer manway is removed and the Pressurizer is drained to 30%, the SDC overpressure suction valve closure interlock is manually defeated by tuning off the breakers to the following SDC suction valves:
   - V3480, SDC Loop 2A
   - V3481, SDC Loop 2A
   - V3651, SDC Loop 2B
   - V3652, SDC Loop 2B
2. §8 After the SDC suction valve overpressure closure interlock is defeated, V3545, Tie Isolation Valve, is normally maintained closed until RCS fill and vent is begun.
3. §8 When RCS level is less than or equal to 33 feet, V3545, Tie Isolation Valve, is maintained closed to prevent loss of suction prime to both LPSI pumps in the event of an RCS low level.
4. §8 When RCS / Refueling Cavity level is between 33 feet and 52 feet <u>and</u> 2A LPSI Pump is the only LPSI pump operating, V3545 may be OPEN or CLOSED. If V3545 is open in this condition, the 2A LPSI pump can operate at higher flows.
5. §8 When Refueling Cavity level is greater than 52 feet, V3545 may be OPEN or CLOSED with no effect on LPSI pump flow limits.

4.29 When PRC-01 resin is loaded into a CVCS ion exchanger for shutdown cleanup, the requirements of PSL-ENG-SENS-00-013, Rev. 2 shall be met. Those requirements include:

1. Reactor is subcritical; Keff less than 1.0.
2. Hydrogen peroxide concentration in the RCS is less than or equal to 5 ppm (Post Peroxide Injection).
3. A clearance to the Operations Supervisor shall be established to control placement of the resin bed in service.
4. The PRC-01 resin shall be rinsed prior to use to borate the resin.
5. The influent temperature to the PRC-01 resin shall not exceed 140 degrees F.

Question: 25

Unit 2 is in Mode 3 performing a Reactor startup. The following conditions exist:

- Steam Bypass control (SBCS) in Auto maintaining Tave 532°F
- PS 10-9 Condenser vacuum to SBCS momentarily spikes to 15 inches HG and returns to 3 inches HG.

Based on the above conditions, what is the status of the SBCS?

A. SBCS will maintain RCS temperature in automatic, with no Operator action.

B. SBCS can maintain RCS temperature in manual only, until the system is reset by depressing the 'Emergency off/Vacuum interlock pushbutton'.

C. SBCS permissive switch must be placed in manual, and the 'Emergency off/Vacuum interlock pushbutton' depressed to regain control of SBCS.

D. SBCS permissive switch must be placed in 'Off' and the SBCS can be used in manual only.

A. correct, all stations maintained in auto, system will auto reset

B. incorrect, auto is available even without interlock pushbutton depressed

C. incorrect, permissive switch need not be placed in manual

D. incorrect, 'Off' position disables SBCS entirely.

Question level: 2
Question source: Modified
Exam: RO/SRO
K/A: 041.K6.03
Importance: 2.9
References: 0711406 'Steam Bypass Control System' Lesson Text, LP 0702406-7B

ORIGINAL QUES.

Unit 2 is ready to cooldown to Shutdown Cooling entry conditions due to a Steam Generator tube rupture. The following are the plant conditions.

- Steam Bypass Control system (SBCS) is in auto (all controllers) since the unit tripped.
- RCS temperature is 532 ° F and stable.

Which of the following are the minimum actions necessary to use the SBCS to cooldown the RCS to **SDC** entry conditions?

A. Ensure the master controller (PIC 8010) in auto and the permissive switch is in auto, open PCV 8805 by dialing down the setpoint from PIC 8010 to the desired cooldown rate.

B. Ensure the permissive switch in auto, ensure the master controller (PIC 8010) in auto, place HIC 8801-8804 in manual and closed. Dial the setpoint down on PCV 8010 to the desired cooldown rate.

C. Place the permissive switch in manual, ensure the controller for PCV 8801 is in auto and dial the setpoint down on PCV 8801 to the desired cooldown rate.

D. Place the permissive switch in manual, place the controller for PCV 8801 in manual and open PCV 8801 to the desired cooldown rate.

A. Ensure the master controller (PIC 8010) in auto and the permissive switch is in auto, open PCV 8805 by dialing down the setpoint from PIC 8010 to the desired cooldown rate. (incorrect, reasons same as B and C above)

B. Ensure the permissive switch in auto, ensure the master controller (PIC 8010) in auto, place HIC 8801-8804 in manual and closed. Dial the setpoint down on PCV 8010 to the desired cooldown rate. (incorrect, permissive switch must be in manual to cooldown to SDC conditions)

C. Place the permissive switch in manual, ensure the controller for PCV 8801 is in auto and dial the setpoint down on PCV 8801 to the desired cooldown rate. (incorrect, cannot dial down down the setpoint for PCV 8801)

D. Place the permissive switch in manual, place the controller for PCV 8801 in manual and open PCV 8801 to the desired cooldown rate. (correct)

INTERLOCKS

The SBCS valve interlocks are:

- SBCS permissive switch
- Condenser vacuum
- Emergency off switch

SBCS Permissive Switch

The permissive switch is part of the circuitry that controls the operation of the permissive solenoid valves that allow pressure to be applied to the diaphragm of the bypass valves. The SBCS permissive switch mounted on the RTGB-102 [202] apron, enables the operator to select MANUAL, AUTO, or OFF modes. Refer to Figures 17 and 18.

- MANUAL: The permissive solenoids are energized, enabling remote control of the bypass valves provided the low condenser vacuum and emergency off interlocks are met.

- AUTO (normal mode): The permissive relays are energized by any demand signal from the permissive circuitry.

- OFF: Operation of the turbine bypass valves is blocked, as the permissive solenoid valves are maintained de-energized.

When these solenoid valves are de-energized and vented to atmosphere, the bypass valves spring close and cannot be opened except by the local valve hand jack.

Condenser Vacuum

When condenser backpressure, as detected by PS-10-9 (located on mezzanine deck of turbine building), is insufficient (**setpoint of 12" Hg absolute increasing**), the opening of the bypass valves is blocked in order to prevent damage to the turbine or the condenser.

- If **all** the M/A stations are in AUTO when condenser vacuum is regained, the block is automatically removed without operator action and the valves will reopen as required.

- If any one of the M/A control stations is in MANUAL when condenser vacuum is regained, none of the bypass valves will reopen without additional operator action, to prevent flow from unattended preset controllers.
    - In this case, the operator can reset the system by depressing the Emergency Off/Vacuum Interlock reset pushbutton. The valves will then re-open to the preset MANUAL M/A control station settings.
- If the SBCS is de-energized, the bypass valves are still subject to the blocking action of the condenser vacuum interlock and emergency off relay.

Emergency Off Switch

Depressing the Emergency Off pushbutton on the SBCS test panel closes all bypass valves, regardless of whether the system is in the AUTO or MANUAL mode. This is useful if the system malfunctions while conducting periodic tests at the SBCS Test Panel. Once this pushbutton is depressed, the bypass valves cannot be operated until the system is reset using the Emergency Off/Condenser Vacuum Interlock Reset Pushbutton also located on the Test Panel.

MASTER CONTROLLER (PIC-8010)

The master controller (PIC-8010), located on RTGB-102 [202], is a standard Proportional-Integral-Derivative (PID) controller. The controller, in addition to acting as a regulating unit, incorporates MANUAL/AUTO switching and indication of both the setpoint and the process signals. The controller is shown in Figure 19. The movable pointer indicates the steam header pressure (P_{sec1} supplied by PT-8010). The setpoint (P_{sp1}) is remotely derived using the calculator, therefore, the local setpoint thumbwheel adjustment is never used.

- Normally the Master Controller (PIC-8010) is maintained in Automatic, and controls all pressure related modulation.
- If PIC-8010 is in Manual, the steam pressure interlock is met (886 psia), and HICs are in automatic, the PIC-8010 output will be sent to all bypass valves. If the pressure

Question: 26

Unit 2 is at 100% power with Pressurizer Level Control Channel 1110-Y selected for control.

Level transmitter 1110Y fails high

Which of the following describes the plant response? (assume no Operator actions)

A. Maximum letdown, All heaters on, backup Charging pumps start.

B. Maximum letdown, Pressurizer level and pressure decrease, all but one Charging pump off.

C. Minimum letdown, Pressurizer level and pressure increases. Spray valves open on high pressure.

D. Minimum letdown, all charging pumps and Pressurizer heaters on. Spray valves open on high pressure.

A. Incorrect, all but one Charging pump off

B. **Correct.**

C. Incorrect, correct for channel failing low

D. Incorrect, combination of actions for high and low failures.

Question level: 1
Question source: Modified
Exam: RO/SRO
KA: 028.AK2.02
Importance: 2.7
Reference: Lesson Text 0711206, LP 0702206-13, PPLCS, ONP 2-0120035, Pressurizer Pressure and Level

ORIGINAL QUES

Unit 2 is at 100% power with Pressurizer Level Control Channel 1110-Y selected for control.

Level transmitter 1110Y fails low

Which of the following describes the plant response? (assume no Operator actions)

A. All heaters on, Pressurizer pressure increases. Spray valves open on high pressure.

B. Maximum letdown, Pressurizer level and pressure decrease, all but one charging pump off.

C. Minimum letdown, Pressurizer level and pressure increases. Spray valves open on high pressure.

D. Minimum letdown, all charging pumps and Pressurizer heaters on. Spray valves open on high pressure.

A. Incorrect, correct for level channel failing high

B. Incorrect, correct for level channel failing high.

C. **Correct**

D. Incorrect, combination of actions for high and low failures.

Question level: 1
Question source: New
Exam: Both
KA: 011 A2.11
Importance: 3.4/3.6
Reference: LP 0702206-13, PPLCS, ONP1-0120035 & ONP 2-0120035, Pressurizer Pressure and Level

TABLE 1 - Selected Level Channel Failures

SELECTED LEVEL CHANNEL FAILS HIGH

AUTOMATIC RESPONSE TO FAILURE

- High/Low Level Alarm (+ 10% Deviation) [67%]
- Maximum Letdown - Letdown (128 gpm) exceeds Charging Flow (+ 9.2% Deviation)
- All Heaters On, All But One Charging Pump Off (+ 3.6%)

PLANT RESPONSE TO FAILURE

- Actual PZR Level and Pressure Decreases
- High/Low Level Alarm on Operable Channel at –5% Deviation
- Low/Low Level Alarm on Operable Channel, All Heaters Off at 28 [27]%
- TM/LP Trip

OPERATOR ACTION

- Select Operable Channel on HS-1110-2 or Take Manual Control

SELECTED LEVEL CHANNEL FAILS LOW

AUTOMATIC RESPONSE TO FAILURE

- High/Low Level Alarm and Standby Charging Pumps ON (-5% Deviation)
- Minimum Letdown (29 gpm)
- Low/Low Level Alarm, All heaters Off 28% [27%]
- Opens 4160V breaker on one side and 480V breakers on the other

PLANT RESPONSE TO FAILURE

- Actual PZR Level and Pressure Increases
- High/Low Level Alarm from Operable Channel (+10% Deviation) [67%]
- Spray Valves Open on High Pressure
- High Pressure Reactor Trip When Solid 2370 [2400] psia

OPERATOR ACTION

- Take Manual Control of HIC-1110
- On Unit 1 Place HS-1110-2 to Operable Channel
- [Select level bypass]
- Reset/Close 480V breakers

Question: 27

Given the following conditions:

- Unit 2 has just tripped from 100% power due to loss of the 2A 125 VDC bus
- Normal AC electrical lineup prior to trip
- AB DC electrical lineup is to the A side
- Operators are performing 2-EOP-01, 'Standard post trip actions'
- No Contingency Actions have been performed.

Which of the following describes the configuration of the AFW system immediately following AFAS actuation?

A. 2C AFW pump running feeding 2A Steam Generator and 2B AFW pump running feeding 2B Steam Generator.

B. Only the 2C AFW pump running and feeding both Steam Generators.

C. Only the 2B AFW pump running and feeding the 2B Steam Generator.

D. All AFW pumps running and feeding both Steam Generators.

A. **Correct**

B. Incorrect, feed to the 2B S/G is powered from the A side.

C. Incorrect, 2C AFW feeding the 2B S/G also.

D. Incorrect, 2A AFW pump not available due to breaker control power from 2A DC bus.

Question level: 2
Question source: Modified
Exam: RO/SRO
K/A: 061.K2.01
Importance: 3.3
References: 2-ONP-09.02 Auxiliary Feedwater, AFW LP 0702412-11C

ORIGINAL QUES.

Given the following conditions:

- Unit 1 has just tripped from 100% power due to loss of the 1A 125 VDC bus
- Normal AC electrical lineup prior to trip
- AB DC electrical lineup is to the B side
- Operators are performing 1-EOP-01, 'Standard post trip actions'
- No Contingency Actions have been performed.

Which of the following describes the configuration of the AFW system immediately following AFAS actuation?

A. All AFW pumps running and feeding both Steam Generators.

B. Only the 1C AFW pump running and feeding both Steam Generators.

C. Only the 1B AFW pump running and feeding the 1B Steam Generator.

D. 1C AFW pump running feeding both Steam Generators and 1B AFW pump running feeding 1B Steam Generator.

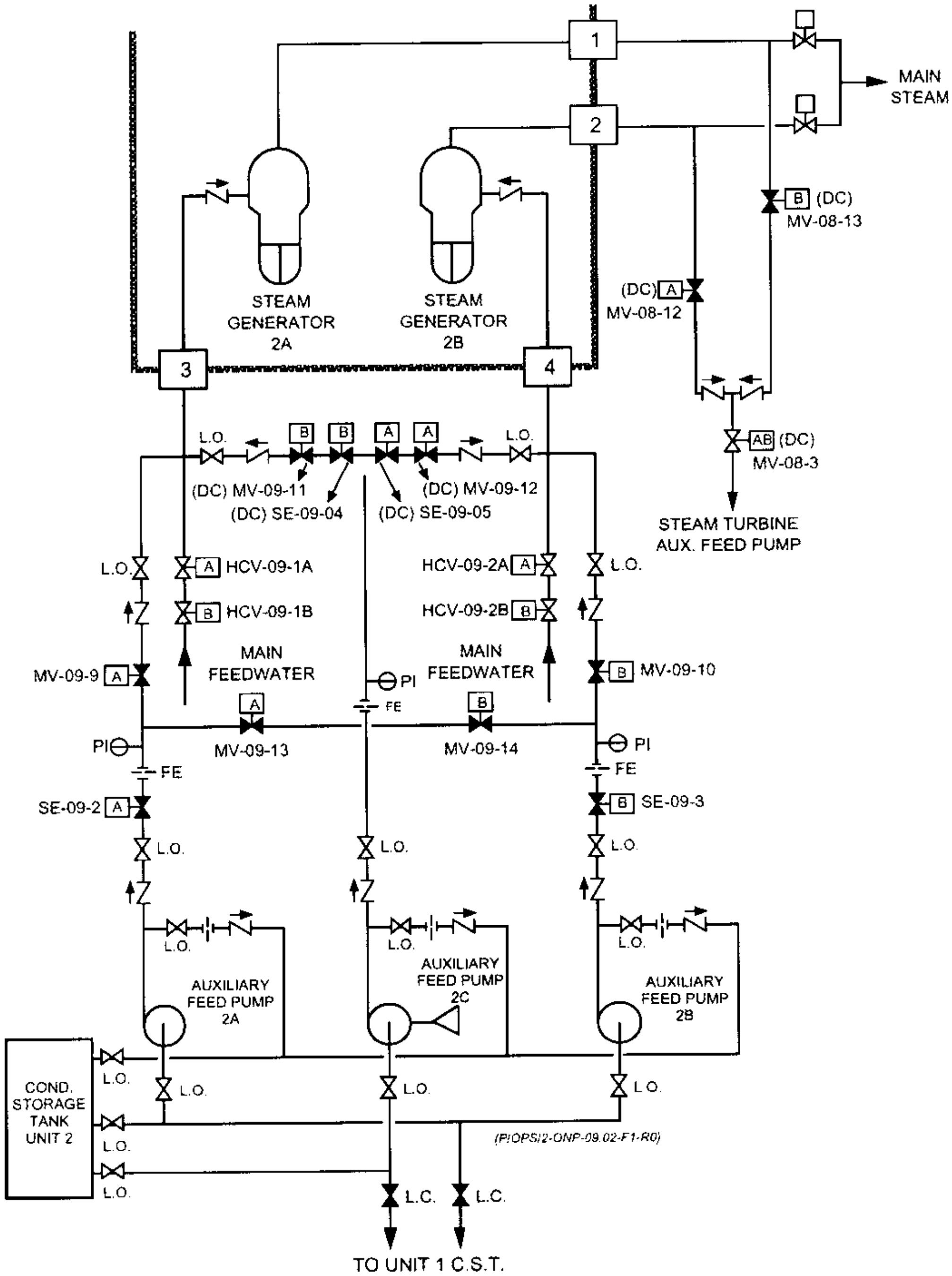
A. Incorrect, loss of A DC bus results in loss of AC power on the A side

B. Incorrect, the B side AFW system is available

C. Incorrect, because the AB DC bus is alligned to the B side the the C AFW system is available

D. **Correct**

FIGURE 1
UNIT 2 AUXILIARY FEEDWATER SYSTEM



Question: 28

Unit 1 has tripped from 100% power. EOP-01 has been completed and ONP '1-0700031 Auxiliary Feedwater' is being implemented. The 1C AFW pump AB Bypass switch has been placed in the 'Bypass' position.

Which of the following states the reason the AB Bypass switch has been placed in bypass position?

In preparation to reset:

A. an electrical or mechanical overspeed condition. This will bypass the AFAS open signal and allow closing the steam supply valves.

B. an electrical or mechanical overspeed condition. This will bypass the AFAS open signal and close all the feed and steam valves.

C. an electrical overspeed condition only. This will bypass the AFAS open signal and allow closing the steam supply valves.

D. an electrical overspeed condition only. This will bypass the AFAS open signal and close the feed and steam supply valves.

A. **Correct**

B. Incorrect, only effects the steam supply valves

C. Incorrect, applies to mechanical overspeed also

D. Incorrect, same as B and C above.

Question level: 1
Question source: New
Exam: RO/SRO
K/A: 061.G2.4.11
Importance: 3.6
References: 1-0700031 Auxiliary Feedwater, Lesson Text 0711412 Auxiliary feedwater, LP 0702412-4A,B

APPENDIX A
RESETTING THE 1C AUXILIARY PUMP FOLLOWING
MECHANICAL OR ELECTRICAL OVERSPEED TRIP
(Page 1 of 1)

1. If the 1C Auxiliary Feedwater pump has tripped due to mechanical or electrical overspeed, Then perform the following:

> CAUTION
> If AFAS signal is present, AFW pump will restart when the AB Bypass switch is placed to NORMAL position.

A. Mechanical Overspeed Trip:

1. Locally reset the trip and throttle valve (MV-08-3) trip lever.
2. Insert key into the AFAS AB Bypass switch on RTGB 102 and turn the switch to the BYPAS position.
3. Place the 1C Auxiliary Feedwater pump START/STOP switch to the STOP position.
4. Verify pump has stopped rotating.
5. Place the AFAS AB bypass switch to the NORM position. The 1C Auxiliary Feedwater pump is now ready for a normal start.

B. Electrical Overspeed Trip:

1. Insert key into the AFAS AB Bypass switch on RTGB 102 and turn the switch to the BYPAS position.
2. Place the 1C Auxiliary Feedwater pump START/STOP switch to the STOP position.
3. Verify pump has stopped rotating.
4. Place the AFAS AB bypass switch to the NORM position. The 1C Auxiliary Feedwater pump is now ready for a normal start.

END OF APPENDIX A

selecting "STOP" on the START/STOP/ START switch and "BYPASS" on the AB Bypass switch in the control room or on the Hot Shutdown Panel .

Relatching/restarting following a mechanical-flyweight or local manual mechanical trip lever actuation:

1. Reset the mechanical overspeed trip device and trip linkage rod assembly by pushing the rod toward the T&T valve. Verify that the mechanical overspeed trip device manual trip lever returns to the horizontal, fixed position. Ensure the limit switch (near the mechanical trip-lever) is in position for contact with the actuation arm.

2. Place the "AB NORMAL/BYPASS" keyswitch to "BYPASS." This will bypass the AFAS "OPEN" signal if one exists or occurs during relatching and allows closing the steam supply MOVs.

Select the 1C AFW pump START/STOP/START control switch to the "STOP" position. This action will drive the stem collar up the valve stem and automatically latch it to the trip-hook. The switch selection to "STOP" will also close both steam supply MOVs (MV-08-13 and MV-08-14). The T&T valve is now **LATCHED**, ready to receive an "OPEN" signal from AFAS or the RTGB/HSCP selector switch.
Verify that the pump has stopped rotating and return the AFAS "AB NORMAL/BYPASS" keyswitch back to "NORMAL." This restores AFAS to a normal configuration.

Position the '1C' AFW pump START/STOP/START control switch to either "START" position. This action will OPEN the T&T valve and the selected steam supply MOV. The pump will now **RESTART**.

The relatch/restart actions following an electrical overspeed trip would be the same as for the mechanical overspeed trip actuation except that the mechanical overspeed trip rod need not be reset. All necessary actions can be performed remotely since the trip hook will automatically return to the position for relatch after the overspeed condition clears.

AFW AND AFAS SYSTEM TERMINAL OBJECTIVE

Given a set of unit conditions, evaluate the Auxiliary Feedwater System (AFW) and Auxiliary Feedwater Actuation System (AFAS) response to normal, off-normal and emergency operations on a written examination without references unless stated.

ENABLING OBJECTIVES

1. Describe the flowpaths and alignments associated with the AFW system by:

   A. Drawing a one line diagram of Unit 1 and Unit 2 AFW from the CST to the SGs including all:

      1. AFW pumps.

      2. AFW flow paths.

      3. Motor and solenoid operated valves.

      4. Control Room flow and pressure instrumentation.

   B. Labeling a one line drawing (similiar to Objective 1A) of the Unit 1 and Unit 2 AFW flowpaths with power supply train (A, B, AB) associated with each pump and electrically operated valve.

   C. Drawing a one line diagram AFW pump suction crossties between the Unit 1 and Unit 2 CSTs.

   D. Listing the following AFW pump data:

      1. Design flow rate.

      2. Shut off head.

2. State the basis for the Tech Spec minimum CST level.

3. Explain the overspeed trip protection of the C Aux feed pump.

4. Describe the operator control manipulations of the AFW to:

   A. Reset the mechanical overspeed trip.

   B. Reset the electrical overspeed trip, include unit differences.

   C. Manually feed either steam generator with any AFW pump, including unit differences.

Question: 29

Unit 2 is experiencing an unexplained RCS cooldown post trip from 100% power. Which of the following is a possible reason for the cooldown?

A. Excessive boration.

B. Condenser vacuum was lost.

C. MSR Block valves were not closed.

D. Spillover bypass valve MV-08-814 not closed

A. Incorrect, Boration does not affect RCS temperature below the point of adding heat.

B. Incorrect, Loss of condenser vacuum would disable SBCS which would cause RCS temperature to increase until ADVs were placed inservice.

C. Correct

D. Incorrect, this valve is closed to maintain vacuum

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 039.K3.05
Importance: SRO 3.7
References: 2-EOP-01 Standard Post Trip actions, 0711304 Main, Extraction and Auxiliary Steam System

4.0 OPERATOR ACTIONS (continued)

RCS HEAT REMOVAL

INSTRUCTIONS	CONTINGENCY ACTIONS
6. (continued)	**6.** (continued)
E. ENSURE the **FOUR** MSR TCV Block Valves are CLOSED.	**E.1** CLOSE **ALL** TCVs using the MSR Reheat Control Panel.
F. ENSURE the MSR Warmup Valves are CLOSED.	
G. If maintaining a vacuum is desired, Then ENSURE MV-08-814, Spillover Bypass Valve, is CLOSED.	

SCRD 96-2747, Unplanned Closure of Moisture Separator Reheater (MSR) Warmup Valves Due to Improper Removal of Pressure Gages

In 1996, while Unit 2 was operating at 100% power, operators noticed RCS pressure and temperature were increasing unexpectedly. They quickly realized that two MSR 8" TCVs indicated closed. They borated and secured pressurizer heaters to reduce RCS temperature and pressure and began to investigate why the valves closed. Just as RCS temperature had begun to decrease, the other two 8" TCVs went closed, again resulting in a load rejection and increase in RCS pressure and temperature. Operators again took action to mitigate the increases, and within 30 minutes had stabilized the plant at approximately 94% power.

The work control group supervisor reported that I&C had been given permission to work in the vicinity of the MSRs. A clearance was hung which confirmed isolation of the 3" TCVs. These air operated valves are normally open; and manually isolated at power by procedure. An I&C technician went to replace a signal input air pressure gage at the positioner (used to show pneumatic controller output to the positioner) to the TCV-08-7 (3" valve). The gage read approximately 30 psig as expected, and the technician removed it. As the line immediately depressurized, the technician noted that TCV-08-7 stroked closed, which was also anticipated. What had not been recognized was that the limit switch from TCV-08-7 sends a signal to TCV-08-1 (8" valve), which made it close. Simultaneously, because the input is shared, the pneumatic positioner closed TCV-08-8, which then closed TCV-08-2 by the same sequence.

Approximately five minutes later, the technician removed and replaced another signal line pressure gage for TCV-08-10, initiating a nearly identical sequence for MSR steam supply valves TCV-08-3 and 4, which closed.

When the second set of valves closed, indicated cold leg temperature peaked at approximately 551.2°F, and pressure had again increased. Generator load was reduced by approximately 50 MW. Technical Specification LCO 3.2.5 DNB Parameter limit of a maximum RCS cold leg temperature of 549°F was exceeded, and operators entered a two hour action statement. The action statement was exited after indicated cold leg temperature was reduce to less than 549°F (approximately 15 minutes).

Question: 30

At 100% power a loss of the 1B2 480 Volt Load Center has occurred and cannot be immediately recovered. A short time later, the plant trips and three CEA's are not fully inserted.

Which of the following Operator actions should be taken?

A. Start both Boric Acid makup pumps, close both Boric Acid pump recirc valves and open emergency borate valve V2514.

B. Start both Boric Acid Makup pumps, close both Boric Acid pump recirc valves and open Boron load control valve V2525.

C. Open Gravity Feed valves V2508 and V2509, close and hold closed VCT outlet valve V2501.

D. Open Gravity Feed valves V2508 and V2509, and emergency borate valve V2514.

A. **Correct**

B. MV 2525 required to be closed.

C. Incorrect, Gravity feeds powered from B side

D. Incorrect, Gravity feeds powered from B side

Question Level: 2
Question Source: Modified
Exam:RO/SRO
K/A: 004.K2.05
Importance: 2.9
References: 1-ONP-02.02 Emergency Boration, CVCS Lesson text 0711205, CVCS Lesson plan 0702205-04

ORIGINAL QUES.

At 100% power a loss of the 1A2 480 Volt Load Center has occurred and cannot be immediately recovered. A short time later, the plant trips and RCS temperature indicates 502ºF and lowering.

Which of the following Operator actions should be taken?

A. Start both Boric acid makup pumps, close both Boric acid pump recirc valves and open emergency borate valve V 2514.

B. Start both Boric acid makup pumps, close both Boric acid pump recirc valves and open Boron load control valve V 2525.

C. Open Gravity feed valves V 2508 and V 2509, close and hold closed VCT outlet valve V 2501.

D. Open Gravity feed valves V 2508 and V 2509, and emergency borate valve V 2514.

A. Incorrect, 1A2 480 Volt load center powers both Boric acid makeup pumps.

B. MV 2525 required to be closed.

C. **Correct**

D. Without Boric Acid pumps running, emergency borate valve opening does no good.

Question Level: 2
Question Source: New
Exam: Both
K/A: 024.AK2.03
Importance: 2.6/2.5
References: 1-ONP-02.02 Emergency Boration, CVCS Lesson text 0711205, CVCS Lesson plan 0702205-04

Emergency Boration

Emergency boration (Figure 20) injects concentrated boric acid into the suction of the charging pumps. Emergency boration is used for the following conditions:

1. An unanticipated or uncontrolled RCS cooldown following a reactor trip,
2. An unexplained or uncontrolled reactivity increase, or
3. A loss of shutdown margin due to excessive Control Element Assembly insertion below the PDIL.
4. More than one CEA not fully inserted following a reactor trip.

The emergency boration flowpath is also used in the performance of a rapid downpower.

Emergency boration is achieved by directing flow from the selected BAM pump, through the motor operated emergency borate valve MV-2514, and into the charging pumps common suction header. Emergency boration, although normally an operator controlled evolution, is also initiated automatically by a Safety Injection Actuation Signal. MV-2514 is powered from MCC-A5.

These boration flowpaths discussed require BAM pump operation. Since the safe shutdown of the plant can depend on the injection of concentrated boric acid into the RCS, allowances must be made for the remote possibility that both BAM pumps may fail. For instance, when the 'A' 480 VAC bus goes off line, both BAM pumps will be disabled. In this situation, boration is assured by gravity feed from the BAM tanks into the charging pump suction (Figure 21).

Gravity feed is automatically initiated by SIAS by opening the motor-operated gravity feed line isolation valves V2508 and V2509 and by closing V2501. The combined flow then enters the charging pump suction via a portion of the emergency boration header.

The BAM pumps are powered from MCC-1A6. The gravity feed isolation valves (V2508, V2509) are powered from MCC-1B6.

Question: 31

During operation at 60% power, the Unit 2 Reactor Coolant Pumps' seal readings indicate as follows:

PUMP	PRESSURE (PSIG) Bleedoff Cavity	Upper Seal Cavity	Middle Seal Cavity	FLOW (GPM) Controlled Bleedoff	TEMPERATURE Controlled Bleedoff
2A1	121	776	1516	1.0	139
2A2	124	685	1588	1.1	148
2B1	176	180	2221	2.8	187
2B2	119	782	1505	0.9	143

In accordance with ONP 2-0120034 Reactor Coolant Pump, the crew should:

A. monitor and record RCP seal parameters for additional degradation.

B. perform a unit shutdown, then stop the affected RCP after TCBs are open and initiate seal injection.

C. perform a unit shutdown, then stop the affected RCP after TCBs are open.

D. manually trip the reactor and turbine, then trip the affected RCP.

A. Incorrect, would be correct for 1 failed seal

B. Incorrect requires affected RCP be stopped after unit shutdown, seal injection not used under these conditions.

C. **Correct, 2 failed seals requires unit shutdown**

D. Incorrect, would be correct for 3 failed seals

Question level: 2
Question source: Bank
Exam: SRO Only
K/A: 003.A2.01
Importance: SRO 3.9
References: 2-0120034 Reactor Coolant Pump, 2-NOP-01.02, 0702202 Reactor Coolant Pumps Lesson text, 10CFR.55.43.b5

7. Evaluate the operation of the RCPs (including operating bands or setpoints) during normal, off-normal and emergency conditions by:

   A. Explaining the general sequence for starting an RCP.

   B. Describing how the reactor trip on Unit 2 monitors Component Cooling Water (CCW) flow.

   C. Diagnosing a failure in the RCP seal assembly, given seal temperatures, pressures and flow.

   D. Describing how to diagnose a leak at the RCP casing/cover interface.

   E. Diagnosing a failure in the RCP Lube Oil System, given bearing temperatures and oil levels.

8. Analyze the signals (including bypasses and interlocks) which affect system operation by:

   A. Describing the automatic control features of the RCP oil lift pumps.

   B. Describing the interlocks associated with the RCP seal water injection system.

   C. Describing the automatic actions associated with the Seal Heat Exchanger outlet valve.

   D. Listing the inputs with setpoints for the RCP Start Permissive.

9. Explain the administrative requirements that affect Reactor Coolant Pump operation during all modes of plant operation.

10. Given a set of plant conditions, identify if the RCP related Tech Spec LCO requirements are being challenged.

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

NOTE

- If controlled bleedoff or lower seal cavity temperature is greater than 250°F, the life time of the seal is being reduced.
- If seal cavity pressures are NOT equally reduced by approximately one-third of RCS pressure, seal damage has occurred. /R28

INSTRUCTIONS	CONTINGENCY ACTIONS
10. Verify RCP seal pressure, seal cavity temperature and bleedoff cavity temperatures are normal.	10. If RCP seal alarms are present, Then perform the following: A. Inspect RCP instrumentation to verify which indicator is in alarm condition. B. If CBO or lower seal cavity temperature reaches 250°F for 10 minutes or greater than 300°F at any time, Then PERFORM the following: 1. TRIP the Reactor. 2. TRIP the Turbine. 3. STOP the affected RCP. 4. DEPRESSURIZE and COOLDOWN the RCS as necessary to maintain CBO and lower seal cavity temp less than 250°F.

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
	10. (continued) C. If controlled bleedoff flow is high, Then inspect for failed seals and begin taking 30 minute readings on controlled bleedoff flow and cavity pressures using Data Sheet 1, until it is determined that additional seal degradation is NOT occurring. /R28 D. If Controlled Bleedoff flow is lost, Then PERFORM the following: 1. ENSURE V2505, RCP Bleedoff, is OPEN. 2. ENSURE V2524, RCP Bleedoff, is OPEN. 3. If RCP Bleedoff flow can NOT be reestablished by opening V2505 and V2524, Then OPEN V2507, RCP Bleedoff Relief Stop Vlv.

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
	10. (continued) D. (continued) 4. If RCP Controlled Bleedoff flow can NOT be reestablished within 30 minutes, Then PERFORM the following: a. Trip the Reactor. b. Trip the Turbine. c. STOP all RCPs. /R28 E. If any seal has failed, indicated by a loss of differential pressure across the seal, Then take 30 minute readings on controlled bleedoff flow and cavity pressures using Data Sheet 1, until it is determined that additional seal degradation is NOT occurring. /R28

7.0 OPERATOR ACTIONS: (continued)

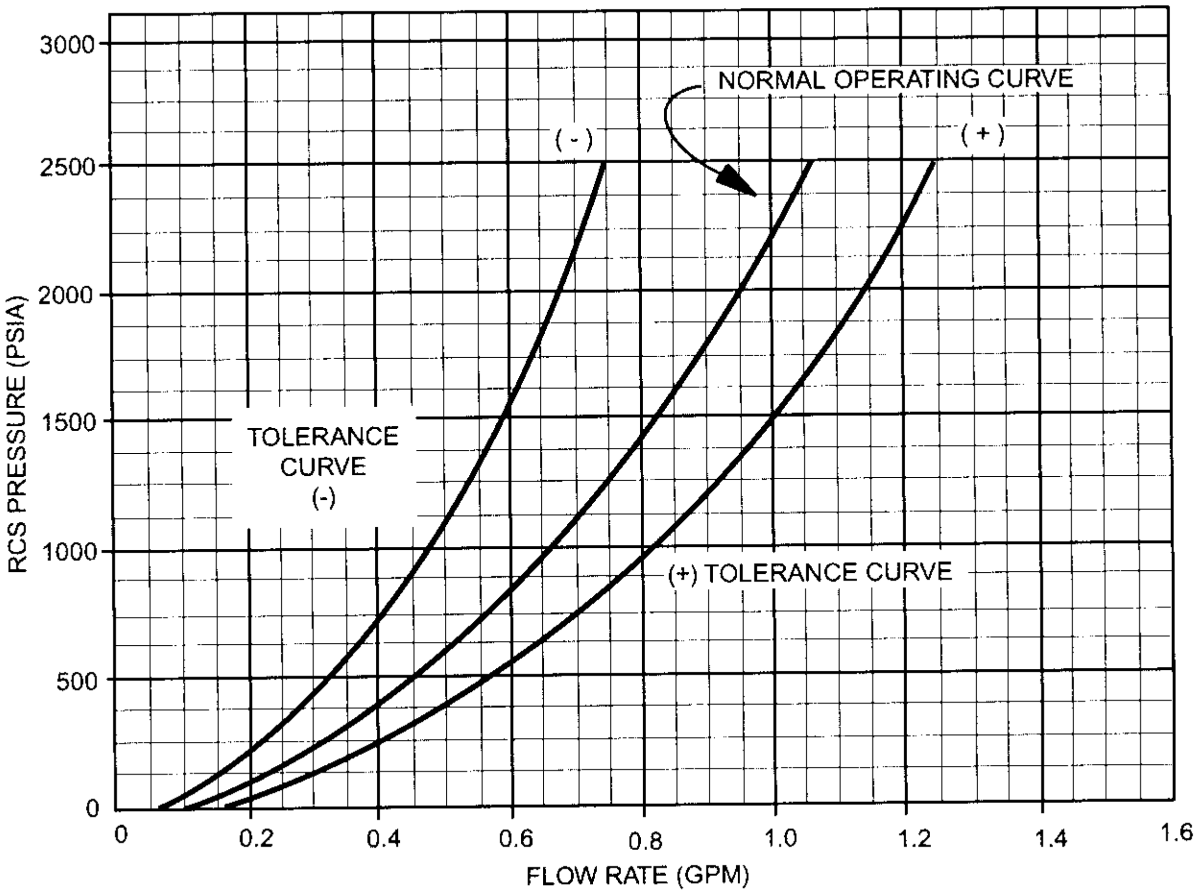
7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
	10. (continued) F. If two seals have failed, Then: 1. Notify the system dispatcher. 2. Begin a unit shutdown. 3. When CEA TCBs are open, Then stop the affected RCP. G. If three seals have failed, Then: 1. Trip the reactor and turbine. 2. Trip the affected RCP. /R28 3. If an immediate RCS cooldown is NOT to be performed, Then depressurize the RCS to approximately 1850 PSIA to maintain RCP lower seal cavity temperature less than 300°F.

APPENDIX A

RCP SEAL LEAKOFF FLOW RATE VS RCS PRESSURE

(Page 1 of 1)



NOTE (1): FLOW RATE INSTRUMENTATION MAY BE UNRELIABLE BELOW 0.7 GPM

(P/OPS/2-NOP-01.02-Appen A-R0)

END OF APPENDIX A

Question: 32

A Start-up is being performed on Unit 1 with the following indications:

	Ch A	Ch B	Ch C	Ch D
Power (%)	$1.5x10^{-4}$	$1.5x10^{-4}$	$1x10^{-5}$	$1x10^{-5}$
Startup Rate (DPM)	1.4	1.3	1.5	1.4

CEA motion has stopped. Which of the below interlocks has stopped CEA motion?

A. CEA Withdrawal Prohibit from channels A and B

B. Auto Withdrawal Prohibit from channels C and D

C. CEA Motion Inhibit from channels A and B

D. Low Power Automatic Withdrawal Prohibit from channels C and D

A. Correct 1.3 DPM or greater with power between $1x10^{-4}$ and 15% on 2/4 RPS channels gives pre-trip and CEA withdrawl prohibit

B. Incorrect, AWP generated from Reactor Regulating System

C. incorrect, generated from CEDS

D. incorrect, generated from Reactor Regulating System

Question Level: 2
Question Source: Modified
Exam: RO/SRO
K/A: 001.K1.05
Importance: 4.4
References: 0711404 Reactor Protective System, LP 0702404-4B

Question 63

ORIGINAL QUES.

A Start-up is being performed on Unit 1 with the following indications:

	Ch A	Ch B	Ch C	Ch D
Power (%)	1.8	2.0	2.1	1.9
Startup Rate (DPM)	1.2	1.3	1.5	1.4

Which of the below interlocks has stopped CEA motion?

A. Auto Withdrawal Prohibit

B. CEA Withdrawal Prohibit

C. CEA Motion Inhibit

D. Low Power Automatic Withdrawal Prohibit

A. Auto Withdrawal Prohibit (incorrect, AWP generated from Reactor Regulating System)

B. CEA Withdrawal Prohibit (correct 1.3 DPM or greater on 2/4 RPS channels gives pre-trip and CEA withdrawl prohibit)

C. CEA Motion Inhibit (incorrect, generated from CEDS)

D. Low Power Automatic Withdrawal Prohibit (incorrect, generated from Reactor Regulating System)

Question Level: 2
Question Source: New
Exam: RO
K/A: 001.K1.05
Importance: 3.2
References: 0711404 Reactor Protective System

Once the pushbutton is depressed, Q_{TR} is reset to the current value of $Q + Q_b$. The system is capable of holding the setpoint Q_{TR} at the previous minimum indefinitely. A pretrip occurs when Q rises to within **2%** of Q_{TR}.

- The Q_{TR} signal has lower and upper limits of **15%** and **107%** respectively.

A similar circuit generates a pretrip limit for the BTU, as well as an annunciator to warn the operator that Q_{TR} may have to be reset to avoid a trip. The pretrip output provides annunciation in addition to CEA withdrawal prohibit (CWP) signals.

Hi Rate of Change of Power

- The high rate (SUR) trip is provided to protect the core during startup operations, and serves as a backup to the administrative startup rate limits. This trip is not credited in any design basis accident; however, this trip is considered in the safety analysis in that it precludes the need for specific analyses of other events initiated from subcritical conditions.

- A high SUR trip is initiated at **2.49 decades per minute (DPM)**, as sensed on 2-out-of-4 wide-range logarithmic channels, over the range of 10^{-4}% to 15% power.

- The SUR signal is automatically grounded below **10^{-4}%** and bypassed above **15%** power. Refer to Figure 6. Annunciation alerts the operator when the SUR trip is enabled.

- A common pretrip alarm is generated by any one of the four channels when its trip unit senses a SUR in excess of **1.3 DPM** over the range of 10^{-4}% to full power. In conjunction with the pretrip alarm, a CWP signal is also generated (2-out-of-4 coincidence logic) which prevents further withdrawal of regulating group CEAs, but does not affect insertion capability.

Low Reactor Coolant Flow

- The reactor coolant low flow trip provides core protection against Departure from Nucleate Boiling (DNB) in the event of a sudden significant decrease in RCS flow.

The Differential Pressure (ΔP) across each steam generator (S/G) is monitored by 4 ΔP transmitters. Refer to Figure 7. Each RPS channel is fed by one ΔP transmitter

Question: 33

Chemistry has reported 3% hydrogen concentration by volume, in the in-service gas decay tank. Which of the following states the minimum oxygen concentration, that if exceeded, requires immediate action as defined by 2-0530030 Waste Gas System Off-Normal Operating procedure?

A. 2%

B. 4%

C. 6%

D. 8%

A. Incorrect, hydrogen limit

B. **Correct**

C. Incorrect, combination of hydrogen and oxygen

D. Incorrect, explosive limit

Question level: 1
Question source: Bank
Exam: RO/SRO
K/A: 071.K5.04
Importance: SRO 3.1
References: ONOP 2-0530030 Waste Gas System, LP 0702812-02

7.0 OPERATOR ACTIONS:

7.1 Immediate Operator Actions:

INSTRUCTIONS	CONTINGENCY ACTIONS
§1 1. If the concentration of oxygen in the in-service gas decay tank is greater than 4% by volume and the hydrogen concentration greater than 2% by volume, Then:	
A. Immediately suspend all additions of waste gases to the system.	
AND	
B. Begin reducing the concentration of oxygen to less than 2% by volume by admitting nitrogen to the Inservice Gas Decay Tank by opening the appropriate valve. 2A GDT-V6588 2B GDT-V6596 2C GDT-V6599	
2. If an unexpected drop or rise in pressure of a gas decay tank occurs, Then immediately terminate any gas release in progress.	

1.0 TITLE:

WASTE GAS SYSTEM OPERATION

2.0 REVIEW AND APPROVAL:

See cover page

3.0 PURPOSE:

This procedure provides instructions for operation of the Waste Gas System.

4.0 PRECAUTIONS AND LIMITS:

4.1 The entire Waste Gas System should be under a slight positive pressure to prevent oxygen in-leakage.

4.2 Oxygen in the system will be detected by the Gas Analyzer (GA), which will alarm at 2% oxygen. The presence of oxygen at or above the alarm setting requires prompt action in accordance with ONOP 2-0530030, Waste Gas System to prevent an explosive mixture. Refer to the Technical Specifications for required actions on high oxygen concentration in the GDTs.

4.3 Leakage of gas out of the system could result in a radiation hazard. Vent header gases could also contain hydrogen and a potential for explosion or fire hazard could exist. Accidental release of waste gas from the plant vent or due to leaks in the system are covered by ONOP 2-0530030, Waste Gas System.

4.4 The release of waste gas to the atmosphere shall be performed in accordance with OP 2-0530021, Controlled Gaseous Batch Release to Atmosphere.

4.5 Effluent monitoring equipment shall be operable during release operations or take actions required by Chemistry Procedure C-200, "Offsite Dose Calculation Manual (ODCM)," section 3.3.3.10.

4.6 The Health Physics Department should be notified prior to changing the status of the in service Gas Decay Tank.

4.7 If maintenance has been performed on a Gas Decay Tank and it has been opened to the atmosphere, Then the Gas Decay Tank should be purged with nitrogen to remove the oxygen. Contact the Chemistry Department for assistance.

Question: 34

Unit 1 is in a refueling outage performing a fuel shuffle in the core.

In accordance with Unit 1 Technical Specifications, which of the following requires immediate suspension of refueling operations?

A. Refueling canal level is 22 feet above the top of fuel assemblies that are seated in the reactor.

B. Refueling canal level is 22 feet above the top of the reactor flange.

C. Loss of audible countrate in the Control room

D. Loss of one of the four operable Wide Range neutron flux monitors.

A. Correct

B. Incorrect, would be correct for Unit 2 only.

C. Incorrect, would be correct for Unit 2 only

D. Incorrect, two of the four channels required to be operable

Question level: 1
Question source: New
Exam: SRO Only
K/A: G2.2.27
Importance: 3.5
References: Unit 1 T.S. 3.9.11, 10CFR.55.43.b2

REFEELING OPERATIONS

WATER LEVEL – REACTOR VESSEL

LIMITING CONDITION FOR OPERATION

3.9.10 At least 23 feet of water shall be maintained over the top of irradiated fuel assemblies seated within the reactor pressure vessel.

APPLICABILITY: During CORE ALTERATIONS.
During movement of irradiated fuel assemblies within containment.

ACTION:

With the requirements of the above specifications not satisfied, immediately suspend CORE ALTERATIONS and movement of irradiated fuel assemblies within containment, and immediately initiate action to restore refueling cavity water level to within limits.

SURVEILLANCE REQUIREMENTS

4.9.10 The water level shall be determined to be at least its minimum required depth within 2 hours prior to the start of and at least once per 24 hours thereafter during CORE ALTERATIONS and during movement of irradiated fuel assemblies within containment.

Question: 35

Given the following:

- Unit 2 is on SDC with RCS temperature of 105°F and stable.
- Both Personnel airlock doors are open.
- A loss of shutdown cooling occurs and the RCS temperature rises to 203°F

The Containment Air Lock Technical Specifications is:

A. met for the current conditions.

B. not required if, within 1 hour, RCS temperature is lowered to 190°F.

C. not met until one Personnel airlock door is closed (the one closed airlock door may be opened for passage)

D. not met until both Personnel airlock doors are closed (one door at a time may be opened for passage).

A. Incorrect, required due to Mode 4 entered

B. Incorrect, required due to Mode 4 entered

C. Incorrect, both doors required to be closed unless one door is open for passage.

D. **Correct**

Question level: 2
Question source: New
Exam: SRO Only
K/A: G2.1.11
Importance: 3.8
References: Tech Specs 3.6.1.1, LP 0902723-06, 10CFR.55.43.b2

CONTAINMENT AIR LOCKS

LIMITING CONDITION FOR OPERATION

3.6.1.3 Each containment air lock shall be OPERABLE with:

a. Both doors closed except when the air lock is being used for normal transit entry and exit through the containment, then at least one air lock door shall be closed, and

b. An overall air lock leakage rate in accordance with the Containment Leakage Rate Testing Program.

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

ACTION:

a. With one containment air lock door inoperable*:

1. Maintain at least the OPERABLE air lock door closed and either restore the inoperable air lock door to OPERABLE status within 24 hours or lock the OPERABLE air lock door closed.

2. Operation may then continue until performance of the next required overall air lock leakage test provided that the OPERABLE air lock door is verified to be locked closed at least once per 31 days.

3. Otherwise, be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

4. The provisions of Specification 3.0.4 are not applicable.

b. With the containment air lock inoperable, except as the result of an inoperable air lock door, maintain at least one air lock door closed; restore the inoperable air lock to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

---

* If the inner air lock door is inoperable, passage through the OPERABLE outer air lock door is permitted to effect repairs to the inoperable inner air lock door. No more than one airlock door shall be open at any time.

Question: 36

Which of the following describes how NPSH for the Containment Spray pumps is maintained during transfer of suctions from the RWT to the Containment sump upon receipt of a Recirculation Actuation Signal (RAS)?

A. The LPSI pumps automatically stop on RAS.

B. The Safeguards pumps minimum flow recirc flowpath is isolated automatically on RAS.

C. On a RAS, the Containment sump outlet valves open fully prior to the RWT outlet valves starting to close.

D. On a RAS, the Containment sump outlet valves opens fully prior to the RWT outlet valves closing completely.

A. Incorrect, LPSI pumps do automatically stop on RAS, but NOT to ensure NPSH for the Spray pumps

B. Incorrect, minimum flow recirc valves do close on RAS, but NOT to ensure NPSH for the Spray pumps.

C. Incorrect, sump outlet valves begin to open at the same time the RWT valves begin to close.

D. Correct

Question Level: 1
Question Source: Bank
Exam: RO/SRO
K/A:026.K4.07
Importance: 4.1
References: 0711401 ESFAS Lesson Text, LP 0702207-10C

53. Which ONE of the following describes how NPSH for safeguards pumps is maintained during transfer of suctions upon receipt of a Recirculation Actuation Signal?

Containment sump outlet valves:

a. will be fully OPEN before the RWT outlet valves begin to CLOSE.

b. will be fully OPEN within 90 seconds and the RWT outlet valves will be fully CLOSED within 30 seconds.

c. will not be fully OPEN until the RWT outlet valves are fully CLOSED.

d. will be fully OPEN within 30 seconds and the RWT outlet valves will be fully CLOSED within 90 seconds.

54. The following plant conditions exist:

- Unit 2 is in MODE 1.
- VCT makeup is in AUTOMATIC.
- The HS-2500 (Automatic Divert) is in the "AUTO" position.
- VCT level transmitter LT-2226 channel fails LOW.
- No operator action is taken.
- VCT control room level indication supplied by LT-2227 is normal.

Which ONE of the following describes the system response?

a. VCT Inlet/Divert valve AOV-2500 will open and divert flow to the radwaste system.

b. VCT makeup bypass valve MV-2525 will close.

c. Receipt of VCT Level LO LO annunciator.

d. VCT relief valve will lift.

55. Unit 1 is at 7% power preparing to latch and roll the turbine. Feedwater control is in automatic using the 15% bypass valves.

Which ONE of the following describes the response of the 15% bypass valves to a reactor trip?

a. Continue to feed the steam generator at its present position.

b. Fully close to isolate flow to the steam generator.

c. Reposition to provide flow equal to 5% of their capacity.

d. Transfer to MANUAL control at its current position.

- CSAS is NOT provided with blocking modules.

Separate control switches for manual initiation of each train of the CSAS are provided on RTGB 106 [206]. These switches have the similar positions and are operated in the same way as those previously described.

Several annunciators associated with CSAS actuation on RTGB 106 [206] are:

- R-11 [S-17], CNTMT PRESS HIGH CSAS CHANNEL TRIP
- R-1 [S-7], CSAS CHANNEL A/B ACTUATION

Recirculation Actuation Signal (RAS)

An RAS automatically transfers the suction of the Safety Injection Pumps and the Containment Spray Pumps from the RWT to the cntmt sump. This is accomplished by opening the two sump outlet valves while simultaneously closing the RWT outlet valves and closing the pump miniflow recirculation valves to the tank. Unit 1 has a key switch to allow auto action to close the miniflow recirculation valves

- The cntmt sump outlet valves open within 30 seconds.
- The RWT outlet isolation valves close within 90 seconds.
- Concurrent with the transfer of the pump suctions, the Low Pressure Safety Injection (LPSI) pumps are automatically stopped to prevent forcing core rubble out reactor vessel and into RCS due to high flow.

The different stroke times of the RWT isolation valves and cntmt sump outlet valves ensure the safeguards pumps have adequate NPSH at all times during operation. RAS automatic actions are detailed in EOP-99.

- RAS is initiated by 2-out-of-4 low RWT level **(4' [6'])** signals.
- RAS is an **energize to actuate** signal.

There are four independent level transmitters (LT-07-02A, B, C, and D).

Question: 37

Which of the following will result in the automatic trip of 2A Main Feedwater pump?

A. Main Feedwater suction header pressure indicates 260 psig.

B. Loss of the 2A Condensate pump with less than 50% feedwater flow.

C. 2A Main Feedwater pump suction valve indicates closed (indication only)

D. Main Feedwater pump low oil pressure indicates 6 psig.

A. Correct

B. Condensate pump trip is greater than 50%.

C. Suction valve closed (green light) feed pump start permissive, not trip criteria.

D. Lube oil pressure trip is at 4 PSIG.

Question level: 1
Question source: New
Exam:RO/SRO
K/A: 056.A1.08
Importance: SRO 2.6
References: 0711301 Condensate, Feedwater and Heater Vents and Drains system Lesson text, Main Feedwater ONOP-0700030,
2-ARP-01-G2&G10

B. Given a simplified diagram, describing the following flow paths:

1. Condensate polisher aligned to Unit 1.

2. Condensate polisher aligned to Unit 2.

3. Cascading drains for all feedwater heaters and the MSRs.

4. Venting of the feedwater heater shell side.

C. Given a set of plant conditions, describing the basic sequence of steps to align the "C" condensate pump to either the "A" or "B" side.

D. Given a simplified diagram of a feedwater heater or MSR, identifying all input drains, output drains and steam supplies.

3. Describe the instrumentation, available in the control room, used to evaluate the Condensate, Feedwater and Heater Vent and Drain System status under normal, offnormal and emergency conditions.

4. Identify the power sources for the following loads:

A. The three condensate pumps

B. The two main feedwater pumps

C. The main feedwater auxiliary lube oil pumps

D. Heater drain pumps

5. Describe the operation of the Condensate, Feedwater and Heater Vent and Drain Systems, as applicable for the following:

A. Normal operating modes of the MFIVs.

B. Fast closure modes of the MFIVs (Unit 2 only).

C. Starting and tripping interlocks, including setpoints, associated with Condensate Pumps, Main Feedwater Pumps, and Heater Drain Pumps.

D. Number 4 heater level control and the Heater Drain Pump (HDP) discharge valve control during HDP startup and operations.

- The RECIRC position causes the recirculation flow control valve to stay open after the pump has been started. The control switch is procedurally maintained in RECIRC until feedwater flow exceeds 10,000 gpm (15,000 for two pumps).

- In the AUTO/RECIRC position, the recirculation flow control valve opens when flow falls below 4500 gpm. This is the required switch position when feedwater flow is above 10,000 gpm, (15,000 gpm for 2 pumps).

On a turbine trip signal, the feedwater pump recirculation valves will receive an AUTO open signal that is maintained until the trip signal is cleared, or the Feedwater Bypass on Trip Manual Override pushbutton on RTGB-102 [202] is pressed. At that time, the recirculation valves will close.

Only one MFW pump is normally running when plant power is less than 45%. The second MFW pump will automatically start if the running feedwater pump trips and the control for the idle pump is in the AUTO/RECIRC, provided the pump start interlocks are met.
To start a MFW pump, the following interlocks must be met: (Refer to Figure 20.)

- Lube oil pressure >8 psig.
- Feedwater pump suction valve is open.
- Feedwater pump suction pressure >275 psig.
- Two Condensate pumps are running, or
  total feedwater flow is less than 50% and one Condensate pump is running.

The MFW pump discharge valve will open after the pump starts. The auxiliary oil pump must be manually stopped locally.

The MFW pumps will trip under the following conditions: (Refer to Figure 21.)

- Lube oil pressure <4 psig.
- Operating pump suction pressure <275 psig.
- Electrical fault.
- Both running Condensate pumps are stopped.
- Feedwater pump suction flow ≤2500 gpm.
- Hi-Hi steam generator level ≥90% [≥88%].
- 6.9 KV undervoltage

- Loss of one Condensate pump with total feed flow >50% and both feedwater pumps running. (Loss of Condensate pump trips its respective side feedwater pump)
- MSIS (Unit 1 only)

Each MFW pump motor has a thrust bearing and two radial journal bearings, which are lubricated and cooled by oil from the feedwater pump oil system. Each feedwater pump's oil system has a shell-and-tube heat exchanger for oil cooling. The heat exchanger is supplied with cooling water from the turbine cooling water system.

Forced oil lubrication for the feedwater pump and motor is supplied by a shaft-driven positive displacement pump mounted on the end of the pump shaft. This pump supplies oil for the feedwater pump and motor bearings.

In addition there is a motor driven auxiliary oil pump in each feedwater pump's oil system, that will start on the following conditions:

- The corresponding feedwater pump control switch is placed in the start mode.
- The auxiliary oil pump local switch is placed in the start mode.
- Lube oil pressure on the corresponding running feedwater pump drops to $\leq$ 6 psig.
- The corresponding feedwater pump is not running and the running feedwater pump trips for any reason (except for its control switch being placed in the stop mode).

MFW Pump Discharge Valves

MFW Pump Discharge Isolation Valves, MV-09-1 and MV-09-2, are the motor-operated discharge valves for feedwater pumps A & B. They are operated with the pump Start-Stop switch, using 480V power from MCC 1A5 (1B5) [2A1 (2B1)]. Loss of power/thermal overload Alarms in the Control Room.

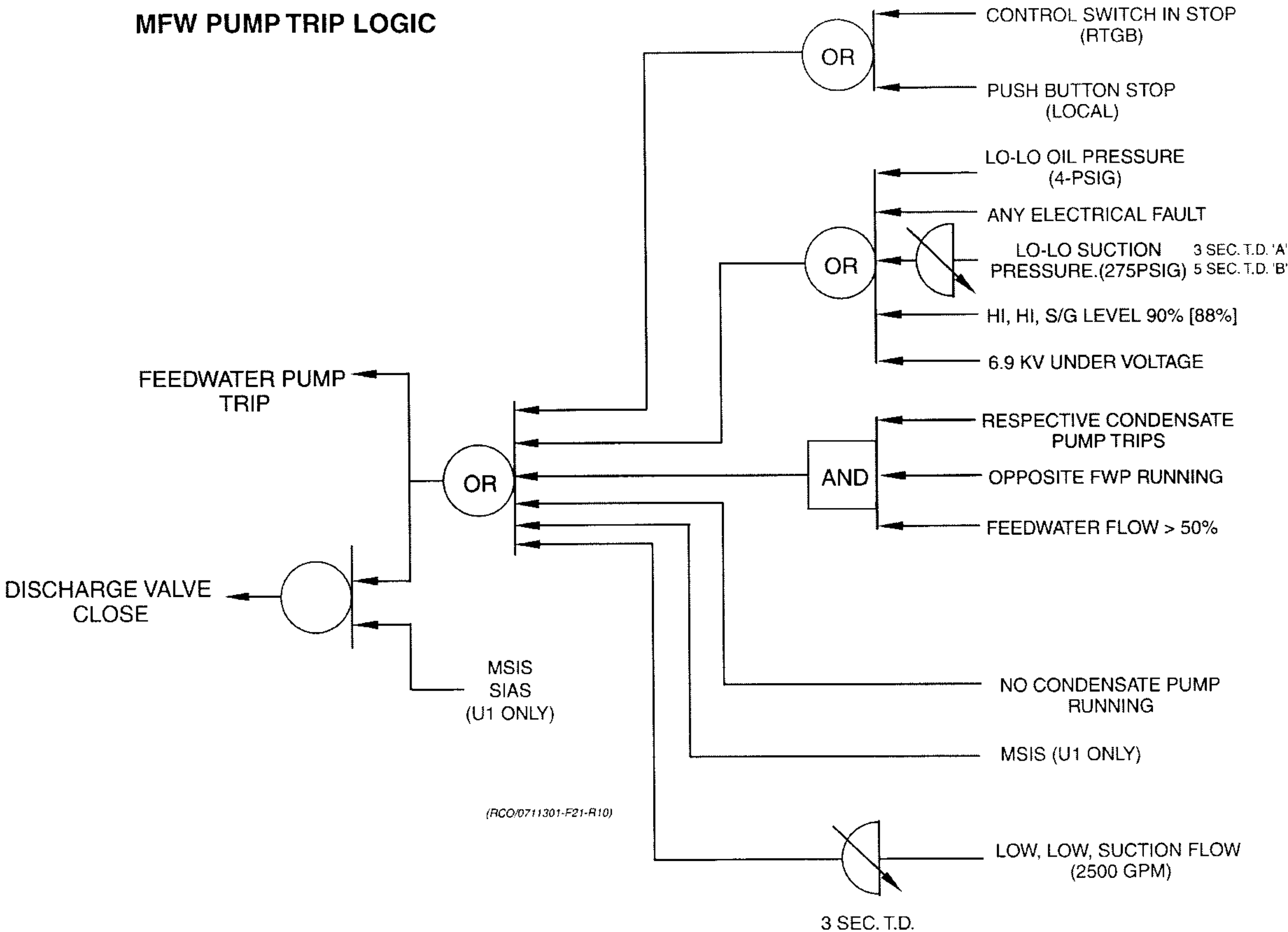
- At Unit 1, these valves auto close on MSIS and SIAS.

Feedwater Heater Number Five

The operation of feedwater heater #5 is similar to the other four heaters already discussed. Refer to Figure 22. The major difference is that the #5 heater is a high pressure heater. The #5 heater is referred to as a high pressure heater due to the high pressure (1200 psig) feedwater on the tube side. Refer to Figure 10 for #5 heater level control program.

FIGURE 21

MFW PUMP TRIP LOGIC



REVISION: 1	PROCEDURE TITLE: ANNUNCIATOR RESPONSE PROCEDURE	PANEL: G
PROCEDURE NO: 2-ARP-01-G10	ST. LUCIE UNIT 2	WINDOW: 10

ANNUNCIATOR PANEL G

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

2A FW PUMP
FLOW LOW/
BRG OIL LP/
CP INTLK TRIP
G-10

DEVICE:	LOCATION:	SETPOINT:
74-3/TDO	Bkr 2-30103	Energized
62X/TDO	Bkr 2-30103	De-energized
PS-09-9A2	TGB/ 23 /S-25/ E-B	4 psig
FIS-09-1A3	TGB/ 20/ N-25/E-B	25 inches of water (2500 gpm) /R1
52/MOC	Bkr 2-20107	Loss of a Condensate pump

ALARM CONFIRMATION:

1. AM-615, 2A Main Feedwater pump ammeter, indicates no amps.
2. 2A Main Feedwater pump tripped.
3. PIS-09-5, Feedwater pump discharge pressure, is lower than expected.
4. FI-09-1A, Feedwater pump flow, indicates NO flow.
5. Annunciator G-7, 2A/ 2C COND PUMP OVRLD/TRIP .
6. Annunciator G-26, 2A FW PUMP FLOW LOW .
7. 2A/2C Condensate pump tripped.
8. PI-12-19, Feedwater pump suction pressure, is lower than expected.
9. FCV-09-1A2, 2A Main Feedwater pump recirculation valve, indicates closed .

OPERATOR ACTIONS:

1. <u>If</u> available, <u>Then</u> START 2B Main Feedwater pump.
2. <u>If</u> 2A /2C Condensate pump is tripped, <u>Then</u> ENSURE 2A Main Feedwater pump is TRIPPED.
3. Depending on the plant power level and with NPS/ANPS discretion PERFORM **ONE** of the following:
   A. IMPLEMENT ONOP-2-0700030 Main Feedwater
   OR
   B. TRIP the Reactor
      1. TRIP the Turbine
      2. **GO TO 2-EOP-01 Standard Post Trip Actions.**

CAUSES: 2A Main Feedwater pump tripped due to low oil pressure, low flow, or the associated Condensate pump tripped.

REFERENCES
1. CWD 2998-B-327 SH 615, 617
2. Schematic 2998-B-326 SH 615
3. TEDB

REVISION: 0	PROCEDURE TITLE: ANNUNCIATOR RESPONSE PROCEDURE	PANEL: G
PROCEDURE NO: 2-ARP-01-G2	ST. LUCIE UNIT 2	WINDOW: 2

ANNUNCIATOR PANEL G

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

2A FW PUMP SUCTION PRESS LOW/TRIP
G-2

DEVICE:	LOCATION:	SETPOINT:
74-3/TDO/615	Bkr 2-30103	Energized
62X/TDC/615	Bkr 2-30103	Energized
PS-12-14A	TGB/23/S-25/E-B	275 psig Trip
PS-12-15A	TGB/23/S-25/E-B	350 psig Alarm

ALARM CONFIRMATION:
1. PI-12-19, Feedwater pump suction pressure, indicates less than 350 psig.
2. PIS-09-5, Main Feedwater pump discharge pressure, indicates less than expected.
3. 2A Main Feedwater pump is tripped.
4. AM-615, 2A Main Feedwater pump ammeter, indicates no amps.
5. FI-09-1A, Feedwater pump flow, indicates no flow.
6. FR-09-1A, Feedwater pump 2A flow, indicates no flow.

OPERATOR ACTIONS:
1. If the 2A Main Feedwater pump did NOT TRIP, Then START the standby condensate pump or the standby heater drain pump.
2. Depending on the plant power level and with NPS/ANPS discretion PERFORM **ONE** of the following:
   A. IMPLEMENT ONOP-2-0700030 Main Feedwater.
   OR
   B. GO TO 2-EOP-01 Standard Post Trip Actions.

CAUSES: 2A Main Feedwater Pump suction pressure maybe low due to the feedwater pump or associated running condensate pump recirculation valves failing open. 2A Main Feedwater Pump tripped on low suction pressure due to a loss of a condensate pump or a heater drain pump.

REFERENCES:
1. CWD 2998-B-327 SH 615, 616
2. Schematic 2998-B-326 SH 615
3. TEDB

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

1. (continued)

   B. Perform plant downpower as required to maintain 3 of 4 SG Narrow Range Level Channels on both SGs greater than or equal to 40%.

> **CAUTION**
> Main feedwater pump suction pressure alarm will occur at 350 psig and main feedwater suction pressure trip will occur at 275 psig.

2. Loss of Condensate Pump

   A. Attempt one restart of tripped pump or start standby condensate pump if available.

   B. Perform plant downpower as required to maintain 3 of 4 SG Narrow Range Level Channels on both SGs greater than or equal to 40% and main feedwater pump suction pressure greater than 400 psig.

Question: 38

In preparations for entry into Mode 4, you have been requested to perform a line-up on the AFW system. Which of the below methods describes how to verify the 1A AFW pump discharge valve to be in the correct position?

A. Physical hands on check, slightly moving the valve closed then open, then back to the closed direction ¼ to ½ turn.

B. Physical hands on check, rotating the valve at least one turn fully closed, then fully open against the backseat.

C. Visual observation of the valve stem position.

D. Visual observation of the valve position mechanical pointer.

A. Correct

B. incorrect, not required to rotate a full turn, should not open to backseat

C. incorrect, correct if area inaccessible

D. incorrect, correct, if area inaccessible

Question level: 1
Question Source: Bank (2000 NRC exam)
Exam: RO/SRO
KA: G2.1.29
Importance: 3.3
References: Op 1250020 Valve, Breaker, Motor and Instrument Instructions

8.0 INSTRUCTIONS: (continued)

8.2 (continued)

5. Determine a **NON-THROTTLE** manual valve to be in the **OPEN** position as follows:

A. If the valve has a locking device such as a cable lock or chain installed, **AND** If adequate rotation of the handwheel is available, Then removal of the lock is **NOT** required to check the valve position.

> NOTE
> For most valves at the St. Lucie Plant, the CLOSED direction is in the clockwise position. However, If the valve has left-handed threads on the stem, Then the valve will CLOSE on the counter-clockwise direction. Example of a left-threaded valves are the MV-08-1A, MV-08-1B, and V4111 (Fuel Transfer Tube Gate Valve, Penetr 25).

B. Rotate the valve handle in the CLOSED direction.

C. Verify the valve handle movement in the CLOSED direction.

D. Turn the valve handle in the OPEN direction until the motion/valve travel stops. Do **NOT** do this with a valve wrench.

> NOTE
> RCS manual valves that are to be aligned in the OPEN position shall be placed on the backseat. /R9A

E. When operating non-RCS valves, Then turn the handle back from the "back-seat" 1/4 to 1/2 turn in the CLOSED direction.

F. If the valve has a cable lock or chain lock, Then ensure that the locking device is replaced properly.

> CAUTION
> In the process of determining whether or NOT a valve is in the CLOSED position, **NEVER** move the valve handle to the **OPEN** position.

6. Determine a manual valve to be in the CLOSED position as follows:

A. Turn the valve handle to the CLOSED direction.

Question: 39

Given the following conditions:

- Unit 2 has an Instrument air leak.
- Instrument air pressure is 60.

If Instrument air pressure continues to drop, which of the following must be performed?

A. Trip the reactor and turbine.

B. Commence a Reactor and Turbine shutdown.

C. Take manual control of Main feedwater reg. valves.

D. Ensure the Unit 1 Instrument air crosstie valve is open.

A. Correct, <60 psia required manual trip

B. Incorrect, this MAY be performed at <75 psia

C. Incorrect, this MAY be performed at <75 psia

D. Incorrect, Unit 1 crosstie should be closed.

Question level: 1
Question Source: New
Exam: RO/SRO
KA: 065.AA2.06
Importance: 4.2
References: 2-1010030 Loss of Instrument Air, ONP Lesson plan 0702812-2

7.0 OPERATOR ACTIONS: (continued)

7.1 Immediate Operator Actions: (continued)

1. (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
D. Manually START the standby instrument air compressor (2C or 2D).	

NOTE

The automatic cross-tie feature of the Instrument Air System occurs at approximately 85 psig lowering on the affected unit. The cross-tie valve on Unit 1 will close if EITHER of the following conditions occur:

- The Unit 1 Instrument Air header pressure lowers below 85 psig.
- The Unit 2 Instrument Air header pressure rises above 95 psig.

INSTRUCTIONS	CONTINGENCY ACTIONS
2. If Instrument Air header pressure is lowering, Then VERIFY the standby instrument air compressor (2C or 2D) has started.	2. If the standby instrument air compressor (2C or 2D) has NOT started, Then manually START the standby instrument air compressor (2C or 2D).

NOTE

The time period that the Service Air header feeds the Instrument Air header through the cross-tie should be minimized to prevent oil intrusion into the Instrument Air header.

3. If the Instrument Air header pressure is still lowering, Then PERFORM the following:

   A. ENSURE the Service Air Compressor is running.

7.0 OPERATOR ACTIONS: (continued)

7.1 Immediate Operator Actions: (continued)

3. (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
B. OPEN SH18718, Service Air Cross-tie to Instrument Air Isol.	
C. If the Instrument Air header is fed from the Service Air header for greater than 1 hour, Then BLOW DOWN the Instrument Air header low point drains hourly to remove oil, water and crud build-up.	
4. If the Instrument Air header pressure indicates less than 60 psig and is still lowering, Then PERFORM the following:	
A. TRIP the Reactor and Turbine.	
B. GO TO 2-EOP-01, Standard Post Trip Actions.	

7.0 OPERATOR ACTIONS: (continued)

7.2 Subsequent Operator Actions:

INSTRUCTIONS	CONTINGENCY ACTIONS
1. Check pressure drop across the in service air dryer and filters, to be less than 13 psig.	1. If pressure drop is greater than or equal to 13 psig, Then open V18075, air dryer and filter bypass.
2. If instrument air pressure can be stabilized, Then:	
A. Investigate the instrument air system for leaks, failures, or malfunctions.	
B. Ensure dryers and filters are aligned properly and placed in service correctly.	
3. Ensure power available to the 2C and 2D instrument air compressors.	3. If power is NOT available, Then perform the following as required:
A. "2C Air Compressor (MCC 2A1)", Bkr. 2-40802.	A. Determine that malfunction of the motor or breaker was NOT the reason for loss of power.
B. "2D Air Compressor (MCC 2B1)", Bkr. 2-41608.	B. Restore power to the appropriate MCC and start the instrument air compressor.
	C. Start instrument air compressor 2A or 2B per Appendix A.

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

CAUTION

The ability to maintain Steam Generator levels at full power conditions may be affected as instrument air pressure degrades below 75 PSIG. Air operated valves and instrumentation may lose full range operating capability. Appendix B contains a partial listing of air operated components and their mode of failure upon loss of air supply.

4. If instrument air pressure decreases to less than 75 psig, Then evaluate the need to shut down the unit in accordance with OP 2-0030125, "Turbine Shutdown Full Load to Zero Load" or 2-EOP-01, "Standard Post Trip Actions."

5. If feedwater regulating 15% bypass valves are being used to maintain S/G level, Then use of the Auxiliary Feedwater System will be required if air pressure continues to degrade.

6. If SDC is in service, Then refer to ONOP 2-0440030, "Shutdown Cooling Off-Normal."

Question: 40

A Steam Generator Tube Leak has occurred in 1B S/G. 1-0830030 'Steam Generator Tube Leak' has been entered. The following conditions exist:

- Thot is 505°F
- 1B S/G has been isolated

Which of the following states the MINIMUM RCS pressure that is to be maintained?

A. 700 psia

B. 850 psia.

C. 1050 psia.

D. 1600 psia.

A. Incorrect, Psat for 505°F

B. **Correct (505°F plus 20°F (minimum required) subcooled)**

C. Incorrect, Psat for 505°F plus 50°F subcooled

D. *Incorrect, Psat for* 505°F plus 200°F subcooled

Question level: 2
Question Source: New
Exam: SRO only
KA: 037.AA2.16
Importance: 4.3
References: 1-0830030 Steam Generator Tube Leak, Steam Generator Tube Rupture LP 0702825-07, 10CFR55.43.b5

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
2. (continued)	2. (continued)
V. (continued)	V. (continued)
4. Verify shutdown margin is within the limits specified in COLR in accordance with 1-NOP-100.04, "Surveillance Requirements for Shutdown Margin Modes 2, 3, 4 & 5 Subcritical."	
W. When the reactor is shutdown, Then PERFORM BOTH of the following:	
1. COMMENCE an RCS cooldown until hot leg temperature is less than 525°F using the SBCS.	1. If the SBCS is NOT available, Then steam to atmosphere using the atmospheric steam dump valves and reevaluate the E-Plan classification.
2. DEPRESSURIZE the RCS and maintain 20°F to 50°F subcooling per Figure 1, "RCS Pressure/ Temperature."	

Question: 41

The following conditions exist:

- Unit 1 is in Mode 6
- "A" train containment purge system is in service with suction aligned to the refueling cavity
- The Upper Guide structure is being lifted with one incore not fully inserted.
- The RCO reports A and C CIAS monitors indicate 95 mR/Hr with B and D CIAS monitors indicating 85 mR/Hr.

Which of the following describes the response of the containment purge system?

The containment purge system:

A. is automatically secured.

B. remains in its current configuration.

C. suction is automatically aligned to the containment ring header.

D. discharge is automatically aligned to the shield building exhaust system.

A. Correct

B. Incorrect, CIAS at 90 mr/hr will secure Containment purge.

C. Incorrect, this is a manual operation.

D. Incorrect, fuel pool is re-aligned to shield building on high radiation, not containment purge.

Question level: 2
Question Source: Bank
Exam: RO/SRO
KA: 029.K4.03
Importance: 3.5
References: Ventilation systems text 0711602, LP 0702602-2C

CONTAINMENT PURGE SYSTEM

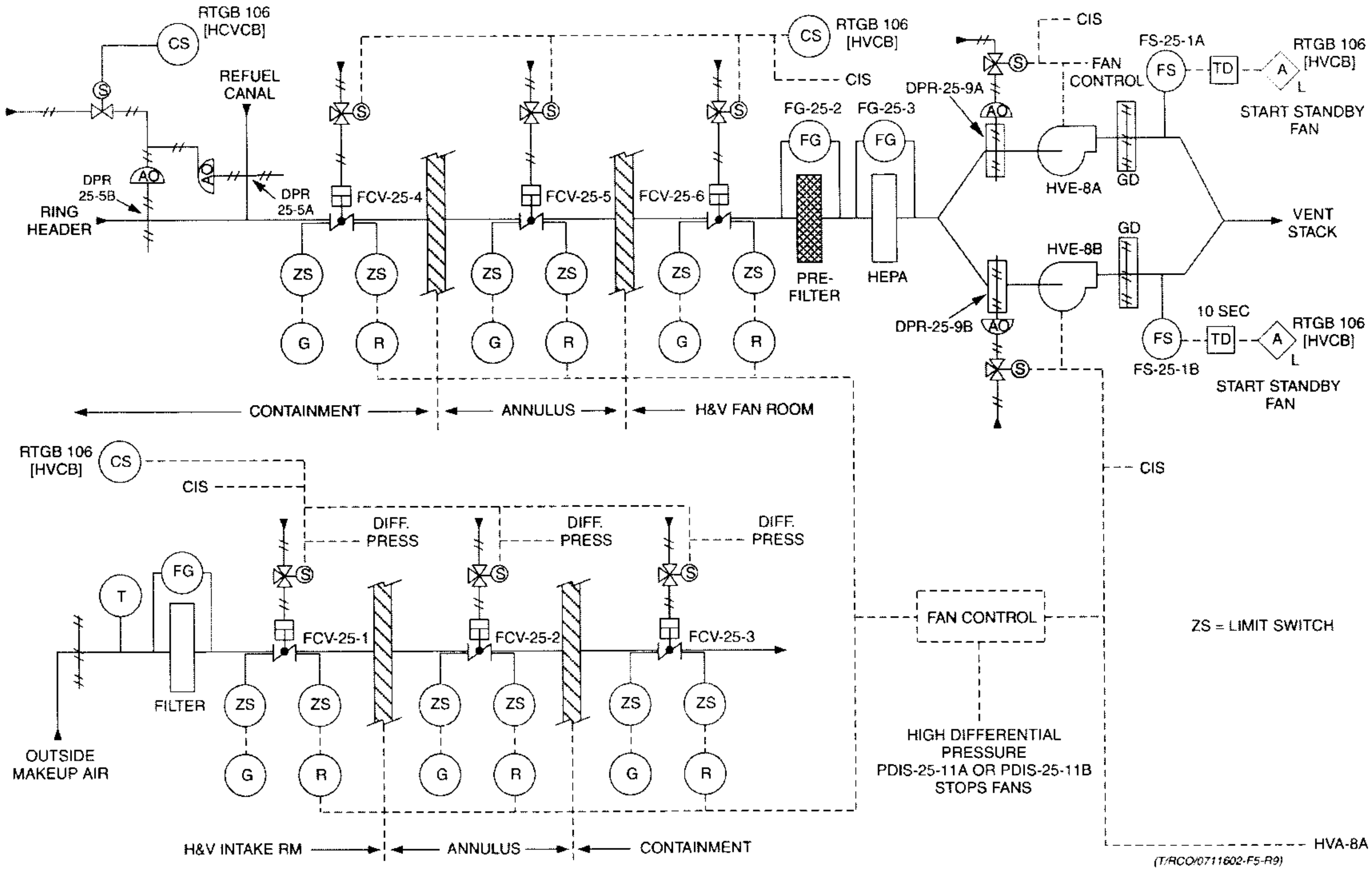


FIGURE 7

Question: 42

Both Units are in a LOOP with all Diesel Generators running and tied to their respective busses. Upon completion of SPTA's, which Unit would have greater control of Natural Circulation?

A. Unit 1, due to two ADV's air operated, capable of being controlled in auto or manual.

B. Unit 1, due to two ADV's, motor operated capable of being controlled manual only.

C. Unit 2, due to four ADV's motor operated capable of being controlled in auto or manual.

D. Unit 2, due to four ADV's air operated capable of being controlled in manual only.

A. Incorrect, loss of air due to LOOP makes Unit 1 ADV's not operable from the control room. Air is not restored until APP H from EOP-99 complete.

B. Incorrect, Unit 1 ADV's air operated

C. **Correct**

D. Incorrect, Unit 2 ADV's motor operated

Question level: 1
Question source: Bank
Exam: RO/SRO
K/A: CE/A13.AK2.2.
Importance: 3.6
References: LOOP lesson text 0711835

circulation, and then match whatever steam demand is placed on the plant for decay heat removal and cooldown (if necessary).

RCS Temperature

RCS Temperature will rapidly increase until opening of the main steam safety valves and then decrease following the reactor trip. Refer to Figure 10. Subsequent RCS temperature responses will be influenced by heat removal via the atmospheric dumps. Since the ADVs on U-1 are air operated, emergency cooling must be established to A and/or B instrument air compressors and the compressor(s) started.

Pressurizer Pressure

Pressurizer Pressure will rapidly increase, and then decrease following the reactor trip due to RCS temperature changes. Refer to Figure 11.

Pressurizer Level

Pressurizer Level will initially increase, and then decrease following the reactor trip. Refer to Figure 12. This is due to RCS inventory shrink and swell response to the RCS temperature swings.

Reactor Vessel Level

Reactor Vessel Level voiding is not expected to occur during a loss of offsite power if hot standby conditions are maintained. Reactor vessel voiding may occur during a natural circulation plant cooldown, but is only be a concern if the voiding inhibits the depressurization of the RCS, in which case a "soak" may be necessary to cool the vessel head.

Steam Generator Pressure

Steam Generator Pressure once the turbine valves have shut, will rapidly increase until the steam generator pressure increases to the main steam safety setpoint (1000 psia),

2) Diesel Generators

a) If one DG was 00S prior to LOOP, or fails to start and/or load, less instrumentation/equipment will be available for mitigation.

1. One entire train of components.

2. Only 2 instrumentation channels

3. ADV operations – if DG is not operating:
 - Unit 1 only one ADV when IA restored.
 - Unit 2 manual/manual (DC mode) on failed train.

4. Letdown will not be restored if either DG fails to operate.

5. Less Pzr heaters for pressure control.

3) AFW System

a) Failure of any components will affect mitigation.

b) Previous CST inventory and length of time without offsite power will affect the time you may remain in hot standby.

New EOP-99 Data Sheet 1 to help calculate this time

4) Instrument Air

a) Air must be restored on Unit 1, otherwise RCS heat removal is dependent on MSSVs, until local manual control of ADVs established.

b) Restoration of IA also enhances RCS inventory control by allowing restoration of letdown.

Question 43

During a LOOP from 100% power, which of the following explains how Feedwater will be supplied to restore S/G level?

A. Manually start the 'C' Auxiliary feedwater pump and initiate feedwater to the 'A' and 'B' S/G's.

B. Depress the 15% manual override pushbuttons and feed the S/Gs using the 15% bypass valves.

C. Feed the S/Gs with the AFW system when AFAS-1 and AFAS-2 automatically actuates.

D. Feed the S/Gs with the AFW system by manually initiating AFAS-1 and AFAS-2.

A. Incorrect, AFAS will automatically start all three AFW pumps.

B. Incorrect, Main Feedwater is not available during a LOOP.

C. Correct

D. Incorrect, manually initiating AFAS is only permitted if auto actuation did not occur.

Question level: 1
Question Source: New
Exam: RO/SRO
KA: 054.AA1.02
Importance: 4.4
References: AFW/AFAS Lesson plan 0702412-11D

d. Supplying Unit 1 AFW system from Unit 2 CST.

EO-1C.

Appendix D of ONP (Unit 1 procedure only).

C. EMERGENCY OPERATIONS

EO-11.

1. Emergency Operations address proper alignment and operation of AFW/AFAS components when their use is required.

2. Emergency Operating Procedures address restoration of AFW using the Off-Normal Procedure and if necessary, depressurizing a S/G in order to use a condensate pump.

3. AFW/AFAS Operations during specific emergency events:

   a. MSLB or FWH Rupture:

   EO-11D

      1) Lo S/G Level both sides.

      2) AFAS blocked (D/P Lockout) on affected side.

      3) AFAS actuates on non-affected side.

   b. Steam Generator Tube Rupture (SGTR).

      1) Normal AFAS response post-trip.

      2) Asymmetric Cooldown after isolation of faulted S/G results in lock out of good S/G.

      3) By procedure, manual initiation allowed.

   c. Rx Trip w/immediate LOOP:

      1) D/Gs pickup safety busses.

      2) AFAS generated.

      3) All components actuate when AFAS Timer reaches the preset TD except AFW PPs A & B.

4) AFW PPs A & B have 15 [30] second delay when D/G bkr closed which will occur after the AFAS signal is generated (AFAS Timer "times out").

D. TECHNICAL SPECIFICATIONS

EO-13.

1. LCO 3/4.7.1.2 – AFW System
   Operability required in Modes 1, 2 and 3 on both units.

2. (U-1) AFW PP 1C

   Perform surveillance. within 24 hours of entering mode 3, prior to mode 2.

3. [U-2] AFW PP 2C

   Verify > 1260 psig on recirc w/>50 psig steam pressure. TS 4.0.4 N/A for entry into Mode 3.

4. LCO 3.8.1.1 – AC Power Sources

   With offsite AC source and 1 diesel INOP in modes 1, 2, or 3, verify within 2 hours AFW PP 2C operable.

5. LCO 3/4.7.1.3 – CSTs

   Quantity required in Modes 1, 2, & 3:

   a. (U-1) >116,000 Gallons.

   b. [U-2] >307,000 Gallons.

6. LCO 3.3.2.1 [3.3.2] ESFAS:

   a. Minimum 3 channels.

   b. Modes 1, 2, 3.

   c. 1. With less than total number of channels operable can change mode 3 provided INOP channel placed in bypass or trip within 1 hour. Can maintain this configuration with FRG review.

   d. To place channel in trip contact I/C.

Question 44

Given the following conditions:

- Reactor trip occurred 10 minutes ago
- RCS hot and cold leg temperatures are stable at normal values
- Pressurizer pressure is 1900 psia and lowering
- Pressurizer level is 59% and rising
- Containment pressure is 0.5 psia and rising slowly
- Charging and letdown are responding as expected

A leak in which of the following locations would result in these symptoms?

A. Pressurizer steam space

B. RCS cold leg

C. Reactor vessel head

D. Main steam line

A. **Correct**

B. Pressurizer level would be dropping

C. Pressurizer level would be dropping

D. RCS temperature would be dropping

Question Level: 2
Question Source: New
Exam: RO/SRO
K/A: 000009.AK3.10
Importance: SRO 3.6
References: 2-EOP-3 Loss Of Coolant Accident, Lesson plan 0702824 LOCA event and procedure

2.0 ENTRY CONDITIONS

2.1 BOTH of the following conditions exist:

1. **EITHER** of the following have occurred:
   - 2-EOP-01, Standard Post Trip Actions, have been performed
   - The event initiated from Mode 3
     and SIAS has NOT been blocked

2. Plant conditions indicate that a LOCA has occurred;
   ANY of the following may be present:
   - Pressurizer level low
     (For a break in the Pressurizer, the level may be high)
   - SIAS actuation has occurred
   - Rise in Containment pressure, temperature, radiation, and Containment sump level
   - High Quench Tank level, temperature, or pressure

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITIES	NOTES AND STUDENT ACTIVITIES
II.G. Characteristics and Parameter Trending		
1. Key parameters are: Reactor Power Pressurizer Level Pressurizer Pressure RCS Temperature Reactor Vessel Level S/G Pressure Containment Radiation Containment Pressure Containment Temperature Containment Sumps	Ask students to list the normal values of key plant parameters Write parameters on the board	EO-08
2. Trending		
a. Reactor Power - Reactor trip rods give short term, moderator voiding, and boron from makeup	Show T/P (Figure 9)	
b. Pressurizer Level - ↓ at a rate dependent on leak rate	Narrate trending Show T/P (Figure 12) Describe erratic or increase in level if leak is in pzr	

Question: 45

Unit 1 is operating at 100% power with channel Y Pressurizer pressure control selected. Annunciator H-14 'PZR CHANNEL Y PRESS HIGH/LOW' alarms. You noticed the selected pressure channel has failed low.

Assuming no Operator actions, which of the following states the plant response?

The Plant will:

A. trip on high Pressurizer pressure due to all heaters on and spray valves closed.

B. trip on low Pressurizer pressure due to all heaters on and spray valves fully open.

C. not trip but pressure will stabilize at a higher value due to all heaters on and spray valves fully open.

D. not trip but pressure will stabilize at a lower value due to all heaters on and spray valves fully open.

A. Correct

B. Incorrect, high pressure trip

C. Incorrect, spray valves will close and not open

D. Incorrect, spray valves will close and not open

Question level: 2
Question Source: New
Exam: RO/SRO
KA: 027.AA2.10
Importance: 3.6
References: Pressurizer Pressure and Level control text 0711206, LP 0702206-11C

TABLE 3 - Selected Pressure Channel Failures

SELECTED PRESSURE CHANNEL FAILS HIGH

AUTOMATIC RESPONSE TO FAILURE

- High/Low Pressure Alarm (2340 psia)
- Proportional Heaters Minimum (+25 psi) [All Heaters Off]
- Spray Valve(s) Full Open (+100[75] psi)
- Backup Heaters in AUTO Off (2220 psia) [All Heaters Off]

PLANT RESPONSE TO FAILURE

- Actual Pressure Decreases
- High/Low Pressure Alarm on Operable Channel (2100 psia)
- TM/LP Trip

OPERATOR ACTION

- On Unit 1 Select Operable Channel on HS-1100-2
- Take Manual Control of HIC-1110

SELECTED PRESSURE CHANNEL FAILS LOW

AUTOMATIC RESPONSE TO FAILURE

- Proportional Heaters on Maximum (-25 psi)
- Backup Heaters in AUTO On (2200 psia)
- High/Low Pressure Alarm (2100 psia)
- Spray Valve(s) Close

PLANT RESPONSE TO FAILURE

- Actual PZR Pressure Increases
- High/Low Pressure Alarm Operable Channel (2340 psia)
- High Pressurizer Pressure Reactor Trip

OPERATOR ACTION

- Select Operable Channel on HS-1100-2
- Take Manual Control

REVISION:	PROCEDURE TITLE:	PANEL:
1	ANNUNCIATOR RESPONSE PROCEDURE	H
PROCEDURE NO:		WINDOW:
1-ARP-01-H14	ST. LUCIE UNIT 1	14

ANNUNCIATOR PANEL H

1	2	3	4	5	6
7	8	9	10	11	12
13	**14**	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

PZR CHANNEL Y
PRESS
HIGH/LOW

H-14

DEVICE:	LOCATION:	SETPOINT:
PA-1100Y/98	RAB/RTGB-103	2340 psia rising (HIGH) 2100 psia lowering (LOW)
SS/9	Isolation Panel 1B	Isolate

ALARM CONFIRMATION:
1. PIC-1100Y, Pressurizer Pressure
2. PR-1100, Pressurizer Pressure

OPERATOR ACTIONS:
1. EVALUATE affected channel indication against redundant channels to determine if alarm is valid.
2. DISPATCH an operator to 1B Isolation Panel to check the position of Pressurizer Pressure & Level PI-1100Y, LI-1110Y-1 NORMAL/ISOLATE switch.

NOTE
Pressurizer pressure of 2225 psia is a DNB Technical Specification limit.

A. **If Pressurizer Pressure & Level PI-1100Y, LI-1110Y-1 NORMAL/ISOLATE switch is in NORMAL, Then GO TO ONOP 1-0120035, Pressurizer Pressure and Level.**
B. If of Pressurizer Pressure & Level PI-1100Y, LI-1110Y-1 NORMAL/ISOLATE switch is in ISOLATE, Then PERFORM the following:
   1. DETERMINE the reason the isolate switch is NOT in normal alignment.
   2. When plant conditions allow, Then PLACE Pressurizer Pressure & Level PI-1100Y, LI-1110Y-1 NORMAL/ISOLATE switch is in NORMAL.

CAUSES: Alarm may be caused by at least **ONE** of the following:
1. Conditions exist which are beyond the capability of the Pressurizer pressure control system:
   - LOCA
   - Excessive Steam Demand
   - Large load change
2. Malfunction of a component in the Pressurizer pressure control system:
   - Safety
   - PORV
   - Spray valve
   - Pressure channel
3. Pressurizer Pressure & Level PI-1100Y, LI-1110Y-1 NORMAL/ISOLATE switch in ISOLATE.

REFERENCES:
1. CWD 8770-B-327 sheet 98
2. P&ID 8770-G-078 sheet 110A
3. Technical Specification Table 3.2-2
4. TEDB

/R1

Question: 46

Given the following plant conditions:

- Plant tripped 30 minutes ago
- Pressurizer Safety Valve is lifting
- Pressurizer pressure is 1900 psia
- RCS Thot is 545ºF
- Quench Tank rupture disk has ruptured
- Containment Pressure is 1 psig

What is the expected temperature in the tailpipe downstream of the affected Pressurizer Safety Valve?

A. 215ºF

B. 300ºF

C. 545ºF

D. 628ºF

A. **Correct**

B. The Saturation temperature that equates to the pressure that the Quench Tank rupture disk ruptures

C. Same as RCS temperature

D. Saturation temperature for 1900 psia

Question Level: 2
Question Source: Bank
Exam: RO/SRO
K/A: 008.AK1.01
Importance: 3.7
References: Mollier diagram

Question: 47

Unit 2 is at 49% power with the following ADV configuration:

2A S/G	2B S/G
One ADV is in Manual One ADV is in Auto	Both ADV's in Manual

Which of the following states the acceptability of this ADV configuration?

This configuration is:

A. acceptable as long as no more than one of four ADV's is in Auto.

B. acceptable as long as power is ~~kept below~~ Less than 50%.

C. in violation of Tech. Specs. due to one ADV on the 2A S/G in Auto.

D. in violation of Tech. Specs. due to both ADV's on the 2B S/G in Manual.

A. Incorrect, no more than one ADV per S/G allowed to be in auto (all must be in manual at >15% power) only applicable on Unit 2.

B. Incorrect, this configuration is acceptable <15% power

C. Correct

D. Incorrect, 2B S/G configuration acceptable

Question level: 2
Question Source: New
Exam: SRO Only
KA: G2.2.3
Importance: 3.3
References: Tech. Specs. 3.7.1.7, 10CFR.55.43.b2

ATMOSPHERIC DUMP VALVES

LIMITING CONDITION FOR OPERATION

3.7.1.7 The atmospheric dump and associated block valves shall be OPERABLE with:

a. All atmospheric dump valves in manual control above 15% of RATED THERMAL POWER, and

b. No more than one atmospheric dump valve per steam generator in automatic control below 15% of RATED THERMAL POWER.

APPLICABILITY: MODE 1.

ACTION:

a. With less than one atmospheric dump and associated block valve per steam generator OPERABLE, restore the required atmospheric dump and associated block valve to OPERABLE status within 72 hours, or be in at least HOT STANDBY within the next 6 hours.

b. With more than the permissible number of atmospheric dump valves in automatic control, return the atmospheric dump valves to manual control within 1 hour, or be in at least HOT STANDBY within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.7.1.7 Each atmospheric dump valve shall be verified to be in the manual operation mode at least once per 24 hours during operation at $\geq$ 15% of RATED THERMAL POWER.

Question 48

During steady state operation at 100% power, the Board RCO notices Charging flow is 10 gpm greater than Letdown flow. Pressurizer level is constant and Tave is constant. What procedure, if any should be entered for this condition?

A. ONP-02.03, "Charging and Letdown"

B. ONP-0120035, "Pressurizer Pressure and Level"

C. ONP-0120031, "Excessive Reactor Coolant System Leakage"

D. No action is necessary, the difference is expected due to RCP seal leakoff flow

A. Incorrect, Charging and Letdown are responding correctly for the condition

B Incorrect, Pressurizer Pressure and Level Control is responding correctly

C. **Correct**

D. Incorrect, Normal Charging And Letdown mismatch due to RCP seal leakoff is 4 gpm

Question Level: 1
Question Source: Bank
Exam: SRO Only
K/A: CE/A16.AKG.2.4.4
Importance: 4.3
References: 0702812-12, ONOP-1-0120031 Excessive Reactor Coolant System Leakage., 10CFR.55.43.b5

3.0 REFERENCES: (continued)

3.9 St. Lucie Unit 1 UFSAR Section 9.1.4.2.14.

3.10 ONP 1-0120036, "Pressurizer Relief/Safety Valve."

3.11 ONOP 1-0310031, "CCW - Excessive Activity."

3.12 ONOP 1-0440030, "Shutdown Cooling Off-Normal."

3.13 Drawings entitled Unit 1 - Principal Locations of Potential Boric Acid Leakage Locations Inside Containment, maintained in the control room.

3.14 HPES Report Number 94-12.

3.15 Low Mode Off-Normal Procedures.

3.16 10 CFR 50.2

4.0 RECORDS REQUIRED:

The completed (signed off) portion of this procedure, including applicable Appendixes (with sign offs), or Data Sheets shall be maintained in the plant files in accordance with QI-17-PSL-1, "Quality Assurance Records."

5.0 ENTRY CONDITIONS:

5.1 Charging flow versus letdown plus RCP controlled bleedoff flow mismatch.

5.2 Reactor Coolant System Water Inventory Balance (OP 1-0010125A, Data Sheet 1) indicates RCS leakage greater than or equal to 1 gpm.

Question: 49

Unit 1 is at 100% power preparing to start a second charging pump. Which of the following is performed prior to starting the charging pump?

Notify:

A. Chemistry department to monitor letdown ion exchanger efficiency.

B. Chemistry department to perform RCS boron sample.

C. HP survey due to the possibility of increasing radiation levels in the letdown area.

D. HP survey due to the possibility of contamination of Charging pump room from potential pump leakage.

A. Incorrect, although Chemistry monitors ion exchanger efficiency, not necessarily for each Charging pump start.

B. Incorrect, although Chemistry performs boron samples, not after each Charging pump start.

C. Correct

D. Incorrect, HP would only be called for a know Charging pump leak.

Question level: 1
Question Source: New
Exam: RO/SRO
KA: G2.3.10
Importance: 3.3
References: 2-NOP-02.02 Charging and Letdown

4.10 The charging pump suction stabilizer impact buttons may separate from the bladder resulting in a metallic rattling noise at the stabilizer. This condition should be identified and scheduled for repair as soon as reasonable. Use of the affected pump should be minimized in order to prevent accelerated wear of the bladder and cage.

4.11 For Charging Pump packing leakage, CONTINUE to run the affected charging pump as the lead pump. If any of the following conditions occur, Then INITIATE a NPWO for pump repack / repair:

Charging Pump Primary leakage raises to greater than or equal to 25 inches per hour,

OR

Charging Pump secondary leakage requires makeup to the seal tank two or more times in a single 8 hour shift,

OR

Seal Tank trouble alarm (M-30) is received two or more times in a single 8 hour shift.

4.12 If the seal tank level raises to or above a leakage rate of 30 inches per hour, Then STOP the affected Charging Pump and LEAVE it available for use until repairs can be made on the pump.

4.13 ¶9 During normal operation, CVCS Purification Filter media change out and/or filter bypass is recommended when the filter differential pressure exceeds 10 psid at 40 gpm, 20 psid at 84 gpm, or 30 psid at 128 pm. This criteria is to prevent lifting of system relief valves during conditions of maximum letdown flow.

4.14 ¶10 Purification filter differential pressure may be allowed to increase to 36 psid during SDC Purification operation.

4.15 ¶9 When the Purification System is in service, Purification Ion Exchanger 2A and 2B and Deborating Ion Exchangers are to be placed in bypass if a downstream CVCS Purification Filter is NOT available to preclude transport of resin fines.

4.16 Placing a second or third charging pump in service will increase Letdown flow which may cause the general area dose rates in the vicinity of the Letdown line in the 19.5' Pipe Penetration room or 19.5' Letdown Cubicle room to exceed 1000 mr/hr (Locked High Radiation Area limit) due to reduced transport time of short lived radioactive isotopes.

6.5 Normal Plant Operation (continued)

NOTE

Steps 6.5.3.A and 6.5.3.B below satisfy the logic to allow the 2C Charging Pump to start on SIAS and Steps 6.5.3.D and 6.5.3.E align the backup Charging Pump to start on low pressurizer level.

3. Operation of the 2C Charging Pump (with the 2A or 2B Charging Pump out of service) should be as follows:

A. ALIGN the 480 LC 2AB to the side with the inoperable Charging Pump in accordance with 2-NOP-52.02, Transfer of 2AB Buses and Components.

B. PLACE the inoperable Charging Pump Control switch to STOP.

C. PLACE the running Charging Pump control switch in START.

D. PLACE the backup Charging Pump control switch in AUTO.

E. PLACE the Chrg Pump Sel Running-B/U PP switch in accordance with Table 1, Charging Pump Combinations vs. Selector Switch Position.

4. <u>If</u> Charging Pump (s) are to be started, <u>Then</u> PERFORM the following:

A. ENSURE that each Charging pump that is desired to be started is ready to operate by local inspection by the SNPO.

B. <u>If</u> the associated Charging Pump Recirc Valve is operable, <u>Then</u> ENSURE that it is OPEN prior to starting the Charging Pump.

NOTE

Placing a second or third charging pump in service will increase letdown flow which may cause the general area dose rates in the vicinity of the letdown line in the 19.5' Pipe Penetration room or 19.5' Letdown Cubicle room to exceed 1000 mr/hr (Locked High Radiation Area limit) due to reduced transport time of short lived radioactive isotopes.

C. NOTIFY Health Physics of the pending charging pump alignment.

D. START the Charging pump.

Question: 50

Which one of the following defines the difference between Mode 1 and Mode 2 of operation?

A. Keff

B. Tave

C. Reactor Power

D. Shutdown Margin

A. Incorrect, Keff the same for both modes

B. Incorrect, Tave the same for both modes

C. Correct

D. Incorrect, although SDM requirement varies with temperature.

Question level: 1
Question Source: Bank
Exam: RO/SRO
KA: G2.1.22
Importance: 3.3
References: T.S. Table 1.2

TABLE 1.2

OPERATIONAL MODES

MODE	REACTIVITY CONDITION, K_{eff}	% RATED THERMAL POWER*	AVERAGE COOLANT TEMPERATURE
1. POWER OPERATION	$\geq$ 0.99	> 5%	$\geq$ 325°F
2. STARTUP	$\geq$ 0.99	$\leq$ 5%	$\geq$ 325°F
3. HOT STANDBY	< 0.99	0	$\geq$ 325°F
4. HOT SHUTDOWN	< 0.99	0	325°F > T_{avg} > 200°F
5. COLD SHUTDOWN	< 0.99	0	$\leq$ 200°F
6. REFUELING**	$\leq$ 0.95	0	$\leq$ 140°F

* Excluding decay heat.

** Fuel in the reactor vessel with the vessel head closure bolts less than fully tensioned or with the head removed.

St. Lucie NRC SRO

Written exam

Question 51 - 100

St. Lucie Plant
April 2002 NRC Exam

Q Num	K/A	Source	Exam	Level	Key
51	G2.2.22	New	SRO Only	1	D
52	024.AK1.02	New	RO/SRO	1	B
53	CE/A11.AK1.2	New	SRO Only	2	B
54	002.A4.03	New	RO/SRO	2	A
55	011.EK2.02	New	RO/SRO	1	A
56	055.EK1.02	New	RO/SRO	2	C
57	040.EA2.1	New	RO/SRO	2	D
58	055.EA1.06	New	RO/SRO	2	C
59	040.EA1.3	New	SRO Only	2	C
60	CE/EO9.EA1.3	Bank	SRO Only	1	A
61	038.EK2.02	New	RO/SRO	1	D
62	007.EK1.2	New	RO/SRO	2	A
63	056.AK3.02	New	RO/SRO	1	B
64	G2.1.32	New	SRO Only	2	A
65	G2.4.41	New	SRO Only	2	B
66	G2.4.40	New	SRO Only	1	A
67	G2.3.11	Bank	SRO Only	1	B
68	G2.2.12	New	RO/SRO	1	C
69	G2.3.9	New	SRO Only	1	D
70	G2.3.6	New	SRO Only	1	A
71	G2.4.49	New	RO/SRO	1	C
72	G2.4.11	New	SRO Only	2	C
73	G2.4.7	New	SRO Only	1	D
74	G2.2.3	New	SRO Only	2	B
75	028.K5.03	Bank	RO/SRO	1	B
76	058.AA1.01	New	RO/SRO	2	C
77	064.K1.03	New	RO/SRO	1	D
78	G2.1.33	New	SRO Only	1	A
79	069.AA2.01	New	SRO Only	2	B
80	074.EA1.05	New	RO/SRO	1	D
81	062.AK3.02	New	RO/SRO	2	D
82	062.K3.02	New	RO/SRO	2	C
83	022.A3.01	Bank	RO/SRO	1	D
84	032.G2.1.27	Bank	RO/SRO	1	B
85	067.G2.4.26	Bank	RO/SRO	1	B
86	022.AA1.01	New	RO/SRO	2	B
87	060.AA2.05	New	RO/SRO	2	A
88	025.AK2.03	New	RO/SRO	2	A
89	061.AK302	New	RO/SRO	2	B
90	017.A2.02	New	SRO Only	2	A
91	068.K1.01	New	RO/SRO	2	B
92	029.EK2.06	New	RO/SRO	2	C
93	073.K5.01	New	RO/SRO	2	D
94	015.A4.03	New	RO/SRO	2	D
95	001.AK.1.07	New	RO/SRO	2	B
96	014.A.1.03	New	RO/SRO	2	A
97	005.G2.2.22	New	SRO Only	1	C
98	035.A4.05	Bank	RO/SRO	1	D
99	022.K3.02	Bank	RO/SRO	1	D
100	027.G2.4.21	New	SRO Only	1	B

Question: 51

Which of the following is referenced in the Technical Specifications to prevent exceeding a Safety Limit?

A. Containment vacuum breakers.

B. Power operated relief valves.

C. Diverse scram system.

D. Main Steam Safety Valves.

A. Incorrect, Containment parameters not Safety Limit

B. Incorrect, PORV's actuate prior to 2750 psia Safety limit. PORV's not T.S. related

C. Incorrect, Diverse scram system designed to actuate at 2450 psia

D. Correct, MSSV's limit Tc to <580 °F Safety limit value

Question level: 1
Question Source: New
Exam: SRO Only
KA: G2.2.22
Importance: 4.1
References: Tech Specs 2.1.2, SRO LP 0902723-4, 10CFR.55.43.b1

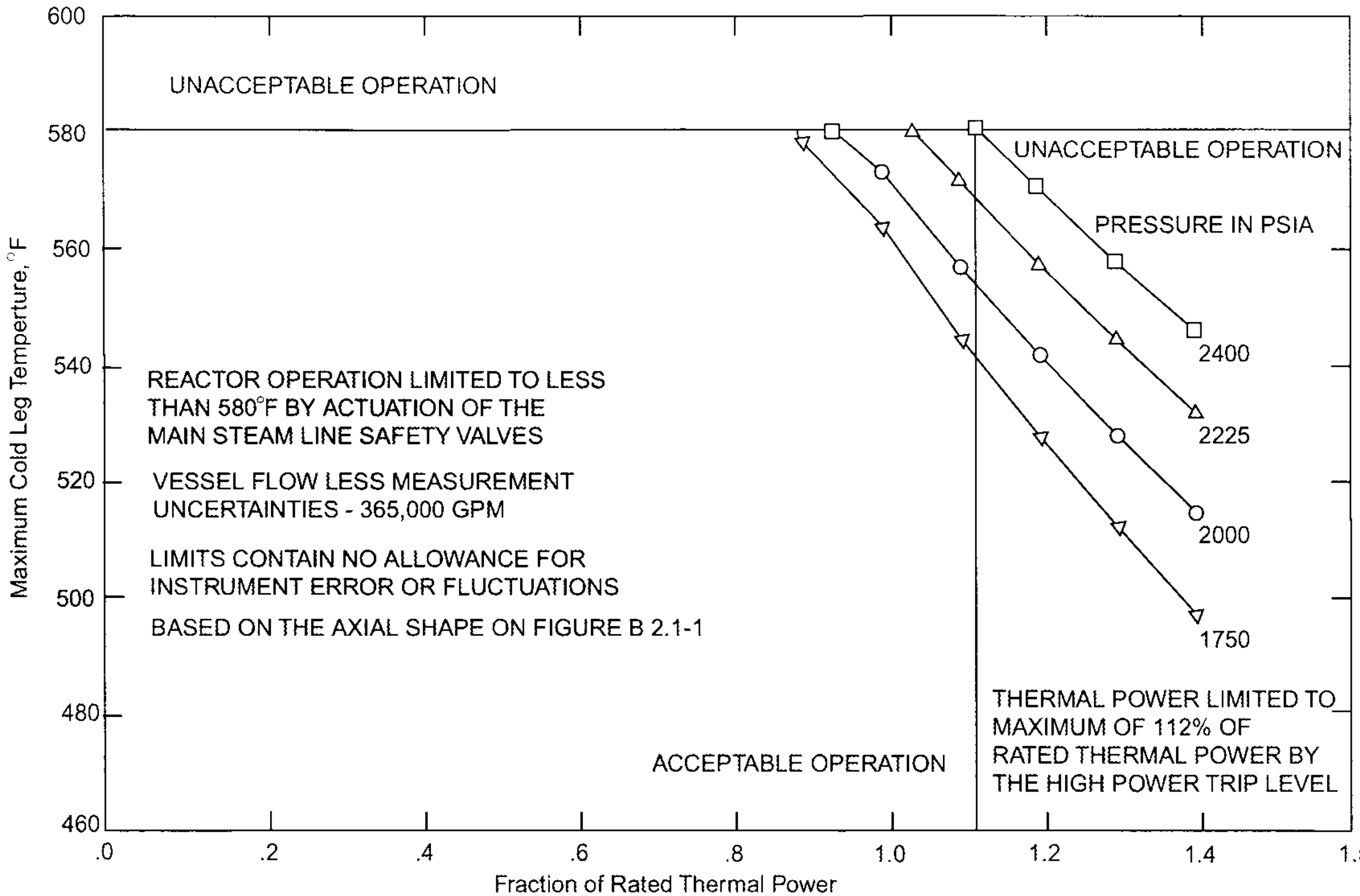


FIGURE 2.1-1: REACTOR CORE THERMAL MARGIN SAFETY LIMIT – FOUR REACTOR COOLANT PUMPS OPERATING

2.0 SAFETY LIMITS AND LIMITING SAFETY SYSTEM SETTINGS

2.1 SAFETY LIMITS

REACTOR CORE

2.1.1 The combination of THERMAL POWER, pressurizer pressure, and maximum cold leg coolant temperature shall not exceed the limits shown on Figure 2.1-1.

APPLICABILITY: MODES 1 and 2.

ACTION:

When the point defined by the combination of maximum cold leg temperature and THERMAL POWER has exceeded the appropriate pressurizer pressure line, be in HOT STANDBY within 1 hour.

REACTOR COOLANT SYSTEM PRESSURE

2.1.2 The Reactor Coolant System pressure shall not exceed 2750 psia.

APPLICABILITY: MODES 1, 2, 3, 4 and 5.

ACTION:

MODES 1 and 2

Whenever the Reactor Coolant System pressure has exceeded 2750 psia, be in HOT STANDBY with the Reactor Coolant System pressure within its limit within 1 hour.

MODES 3, 4 and 5

Whenever the Reactor Coolant System pressure has exceeded 2750 psia, reduce the Reactor Coolant System pressure to within its limit within 5 minutes.

Question: 52

The reactor is critical at 10% power when an inadvertent Emergency Boration occurs. RCS boron concentration is raised by 10 ppm before it is stopped.

Which of the following describes the effect that this event will have on Reactor Power?

A. It will decrease the most at BOL.

B. It will decrease the most at EOL.

C. It will decrease the same at EOL as at BOL.

D. It will not be significantly affected.

A. Incorrect, boron worth increases as core life increases.

B. **Correct**

C. Incorrect, boron worth increases as core life increases.

D. Incorrect, boron worth increases as core life increases.

Question level: 1
Question source: New
Exam: RO/SRO
K/A: 000024.AK1.02
Importance: 3.9
References: LP 0702105-7, 0711100 Plant Specific Reactor Theory

Figure 5-9 shows the differential boron worth vs. burnup for hot zero power and hot full power. The differential worth increases over core life for the reasons given earlier (competition for neutrons decreases, shadowing by other boron atoms decreases).

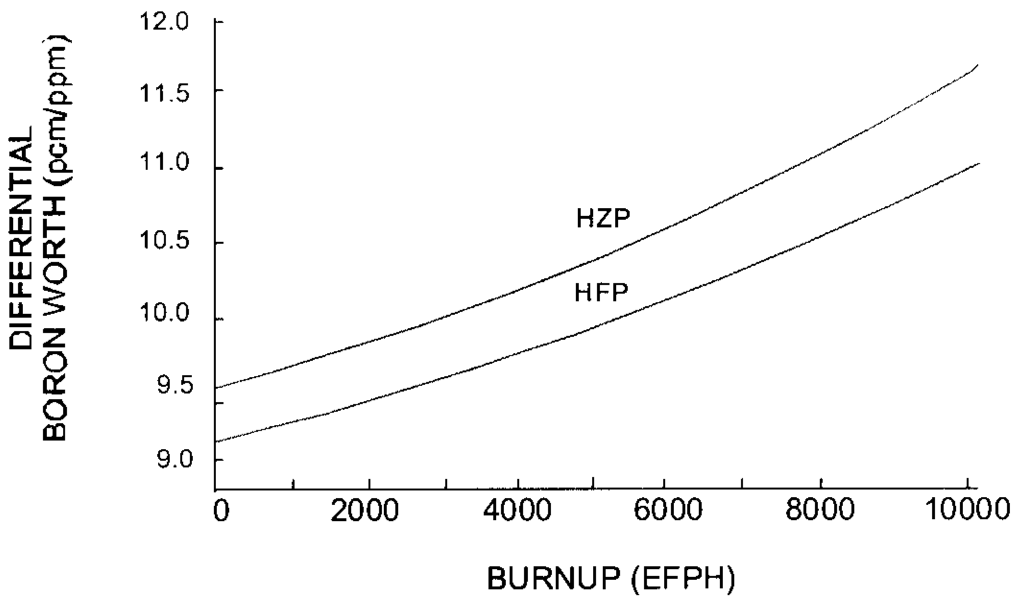


FIGURE 5-9

Differential Boron Worth vs. Burnup Critical PPM Conditions (for 2700 MWt Operation)

{PRIVATE }3.3 <u>Inverse Boron Worth</u>{tc \l 2 "3.3 <u>Inverse Boron Worth</u>"}

Although not used at PSL the student should be familiar with the term "**Inverse Boron Worth**." It is the reciprocal of the "Boron Worth" and has units of PPM/PCM or PPM/%$\Delta\rho$. It is the number of PPM boron it would take to equal one PCM or one %$\Delta\rho$ (depending on units used).

Question 53

Unit 1 has tripped from 100% power due to an Excess Steam Demand on the 1A Steam Generator. 1-EOP-05 'Excess Steam Demand' has been entered with the following conditions:

- Subcooling is greater than minimum
- SIAS has actuated and ECCS flow is meeting figure 2
- HPSI throttling criteria is NOT met
- RCS temperature is lowering
- Pressurizer pressure is lowering
- Pressurizer level is lowering

Which of the following states the required Operator actions?

A. Depressurize the RCS to maximize ECCS flow and regain Pressurizer level.

B. Stabilize RCS temperature when heat removal from the 1A Steam Generator subsides.

C. Stop all feedwater to the 1B Stem Generator to prevent contributing to the cooldown.

D. Manually secure all feedwater to the 1A Steam Generator prior to automatic feedwater isolation.

A. Incorrect, this would contribute to a possible overpressure condition if the RCS were to heat up after the 1A S/G blows dry.

B. Correct (to prevent a possible PTS event)

C. Incorrect, total feedwater isolation is only appropriate when S/G level reaches appropriate level.

D. Incorrect, not permitted by procedure.

Question level: 2
Question source: New
Exam: SRO only
K/A: CE/A11. AK1.2
Importance: 3.3
References: 1-EOP-05 Excess Steam Demand, ESD Lesson Plan 0702826-09, SRO Lesson plan CEN 152 and EOP overview 0902704-1

4.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
☐ 13 **Verify Correct S/G was Isolated** VERIFY the **MOST** affected S/G is isolated by observing **ALL** of the following: • S/G pressures • S/G levels • RCS cold leg temperatures	**13.1** If the wrong S/G was isolated, Then RESTORE feeding and steaming capability to the isolated S/G. **13.2** When RCS heat removal is re-established on the least affected S/G, Then ISOLATE the most affected S/G. **REFER TO** Appendix R, Steam Generator Isolation.
[*] 14. **Stabilize RCS Temperature via ADVs** STABILIZE RCS temperature by controlled steaming of the **LEAST** affected S/G using the ADV.	**14.1** If Instrument Air is NOT available, Then OPERATE the ADV locally. **REFER TO** Appendix U, Local Operation of Unit 1 Atmospheric Dump Valves. **14.2** Steam using 1C AFW Pump and alternate steaming flow paths. **REFER TO** Table 12, Alternate S/G Heat Removal Paths.
[*] 15. **Restore Instrument Air** If a LOOP has occurred, Then PERFORM **BOTH** of the following: **A.** ENSURE 1AB 480V Load Center is aligned to an energized bus. **B.** DISPATCH an operator to restore Instrument Air. **REFER TO** Appendix H, Operation of the 1A and 1B Instrument Air Compressors.	

APPENDIX E
EOP OPERATING PHILOSOPHY
(Page 11 of 15)

Emergency Operating Procedure Implementation: (continued)

1. (continued)

J. Manual Override of MFIV Following AFAS Actuation (Unit 2):

1. Do NOT override and open MFIV from within EOP-1. This overrides a safeguard signal prior to diagnosing the event.

K. CCW to RCPs:

1. SPTAs take precedence over restoring CCW.

2. Reset CCW to RCPs when an RCO is available AND the attention required to reset does NOT adversely affect the maintenance or recovery of other safety functions. /R135

L. Excess Steam Demand event guidance while implementing EOP-05, Excess Steam Demand, and EOP-15, Functional Recovery.

1. Regardless of the rate of RCS pressure and inventory reduction during an Excess Steam Demand, RCS pressure SHALL NOT be intentionally lowered to enhance inventory addition into the RCS unless the RCS Inventory Control Safety Function can NOT be maintained otherwise.

2. If a Main Steam Safety Valve is stuck open, or was stuck open, causing entry into an EOP, Then the affected Steam Generator shall be considered faulted until the Safety Valve is gagged, even if the Safety Valve reseats. The Steam Generator shall NOT be unisolated until the Safety Valve is gagged.

3. During the implementation of EOP-05, Excess Steam Demand, When the Excess Steam Demand has been terminated by whatever means, Then the RCS pressure shall be stabilized and maintained in a stable condition, in accordance with the EOP. RCS pressure SHALL NOT be intentionally lowered to enhance inventory addition into the RCS unless the RCS Inventory Control Safety Function can NOT be maintained otherwise.

4.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
28. (continued)	
C. If a bubble forms in the Reactor Vessel Upper Head region, Then CONTROL Charging, Letdown and HPSI to maintain Reactor Vessel level above the top of the Hot Leg nozzles (sensors 4 through 8 covered).	
D. CONTINUE efforts to establish a bubble in the Pressurizer.	
[*] **29. Maintain Pzr Level 30 to 68%**	
If HPSI throttle criteria are met, Then MAINTAIN Pressurizer level between 30 and 68% using **ANY** of the following:	
A. CHARGE via normal path and OPERATE Letdown.	**A.1** If the Charging Header is NOT available, Then CONSIDER charging to the HPSI header. **REFER TO** Appendix T, Alternate Charging Flow Path to RCS Through Aux. HPSI Header.
B. THROTTLE HPSI flow **AS NECESSARY.**	

ATTACHMENT 1
SAFETY FUNCTION STATUS CHECK SHEET
(Page 4 of 10)

3. RCS INVENTORY CONTROL

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √

B. IF HPSI Throttling Criteria NOT Met:

Safety Function	Acceptance Criteria	Check √
Charging Pumps	**ALL** available running	☐☐☐☐☐☐
		AND
Safety Injection Flow	In accordance with Figure 2, Safety Injection Flow vs. RCS Pressure	☐☐☐☐☐☐
		AND
Reactor Vessel Level	Core covered (sensors 7 and 8 covered)	☐☐☐☐☐☐
		OR
Rep CET temperature	NOT superheated	☐☐☐☐☐☐

END OF SAFETY FUNCTION 3

Question 54

The following conditions exist:

- A LOCA inside containment is occurring on Unit 1
- RCPs were shut off 20 minutes ago
- Containment temperature is 215ºF
- Pressurizer pressure is 1000PSIA
- RCS Thot is 515ºF
- RCS Tcold is 510ºF
- CET is 520ºF

Which of the following statements indicates the status of subcooling?

Subcooling indicates:

A. 25ºF CET subcooled but subcooling is inadequate.

B. 40ºF RCS subcooled but subcooling is inadequate.

C. 25ºF CET subcooled. Subcooling is adequate.

D. 40ºF RCS subcooled. Subcooling is adequate.

References required

A. Correct

B. Incorrect, Actually 30ºF RCS subcooling.

C. Incorrect, Using figure 1B subcooling is inadequate.

D. Incorrect, Actually 30ºF RCS subcooling.. Using figure 1B subcooling is inadequate.

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 002.A4.03
Importance: SRO 4.4
References: 1-EOP-3 LOCA, 1-EOP-99 Appendix's Figures and Tables

FIGURE 1A
RCS PRESSURE TEMPERATURE
(Page 1 of 1)

(Containment Temperature Less Than or Equal to 200°F)

CAUTION
The RCP NPSH curve assumes one pump is operating in each loop. RCP instrumentation should be monitored for seal and pump performance in accordance with 1-NOP-01.02, Reactor Coolant Pump Operation, as the NPSH curve is approached.

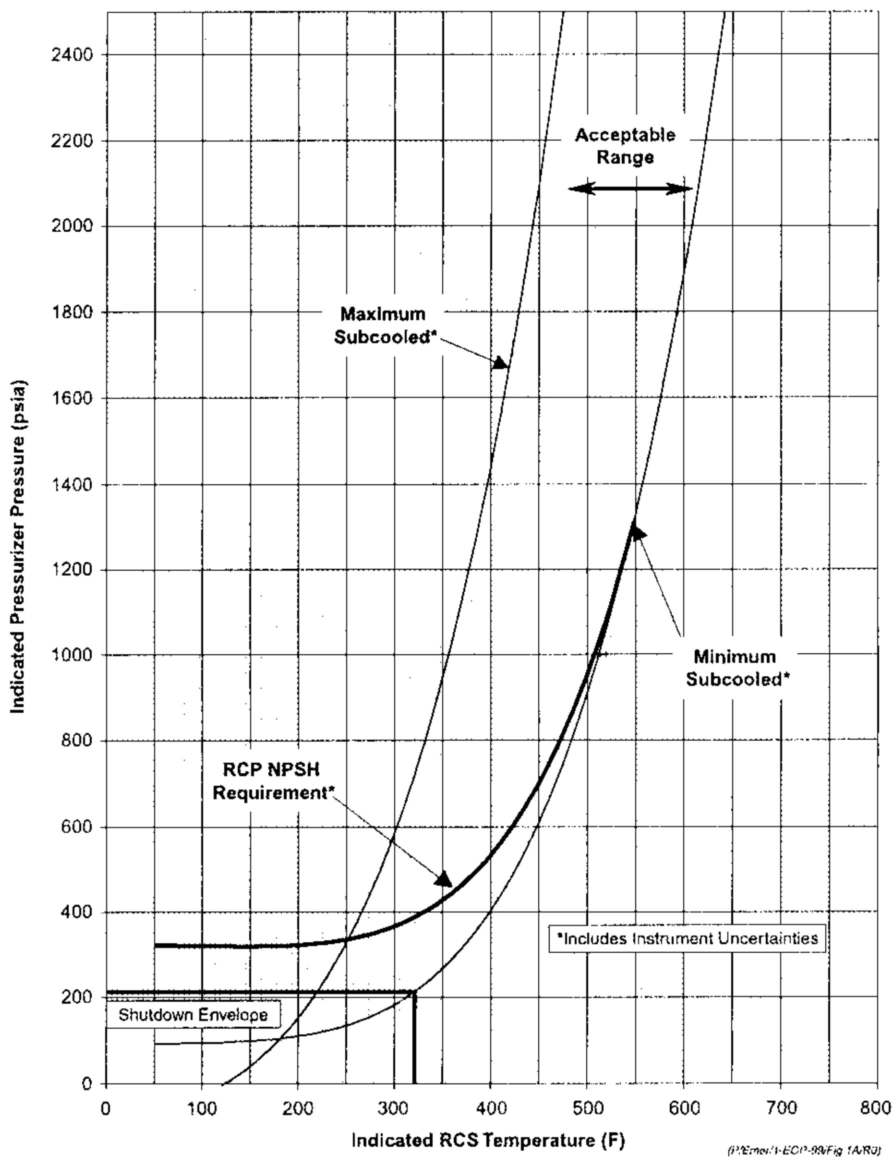
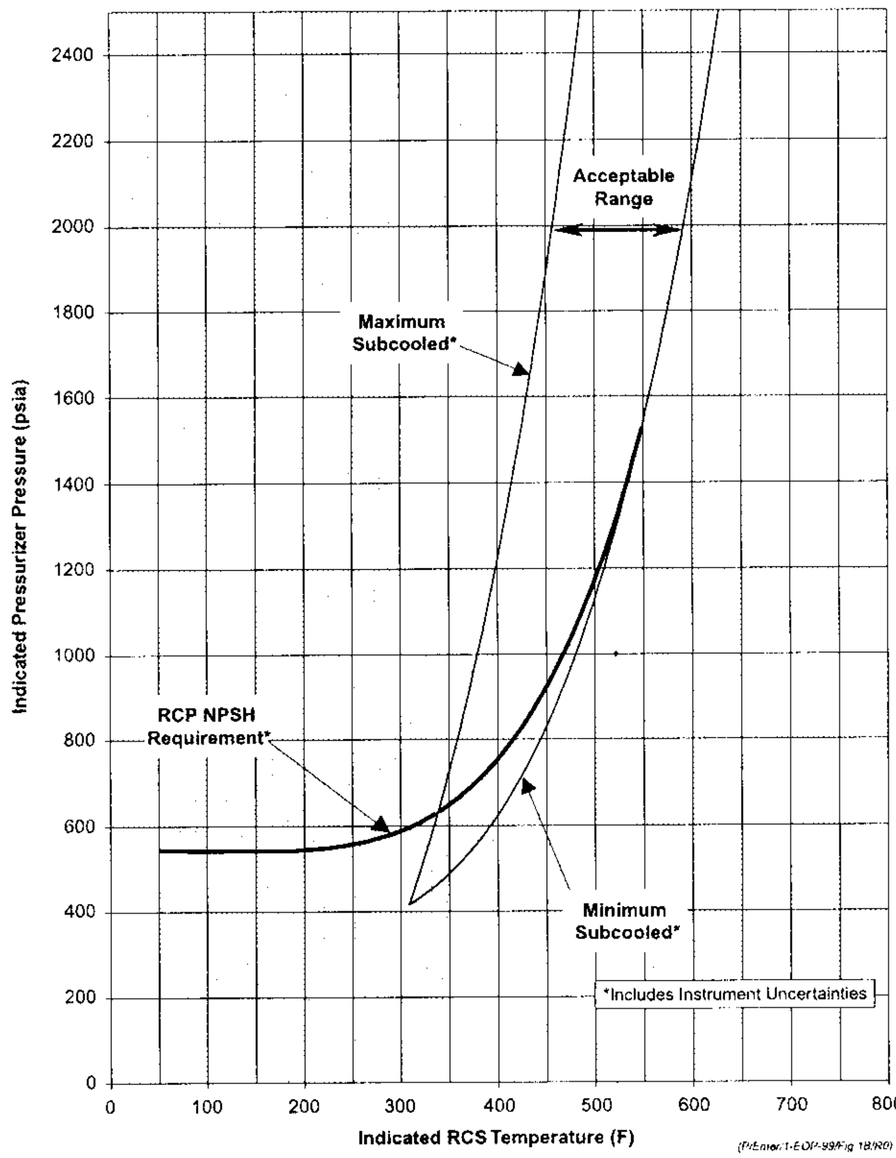


FIGURE 1B
RCS PRESSURE TEMPERATURE
(Page 1 of 1)

(Containment Temperature Greater Than or Equal to 200°F)

> **CAUTION**
> The RCP NPSH curve assumes one pump is operating in each loop. RCP instrumentation should be monitored for seal and pump performance in accordance with 1-NOP-01.02, Reactor Coolant Pump Operation, as the NPSH curve is approached.



4.0 OPERATOR ACTIONS

INSTRUCTIONS | **CONTINGENCY ACTIONS**

CAUTION

A harsh containment condition exists if containment temperature is greater than 200°F. Figure 1A should be used for determination of saturation margin when indicated containment temperature is **less** than or **equal** to 200°F. Figure 1B should be used when indicated containment temperature is **greater** than 200°F. Figure 1A should also be used if containment temperature had exceeded 200°F during event progression but was lowered to 200°F or less by containment cooling systems.

NOTE

- Instruments should be channel checked when one or more confirmatory indications are available. Reg Guide 1.97 designated instruments should be used for diagnosis of events and confirmation of safety functions.
- Steps designated with an * may be performed non-sequentially or are to be performed continuously.

[*] 1. **Confirm Diagnosis**

PERFORM **BOTH** of the following to confirm the diagnosis of a LOCA:

INSTRUCTIONS	CONTINGENCY ACTIONS
A. VERIFY Safety Function Status Check acceptance criteria are satisfied every 15 minutes.	**A.1 REDIAGNOSE the event using 1-EOP-01 Chart 1, Diagnostic Flow Chart, <u>and</u> GO TO ONE of the following:** • **The appropriate Optimal Recovery Procedure** • **1-EOP-15, Functional Recovery**
B. SAMPLE S/Gs. **REFER TO** Appendix A, Sampling Steam Generators.	**B.1** MONITOR other indications of a SGTR.

4.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] **30. Verify Single Phase Natural Circulation**	**30.1** ENSURE proper control of S/G feeding and steaming.

If **NO** RCPs are operating,
Then VERIFY natural circulation flow in at least **ONE** loop by **ALL** of the following:

- Loop ΔT (T_{HOT} minus T_{COLD}) less than 50°F
- Hot leg temperature constant or lowering
- Cold leg temperature constant or lowering
- RCS subcooling is greater than or equal to minimum subcooling based on Rep CET temperature
- NO abnormal difference (greater than 20°F) between T_{HOT} and Rep CET temperature

Question 55

The following condition exist on Unit 2 as the result of a LOCA:

- Pressurizer Pressure is 200 psia and lowering.

Which of the following identifies the short and long term cooling strategy?

Short term, RCS cooling will be:

A. LPSI flow and SIT discharge with long term cooling by hot and cold leg injection

B. ~~HPSI~~ LPSI flow and S/G steaming and feeding with long term cooling by SDC.

C. Break flow and HPSI SIT dumping with long term cooling by SDC.

D. S/G steaming and feeding with long term cooling by hot and cold leg injection.

A. Correct

B. Incorrect, LPSI flow and SITs needed for large break LOCAs, SGs are uncoupled, Long term cooling is hot and cold leg injection

C. Incorrect, Long term cooling is hot and cold leg injection

D. Incorrrect, LPSI flow and SITs needed for large break LOCAs, SGs are uncoupled, Long term cooling is hot and cold leg injection

Question level: 1
Question source: New
Exam: RO/SRO
K/A: 000011.EK2.02
Importance: SRO 2.7
References: 0802008-09, 0711824

3. Increasing containment pressure, temperature, sump level, and **radiation**.

4. Increasing (or high) quench tank level, temperature or pressure (NOTE: The pressure may be low if the rupture disk is blown).

5. Occurrence of automatic safety injection actuation.

6. Actuation of RAB sump level alarms.

{PRIVATE }1.3 Types of LOCAs{tc \l 2 "1.3 Types of LOCAs"}

There are two categories of LOCAs, small break LOCAs and large break LOCAs. Each category can be distinguished by its characteristics and has different recovery requirements. However, the operator does not need to diagnose the size of the break because the EOP successfully combats any size LOCA. Small and large break LOCAs differ in their effect on the post-LOCA heat removal process. For small breaks, heat removal via the energy removed by the break flow is not sufficient to provide adequate cooling. Therefore, the steam generators are needed for heat removal. For a large break, the only heat removal mechanism needed is the break flow combined with core boiloff.

The depressurization and effects of inventory loss during small break LOCA events usually extend over a relatively long period (hours) as opposed to only minutes for the large break LOCAs. For a small break LOCA there is time for operator actions to mitigate the effects, whereas for a large break LOCA, the automatic actions of the engineered safety features must be relied upon to act and replenish the core with cooling water.

Another distinction between small and large break LOCAs is the ability to reach and maintain Shutdown Cooling System (SDC) entry conditions. For a large break LOCA, the RCS pressure will normally decrease to well below that required for SDC, thus the plant may be maintained on simultaneous hot/cold leg injection. For a small break LOCA, the RCS pressure normally stabilizes above that required for SDC, thus the plant can be cooled down, depressurized and placed on SDC.

{PRIVATE }1.3.1 Small Break LOCA{tc \l 3 "1.3.1 Small Break LOCA"}

Following a rupture in the RCS the pressurizer pressure and level decrease due to the loss of inventory through the break. However, for breaks at the top of the pressurizer, the pressurizer level may increase or exhibit erratic behavior. The rate of pressure decrease depends primarily upon the size of the break. A reactor trip and SIAS will occur when the pressurizer pressure falls below the low pressure setpoint.

An illustration of the variation of pressure decrease for different break sizes is shown in Figure 1. In general, the pressurizer liquid inventory will empty very rapidly. For larger size small breaks the rate of pressure drop is moderated by the saturation pressure of the hottest fluid in the RCS (e.g., the reactor vessel upper head). Early in the transient a rapid depressurization is followed by a pressure plateau. The pressure plateau occurs because the energy loss through the break has decreased with the decreasing pressure and has become less than the energy added to the RCS from core decay heat. In order for the heat transfer process to proceed, the RCS temperature and saturation pressure must be higher than that on the secondary side. The pressure plateau will continue until the level of the two-phase (steam-water) mixture in the RCS falls below the level of the break. Then, pure steam discharges from the break and the pressure proceeds to fall more rapidly.

For small break LOCAs, the smaller the break size, the more important the S/G's are as a heat sink for RCS and Core Heat Removal. If feedwater is interrupted for a period, the RCS would repressurize and pressurized/thermal shock considerations would become a concern.

Question 56

Unit 1 is experiencing a Station Blackout and has implemented 1-EOP-10. Which of the following would indicate a problem with natural circulation?

A. Thot is 530ºF and Tcold is 492ºF.

B. Pressurizer level decreases from 34% to 32% when the ADV's are opened.

C. S/G pressures have increased from 800 psia to 820 psia.

D. S/G levels have decreased from 63% narrow range to 61% narrow range.

A. Incorrect, ΔT less than full power ΔT.

B. Incorrect, expected response if cooling down

C. Correct, indicates steaming not occuring

D. Incorrect, levels within acceptable range.

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 055.EK1.02
Importance: 4.4
References: 1-EOP-10 Station Blackout, Station Blackout LP 0702830-5

4.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] 13. **Verify Single Phase Natural Circulation** VERIFY natural circulation flow in at least **ONE** loop by **ALL** of the following: • Loop ΔT (T_{HOT} minus T_{COLD}) less than 50°F • Hot leg temperature constant <u>or</u> lowering • Cold leg temperature constant <u>or</u> lowering • RCS subcooling is greater than or equal to minimum subcooling based on Rep CET temperature (If QSPDS unavailable, use T_{HOT}) • NO abnormal difference (greater than 20°F) between T_{HOT} RTDs and Rep CET temperature (If QSPDS is available)	**13.1** ENSURE proper control of S/G feeding and steaming.
[*] 14. **Evaluate Condensate Inventory** ENSURE the condensate inventory is greater than the minimum required. **REFER TO** Data Sheet 1, Determination of Condensate Required to Remove Decay Heat and RCP Heat.	**14.1** <u>If</u> CST makeup is unavailable, <u>Then</u> CONSIDER use of Unit 2 CST, **REFER TO** ONP 1-0700031, Auxiliary Feed Water.

The Reactivity Control safety function ensures that the reactor is shutdown by monitoring reactor power and startup rate. Reactor power less than 5 x 10-4% and constant or decreasing in conjunction with negative startup rate is positive indication that reactivity control is established.

Ensuring that at least one vital D.C. bus is energized, satisfies the criteria for Maintenance of Vital Auxiliaries. The requirement for one D.C. bus, as minimum, provides monitoring and limited control of all other safety functions.

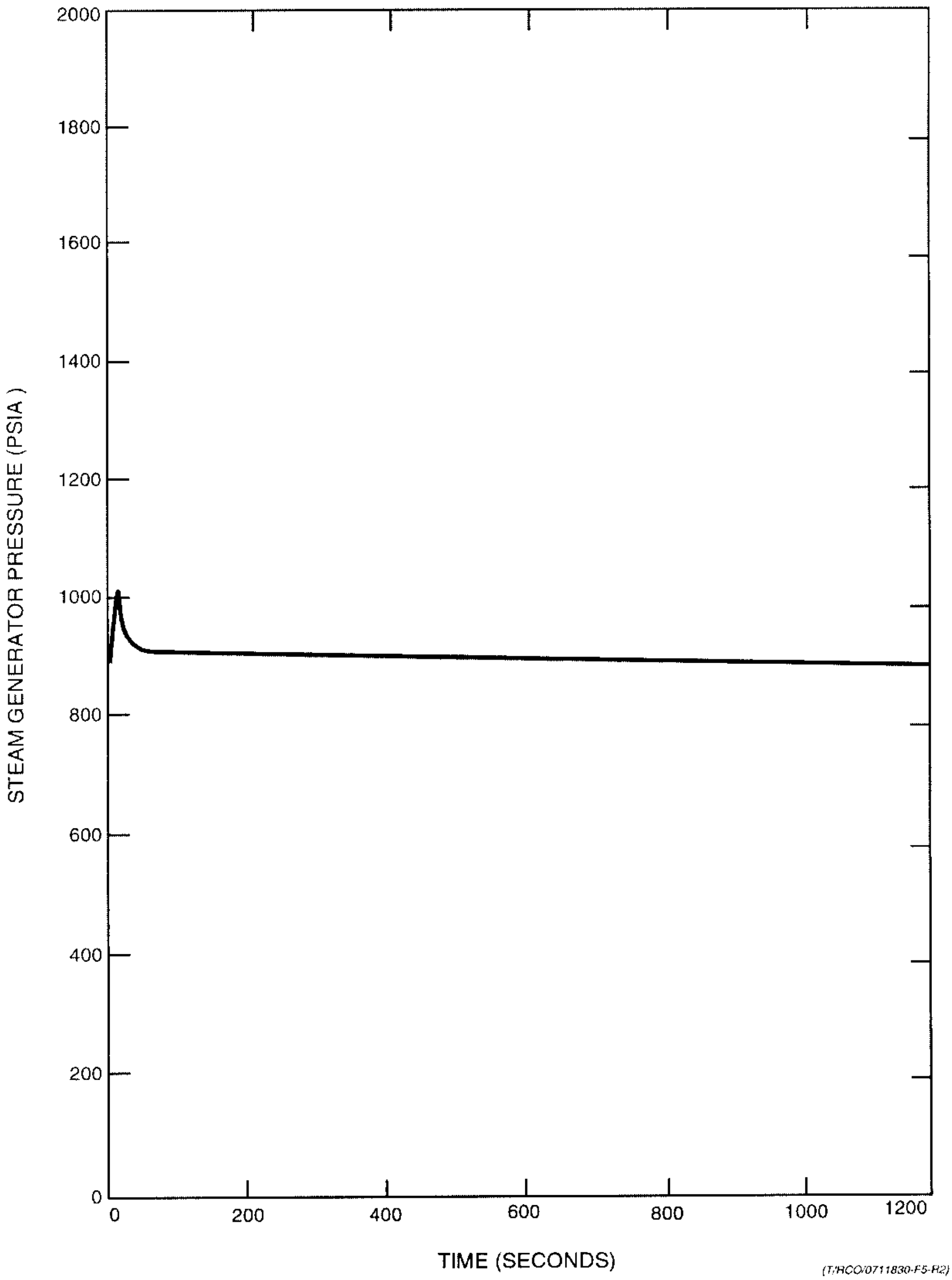
RCS Inventory Control is maintained by ensuring that the Reactor Vessel Level indicates that the core is covered (sensors 7 and 8 covered) and that the highest per quadrant CET temp is less than 22°F superheated. These criteria ensure the core is covered and adequate core cooling is being maintained.

The RCS Pressure Control safety function is satisfied if subcooling is between 20°F and 200°F or highest per quadrant core exit thermocouple temperature is less than 22°F superheat. When the CET temperature indicates >22°F superheated conditions core uncovery may have occurred and adequate core cooling is not being maintained. Positive pressure control can not be established until power is restored to pressurizer heaters and pressurizer spray.

Adequate RCS Heat Removal will be maintained if at least one steam generator is available for removing heat. A steam generator is available for removing heat if it is capable of steam flow and feedwater flow. The acceptance criteria can be satisfied if S/G level is in the normal band (60% to 70% NR) with feedwater available or level is being restored by the AFW system at greater than or equal to 150 gpm. The minimum flow rate required is based on sufficient flow to remove decay heat.

During a Station Blackout event it is not expected that an increase in containment pressure, radiation, or steam generator activity will be detected. Therefore, the Safety Function Status Check sheet instructs the operator to insure the above parameters have not increased. Because of the loss of power to the secondary radiation monitoring, local surveys must be performed.

REPRESENTATIVE STATION BLACKOUT *STEAM GENERATOR PRESSURE



* NOT UNIT SPECIFIC

FIGURE 5

Question 57

The following conditions exist:

- An ESDE has occurred on the 2A steam generator upstream of the MSIVs
- A SGTR has occurred on the 2B steam generator
- Offsite power has been lost
- 2-EOP-15 is being implemented

Which of the following is the mitigation strategy that is to be used by the operators in this event?

Isolate the:

A. 2B steam generator and control RCS temperature using the SBCS.

B. 2B steam generator, cooldown the RCS to shutdown cooling entry conditions using the 2A steam generator.

C. 2A steam generator and control RCS temperature using the SBCS.

D. 2A steam generator, cooldown the RCS to shutdown cooling entry conditions using the 2B steam generator.

A. Incorrect, 2A SG will be isolated and SBCS will not be available due to LOOP.

B. Incorrect, 2A SG will be isolated and RCS cooldown will be performed using the 2B SG.

C. Incorrect, SBCS will not be available due to LOOP.

D. **Correct**

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 000040 EA2.1
Importance: SRO 4.0
References: EOP-15 Lesson Plan 0802828-3, 2-EOP-015 Functional Recovery

4.6 RCS and CORE HEAT REMOVAL – HR-2 (continued) — **Success Path 2 – S/G With SIAS** (continued)

INSTRUCTIONS — **CONTINGENCY ACTIONS**

CAUTION

If there is a conflict between isolating a S/G with indications of S/G tube leakage or isolating a S/G with an unisolable steam leak,
Then the S/G with the ESD should be isolated. At least **ONE** S/G must remain available for heat removal.

[*] 9. **Determine If ESD Present**

If an ESD has occurred as indicated by **ANY** of the following:

- High steam flow from S/G
- Lowering S/G pressure
- Lowering S/G level
- Lowering RCS cold leg temperature
- Lowering Pressurizer pressure
- Lowering Pressurizer level

Then DETERMINE the **MOST** affected steam generator.

[ ] 10. **If No ESD, GO TO Step 14**

If there are NO ESD indications, Then GO TO Step 14.

[*] 11. **Isolate the MOST Affected S/G**

If MSIS has NOT isolated the leak, Then ISOLATE the **MOST** affected S/G.
REFER TO Appendix R, Steam Generator Isolation.

Question 58

Unit 2 has implemented 2-EOP-10 Station Blackout. Unit 1 is in a LOOP with only the 1A Diesel Generator available.

When Unit 2 is crosstied with the only operable Diesel Generator, which of the following component/system will most likely NOT be able to be put in service?

A. Instrument air system

B. Charging pump

C. Letdown

D. Cable spreading room ventilation system

A. Incorrect, instrument air directed to be restored

B. Incorrect, charging pp available to be started

C. Correct, cannot start CCW or ICW pp to support cooling letdown

D. Incorrect, available to be started.

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 055.EA1.06
Importance: 4.5
References: 2-EOP-10 Station Blackout

4.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

CAUTION

If AC power is being supplied from a Unit 1 EDG, then loading restrictions may preclude starting ICW or CCW pumps. Do NOT restart ICW or CCW pumps if power is from the **ONLY** operating EDG on Unit 1. Refer to Table 11, Emergency Diesel Generator Loading (SBO).

[*] **18. Restore CCW and ICW**

If AC power is from any source other than the **ONLY** operating EDG on Unit 1,
Then perform **BOTH** of the following:

A. ENSURE CCW is restored to operation. Vent system components as necessary. **REFER TO** OP 2-0310020, Component Cooling Water – Normal Operation.

B. ENSURE ICW is restored to operation. Vent system components as necessary. **REFER TO** OP 2-0640020, Intake Cooling Water System Operation.

[*] **19. Restore Instrument Air**

PERFORM **BOTH** of the following to RESTORE Instrument Air using the 2A and/or 2B IA compressors:

A. ENSURE 2AB 480V AC Load Center is aligned to an energized bus.

B. DISPATCH an operator to restore Instrument Air. **REFER TO** Appendix H, Operation of the 2A and 2B Instrument Air Compressors.

Question 59

Given the following post trip conditions:

- RCS Tave is 520°F and slowly lowering
- Pressurizer pressure is 1980 psia and slowly lowering
- Pressurizer level is 31% and trending slowly downward
- Containment pressure is rising
- All RCPs are in operation
- Subcooling is approximately 100°F and slowly rising
- Both SG levels are 10% narrow range and slowly lowering
- Both SG pressures are 740 psia and slowly lowering

After completion of EOP-01, which one of the following states the correct EOP to implement? (assume no equipment out of service)

A. Loss of Coolant Accident, EOP-3

B. Steam Generator Tube Rupture, EOP-4

C. Excessive Steam Demand, EOP-5

D. Total Loss Feedwater, EOP-6

A. Incorrect. LOCA does not cause SG pressure to drop.

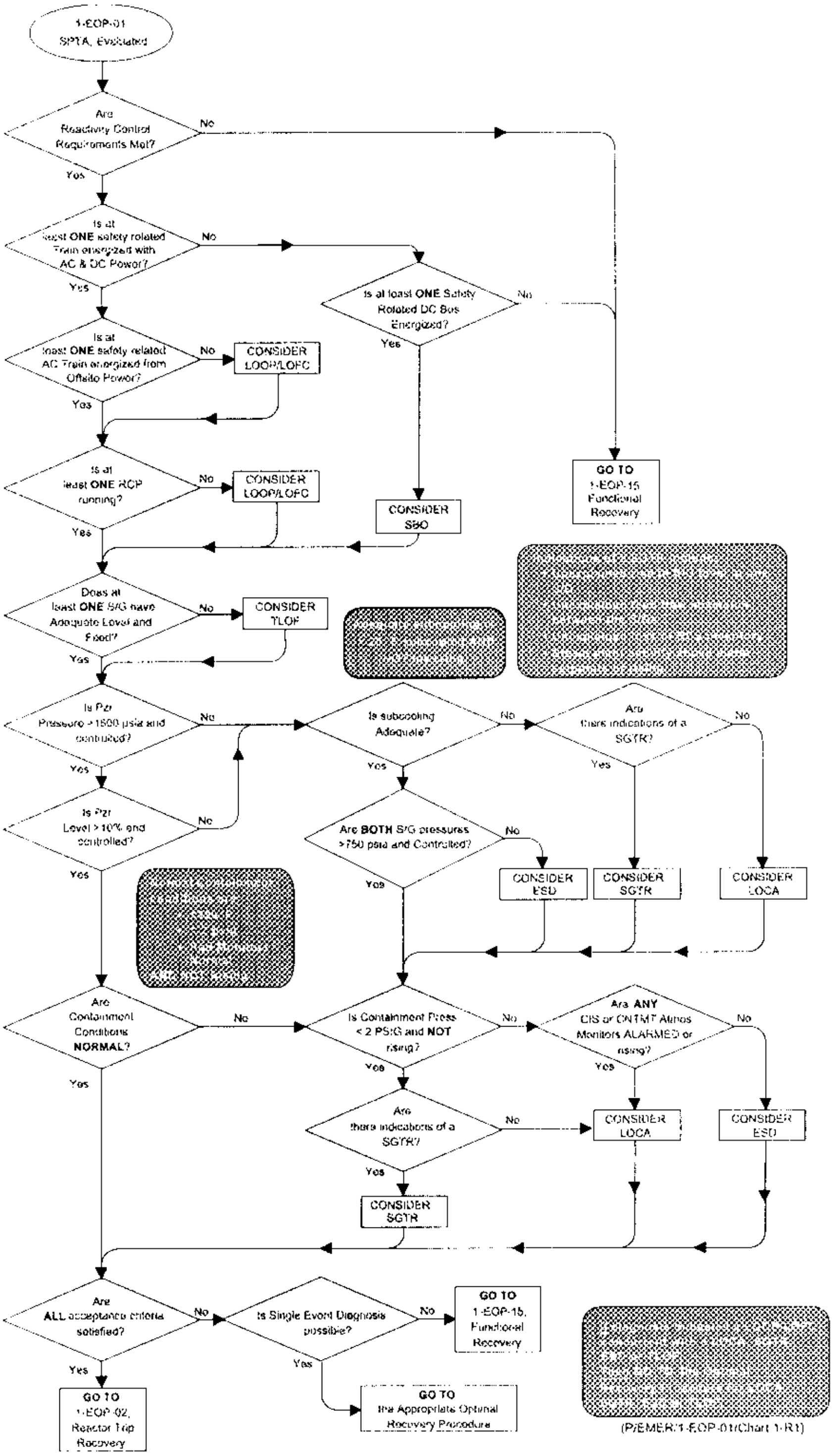
B. Incorrect, SGTR does not cause RCS temperature or SG pressure to decrease.

C. **Correct**

D. Incorrect, TLOF does not cause RCS pressure and temperature to decrease.

Question level: 2
Question source: New
Exam: SRO only
K/A: 000040 EA1.3
Importance: SRO 4.0
References: SRO Lesson plan CEN 152 and EOP Review 0902704-3

CHART 1
DIAGNOSTIC FLOW CHART
(Page 1 of 1)



(P/EMER/1-EOP-01/Chart 1-R1)

Question 60

The Reactor has tripped and four (4) CEAs are stuck out.

The following actions are taken:

Emergency boration was not successful
Reactor power is 10^{-2}% and decreasing

Which of the following states the correct procedure implementation?

A. Complete the Standard Post Trip Actions, then enter Functional Recovery procedure (EOP-15).

B. Complete the Standard Post Trip Actions, then enter Reactor Trip Recovery (EOP-2) procedure.

C. Immediately enter Functional Recovery procedure (EOP-15)

D. Enter Functional Recovery procedure (EOP-15), Reactivity Control success path concurrently with Standard Post Trip Actions.

A. Correct

B. Incorrect, Reactivity Control Safety Function is not met, Reactor Trip Recovery(EOP-2) can not be entered.

C. Incorrect, must complete Standard Post Trip Actions

D. Incorrect, cannot enter two EOP's concurrently

Question Level: 1
Question Source: bank
Exam: SRO only
KA: CE/E09. EA1.3
Importance: 3.8
References: EOP-1, EOP-15, SRO Lesson plan CEN 152 and EOP review 0902704-5

4.0 OPERATOR ACTIONS

REACTIVITY CONTROL

INSTRUCTIONS	CONTINGENCY ACTIONS
☐ 1. DETERMINE Reactivity Control acceptance criteria are met:	
A. VERIFY Reactor power is lowering.	A.1 PERFORM the following **AS NECESSARY** to insert CEAs: 1. Manually TRIP the Reactor. 2. DEENERGIZE the CEDM MG Sets by opening **BOTH** of the following breakers: • LC 1A2, Bkr 1-40207, CEA Drive MG Set #1A • LC 1B2, Bkr 1-40507, CEA Drive MG Set #1B 3. OPEN TCB-1 through TCB-8, Rx Trip Swgr.
B. VERIFY Startup Rate is negative.	
C. VERIFY a maximum of **ONE** CEA is NOT fully inserted.	C.1 INITIATE Emergency Boration to achieve adequate SDM.

CHART 1
DIAGNOSTIC FLOW CHART
(Page 1 of 1)

(P/EMER/1-EOP-01/Chart 1-R1)

2.0 ENTRY CONDITIONS

ALL of the following conditions exist:

1. **EITHER** of the following have occurred:
   - 1-EOP-01, Standard Post Trip Actions, have been performed
   - The event initiated from Mode 3 and SIAS has NOT been blocked
2. Plant conditions indicate that the Functional Recovery procedure needs to be implemented; **ANY** of the following may be present:
   - **ANY** condition, or pattern of symptoms, for which abnormal or emergency guidance can NOT be identified
   - Actions taken in an Optimal Recovery Procedure are NOT satisfying the acceptance criteria in the Safety Function Status Check
   - Multiple events are in progress

Question 61

On Unit 1, which of the following is an automatic action as a result of a Steam Generator tube rupture?

A. Condenser air ejector is aligned to the plant vent

B. Vacuum drag isolates.

C. Steam Generator Blowdown is aligned to the Flash tank.

D. Steam Generator Blowdown sample valves close.

A. Incorrect, this is a manual valve alignment.

B. Incorrect, this is a manual valve alignment.

C. Incorrect, this is a manual valve alignment.

D. **Correct**

Question Level: 1
Question Source: New
Exam: RO/SRO
KA: 000038. EK2.02
Importance: 2.5
References: 0702825-3 SGTR Event And Procedure Lesson Plan, EOP-4 Steam Generator tube rupture.

Chemistry Department must be notified and a determination should be made to identify and isolate the source of increased activity.

Containment Atmosphere Monitors (RM-26-25 and RM-26-26

Off-Normal operation of the containment atmosphere monitor is directed by 2-ONP-26.01, Process Radiation Monitoring. The containment atmosphere monitors provide the control room with continuous indication of the particulate, gaseous, and iodine radioactivity levels inside the containment. Increasing radioactivity levels above background levels is indicative of either the presence of fission products due to a reactor coolant leak or the presence of activation products due to neutron leakage from the reactor vessel. Upon receipt of a valid alarm condition, notify the Chemistry Department. Once the alarm has been determined to be valid, check indications for leakage from the RCS. If excessive RCS leakage is detected, refer to the off-normal operating procedure for excessive RCS leakage.

Component Cooling Water Monitors (RM-26-1 and Rm-26-2

Off-Normal operation of the CCW monitor is directed by 2-ONP-26.01, Process Radiation Monitoring. The CCW monitors are designed to provide an indication of the radioactivity in either CCW header, and to alarm when the radioactivity exceeds the alarm setpoint. Upon receipt of an alarm condition or a fail condition, the CCW surge tank vent valve, RCV-14-1, automatically diverts from atmosphere and realigns to the chemical drain tank. The automatic alignment of the CCW surge tank vent valve should be verified and the alarm condition validated. If a valid alarm is confirmed, 2-ONP-14.02, CCW Excessive Activity, should be implemented.

Steam Generator Blowdown Monitors (RM-26-5 and 26-6

Off-Normal operation of the steam generator blowdown monitors is directed by 2-ONP-26.01, Process Radiation Monitoring. The steam generator blowdown monitors provide indication of radioactivity in the blowdown effluent to the discharge canal or the steam generator blowdown treatment facility. When an alarm condition is detected by the monitor, valves in the blowdown piping will automatically shut to terminate the release. The signal sent to isolate the blowdown piping also shuts the valves upstream of the radiation monitors. The monitors will therefore only see the stagnant sample left in the isolated piping. The alarm on the steam generator blowdown monitor may have either been preceded or followed by an air ejector radiation monitor alarm. The air ejector monitor alarm will be the only indication of a possible buildup of radioactivity in a steam

The observed response on the RM-23/23P chart recorder or PC-11 should be one decade increase above the lower range limit.

OFF-NORMAL OPERATION

Event Detection

The Radiation Monitoring System aids the operator in detecting, analyzing and mitigating abnormal plant conditions. Of significant importance to the operator are:

- Primary-to-Secondary leaks
- Primary-to-Atmosphere leaks
- Primary-to-CCW leaks
- LOCAs
- High Fission Product activity

The following discussions focus on how specific radiation monitors assist the operator in dealing with the above conditions.

Condenser Air Ejector Monitor (RM-26-11

Off-Normal operation of the condenser air ejector monitor is accomplished in accordance with 2-ONP-26.01, Process Radiation Monitoring. The condenser air ejector monitor measures non-condensable fission product gases in the condenser air ejector discharge to detect any primary-to-secondary leakage. Upon receipt of a condenser air ejector monitor alarm, the Chemistry Department must be notified and directed to conduct secondary sampling. The condenser air ejector exhaust shall be manually shifted to the Plant Vent.

A determination should also be made as to the relationship of the steam generator activity to the Tech Spec limit of 0.1 uCi/gm dose equivalent iodine and of the primary-to-secondary leak rate limit of 1 gpm.

UNIT 1 [UNIT 2] - STEAM GENERATOR BLOWDOWN SCHEMATIC

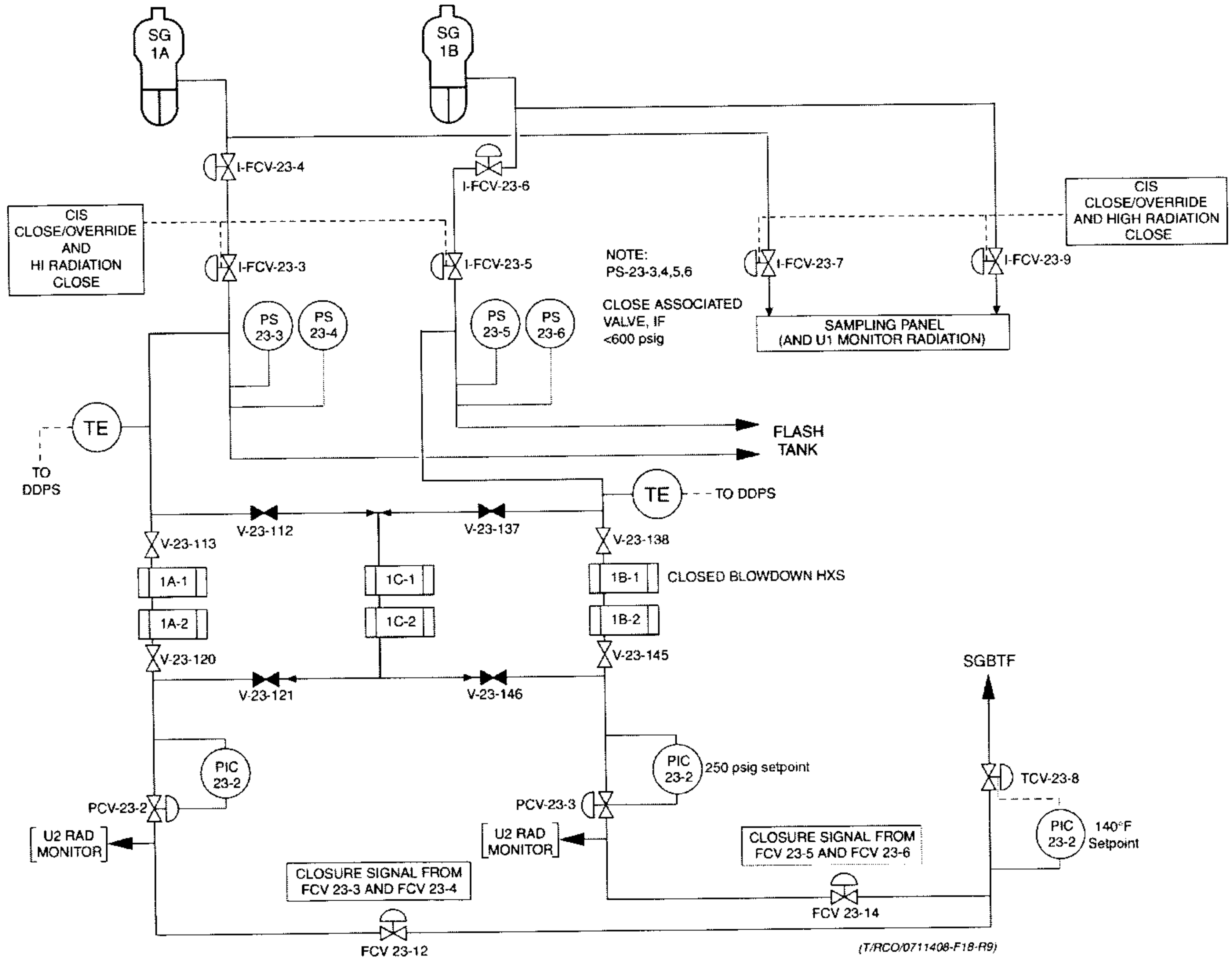


FIGURE 8

Question 62

Unit 2 has tripped from 100% power. An uncomplicated trip has been diagnosed and 2-EOP-02 has been entered.

- The B side 4.16KV and 6.9KV buses did not transfer to the startup transformer post trip.
- The B Diesel Generator is supplying the B vital bus.

Attempt to re-energize the B side from offsite power was not successful.

Which of the following is the desired Pressurizer pressure range while in EOP-02?

A. 1800 to 1850 psia.

B. 1800 to 1900 psia.

C. 1800 to 2300 psia.

D. 2225 to 2275 psia.

A. Correct, due to two RCP's off

B. Incorrect,

C. Incorrect, meets the safety function, but needs to be maintained 1800 to 1850 due to two RCP's off.

D. Incorrect, correct for all RCP's running

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 007.EK1.2
Importance: 3.4
References: 2-EOP-02 Reactor Trip Recovery

ATTACHMENT 1
SAFETY FUNCTION STATUS CHECK SHEET
(Page 4 of 7)

4. RCS PRESSURE CONTROL

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A. Pressurizer Pressure	Between 1800 and 2300 psia	☐☐☐☐☐☐
		AND
	Trending to between 2225 and 2275 psia	☐☐☐☐☐☐
		OR
	If **ANY** RCP is stopped, Then maintaining between 1800 and 1850 psia	☐☐☐☐☐☐
		AND
RCS Subcooling	At least 20°F	☐☐☐☐☐☐

END OF SAFETY FUNCTION 4

ATTACHMENT 1
SAFETY FUNCTION STATUS CHECK SHEET
(Page 1 of 7)

TIME ☐☐☐☐☐☐

1. REACTIVITY CONTROL

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A. Reactor Power	Lowering with Startup Rate negative	☐☐☐☐☐☐
		OR
	Less than 5 X 10^{-4}% <u>and</u> stable or lowering	☐☐☐☐☐☐
		AND
CEA Position	Maximum of 1 CEA NOT fully inserted	☐☐☐☐☐☐
OR		
B. Reactor Power	Lowering with Startup Rate negative	☐☐☐☐☐☐
		OR
	Less than 5 X 10^{-4}% <u>and</u> stable or lowering	☐☐☐☐☐☐
		AND
Emergency Boration	Boration Rate greater than 40 gpm	☐☐☐☐☐☐
		OR
Adequate SDM established	RCS boron Concentration greater than the SDM value required by the COLR.	☐☐☐☐☐☐

END OF SAFETY FUNCTION 1

ATTACHMENT 1
SAFETY FUNCTION STATUS CHECK SHEET
(Page 2 of 7)

2. MAINTENANCE OF VITAL AUXILIARIES

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A. Vital 4.16 kV Buses (2A3 or 2B3)	At least **ONE** energized	☐☐☐☐☐☐ **AND**
6.9 kV Buses (2A1 or 2B1)	At least **ONE** energized	☐☐☐☐☐☐ **AND**
Non-Vital 4.16 kV Buses (2A2 or 2B2)	At least **ONE** energized	☐☐☐☐☐☐ **AND**
Vital DC Buses (2A or 2B)	At least **ONE** energized	☐☐☐☐☐☐ **AND**
120V AC Instrument Buses	At least **ONE** energized	☐☐☐☐☐☐

END OF SAFETY FUNCTION 2

Question 63

During implementation of 2-EOP-09 LOOP, which of the following actions is performed to protect the Main Condenser?

A. Restoring Instrument air

B. Closing the MSIV's

C. Ensuring the FW heater alternate drains are closed

D. Ensuring the Turbine drain valves are open

A. Incorrect, Instrument air is restored in EOP-09, but does not contribute to protecting the main condenser.

B. Correct

C. Incorrect, drains fail open on loss of air, no procedure guidance to close

D. Incorrect, Turbine drain valves are to be closed, not opened.

Question level: 1
Question source: New
Exam: RO/SRO
K/A: 056.AK3.02
Importance: 4.7
References: 2-EOP-09 Loss of Offsite Power

4.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
* 7. **Protect Main Condenser**	
A. If a LOOP has occurred, Then PERFORM **BOTH** of the following to protect the Secondary Plant: **1.** ENSURE MSIVs are CLOSED. **2.** ENSURE SGBD is ISOLATED.	
B. STABILIZE the Secondary Plant. **REFER TO** Appendix X, Secondary Plant Post Trip Actions, Section 2.	
* 8. **Stabilize RCS Temperature** ENSURE RCS T_{COLD} is less than 535°F and controlled by operation of **ANY** of the following: • SBCS • ADVs	**8.1** If RCS T_{COLD} is greater than 535°F, Then VERIFY MSSVs are controlling RCS temperature. **8.2** If ADVs are unavailable, Then use alternate steaming paths. **REFER TO** Table 12, Alternate S/G Heat Removal Paths.
* 9. **Ensure S/G Level 60 to 70% NR** ENSURE at least **ONE** S/G has level being maintained or restored to between 60 and 70% NR.	

Question 64

Which of the following could result in RCS pressurization and a loss of inventory should a loss of SDC occur while in reduced inventory.

A. Removal of the Cold leg manways prior to removing Hot leg manways.

B. Removal of the Hot leg manways prior to removing Cold leg manways.

C. Installing the Cold leg Nozzle dams prior to installing the Hot leg Nozzle dams.

D. Installing the Pressurizer manway prior to installing the Hot leg manway.

A. Correct

B. Incorrect, removal of Hot leg first prevents pressurization

C. Incorrect, prevents pressurization

D. Incorrect, Pzr. Manway remove as vent path for initial RCS drain down.

Question level: 2
Question source: New
Exam: SRO Only
K/A: G2.1.32
Importance: 3.8
References: RCS Reduced Inventory and Mid-Loop Operation1-NOP-01.04, 10CFR.55.43.b

4.13 §1,2 To prevent RCS pressurization and loss of inventory in the event that SDC becomes inoperable, Steam Generator hot legs shall be opened prior to cold legs. Steam Generator primary side manway and nozzle dam removal/installation shall be performed in the following sequence in accordance with MMP-01.05, Steam Generator (S/G) Primary Side Maintenance:

1. Hot leg manways shall be removed prior to cold leg manways.
2. Cold leg nozzle dams shall be installed prior to hot leg nozzle dams.
3. Hot leg nozzle dams shall be removed prior to cold leg nozzle dams.
4. Cold leg manways shall be installed prior to hot leg manways.

4.14 Excessive drain down flow rates can cause air entrainment and vortexing in the SDC System, which can result in LPSI pump cavitation and air binding, even at RCS levels well above Mid-Loop

4.15 When venting through the RCGVS, the maximum drain down and fill rate is limited to 500 gpm due to 7/16 inch orifices installed in the vent lines from the Reactor Head and the Pressurizer.

4.16 ¶6 Operating a LPSI pump continuously at flows less than 1183 gpm can cause pump degradation.

4.17 The Steam Generators will NOT drain until a vent path for the U-tubes is established by lowering RCS level below the top of the hot legs.

- LI-1117-1 and LI-1117 42 inches
- Tygon level hose 31 ft, 3 inches

4.18 ¶2 RCP Seal Injection is required to be in service when filling from below the 33 foot elevation (63 inches on LI-1117-1) to above the 33 foot elevation to prevent contaminants, which can cause seal damage, from entering the RCP seals.

4.19 If the drain down is being performed via SDC Purification and the drain down and purification flow is stopped for more than an hour, SDC Purification should be placed back in service to continue RCS cleanup.

Question 65

Unit 2 is in Mode 5, with the Pressurizer manway off. A differential current trip occurs on the 2A3 4.16 KV buss. Subsequently, the 2B LPSI pump was secured when the motor current increased and pegged out.

Refueling level indicators LI-1117 and LI-1117-1 indicate RCS level at 49" and constant. RCS temperature has increased to 212°F. The differential current condition is expected to be cleared in 20 minutes.

For this condition the Emergency action level (EAL) would be:

A. Unusual event

B. Alert

C. Site Area Emergency

D. General Emergency

A. Incorrect

B. Correct

C. Incorrect

D. Incorrect

References Required

Question level: 2
Question source: New
Exam: SRO Only
K/A: G2.4.41
Importance: 4.1
References: EPIP-01 Classification of Emergencies, EPIP lesson plan 0902702-2, 10CFR.55.43.b5

ATTACHMENT 1
EMERGENCY CLASSIFICATION TABLE
(Page 17 of 20)

EVENT/CLASS	UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY
8.A. LOSS OF PLANT CONTROL FUNCTIONS		Loss of Plant Control Functions 1. Complete loss of any function needed for plant cold shutdown. OR 2. Failure of the Reactor Protection System to bring the reactor subcritical when needed. OR 3. Control Room is evacuated (for other than drill purposes) with control established locally at the Hot Shutdown Control Panel. Loss of Shutdown Cooling 1. Complete loss of functions needed to maintain cold shutdown. A. Failure of shutdown cooling systems, resulting in loss of cold shutdown conditions. AND B. RCS subcooling can NOT be maintained greater than 0°F.	Critical Loss of Plant Control Functions 1. Loss of any function or system which, in the opinion of the Emergency Coordinator, precludes placing the plant in Hot Shutdown. OR 2. Failure of the RPS to trip the reactor when needed and operator actions fail to bring the reactor subcritical. OR 3. Control Room is evacuated (for other than drill purposes) and control cannot be established locally at the Hot Shutdown Control Panel within 15 minutes.	**NOTE** Refer to Potential Core Melt Event/Class 6.A.

8.A. LOSS OF PLANT CONTROL FUNCTIONS

AFTER CLASSIFYING, GO TO EPIP-02, DUTIES AND RESPONSIBILITIES OF THE EMERGENCY COORDINATOR

Question 66

During implementation of the EPIP's, which of the following Emergency Coordinator duties are **NOT** transferred to other individuals in the emergency response organization when the TSC, EOF and OSC are fully operational?

A. Classification of emergencies

B. Notifications to state and local authorities

C. Protective action recommendations

D. Authorizing all field activities and re-entries

A. Correct

B. Incorrect, this is accomplished at the EOF

C. Incorrect, this is accomplished by the RM

D. Incorrect, this is accomplished by the OSC supervisor

Question level: 1
Question source: New
Exam: SRO only
K/A: G2.4.40
Importance: 4.0
References:EPIP-08 Off-Site Notifications and Protective Action Recommendations, SRO EPIP lesson plan 0902701-02

5.1 General Overview (continued)

2. (continued)

C. Recommendation of protective actions for the public.

Once the EOF is operational and proper turnover has been conducted, the Recovery Manager (RM) will assume responsibility for off-site notifications to the state and local authorities and for recommending off-site protective actions.

3. Order of Succession

If the NPS is incapacitated, Then the EC shall be (in order of succession):

A. Assistant Nuclear Plant Supervisor (ANPS) (from the affected unit)

B. Nuclear Watch Engineer (NWE)

C. Any other member of the plant staff with an active SRO license.

4. Watch Relief

A. The EC shall grant permission for watch relief, including his/her own, only when it is safe in his/her judgement to do so.

5. ¶14 Early Activation of Emergency Response Facilities

It may be useful to have technical and/or operational support available early in an emergency prior to when the Technical Support Center (TSC), Operational Support Center (OSC), or Emergency Operations Facility (EOF) is required to be operational. Activation of any of these facilities does not require declaration of an emergency class or entry into a specific emergency classification. If early activation of one or more of the facilities is desired, then follow these guidelines:

A. This is an option during normal working hours only.

B. A page announcement should be made to request that appropriate Emergency Response Organization personnel to report to the [identify what facility/facilities is/are to be activated early].

C. Turnover of EC responsibilities is done in accordance with Step 5.1.1, above.

1.0 PURPOSE

1.1 Discussion

1. This procedure provides information and instructions for undertaking notifications of the State Warning Point (SWP) and the Nuclear Regulatory Commission (NRC) and for determination of Protective Action Recommendations (PARS).

2. This procedure is for use in the Control Room, Technical Support Center (TSC) and Emergency Operations Facility (EOF).

3. Upon declaration of an emergency classification the Nuclear Plant Supervisor (NPS) assumes the duties of the Emergency Coordinator (EC). The EC has initial responsibility for off-site notifications and PARs.

4. Once the EOF is operational and proper turnover has been conducted, the Recovery Manager (RM) assumes responsibility for off-site notifications and PARs from the EC.

5. At an Alert or higher level emergency, communications with the NRC transition to an open phone line from the TSC and the EOF (at a Site Area Emergency of higher level emergency).

6. The following table illustrates which facility has a responsibility for Classification, Notification or PARs.

	Control Room (**X** until EC function transfers to the TSC)	**TSC** (**X** when operational)	**EOF** (**X** when operational)
Classifications	**X** transfers →	**X**	
Notifications	**X** transfers →	**X** transfers →	**X**
PARs	**X** transfers →	**X** transfers →	**X**

7. Off-site Notification

   A. Purpose of Off-Site Notifications

   FPL is required to notify off-site agencies in the event of any emergency that could threaten the health and safety of the public. These notifications provide an early warning to agencies responsible for public protection.

ATTACHMENT 4
FIELD OPERATOR RE-ENTRY GUIDELINES
(Page 1 of 1)

CAUTION

As specified in ADM-17.09, Invoking 10 CFR 50.54(x), the Emergency Coordinator (EC) may (with the concurrence of a licensed senior operator) waive re-entry requirements to place the plant in a safe shutdown condition or mitigate a release, if this immediate action is needed to protect the health and safety of the public.

1. **Prior to evacuation and with the Operational Support Center (OSC) NOT operational.**

   Re-entry guidelines do not apply.

2. **Prior to evacuation and with the OSC operational.**

   ¶8 Operators in the field should return to the Control Rooms and obtain an Electronic Personal Dosimeter (EPD) from the Health Physics Emergency Kit prior to returning to field.

3. ¶8 **Evacuation ordered and with the OSC NOT operational.**

   Operator actions in the field must be viewed as re-entry activities. Operators shall return to the Control Rooms following the evacuation order. Operators shall obtain an Electronic Personal Dosimeter (EPD) from the Health Physics Emergency Kit, if not done previously. Re-entry into the plant requires:

   A. The EC (initially the NPS) authorize the entry.

   B. Maintenance of appropriate radiological and safety measures.

   C. Tracking the whereabouts of the team.

4. **Evacuation ordered and with the OSC operational**

   A. NLOs, from both Units, are to report to the OSC once it is declared operational.

   B. All field activities are re-entries and shall be coordinated and controlled by the OSC.

END OF ATTACHMENT 4

Question 67

Unit-2 is in the process of cooling down due to a Steam Generator Tube Rupture in the 2A Steam Generator. The Board RCO reports that RCS T-Hot just reached 509 ºF and RCS pressure is 1950 psia.

What action should be performed?

A. Reduce cooldown to less than 30ºF per hour.

B. Isolate the 2A Steam Generator.

C. Stop one RCP in each loop.

D. Block MSIS.

A. Incorrect, Cooldown rate is reduced to less than 30ºF per hour after SG is isolated and only during natural circulation.

B. Correct

C. Incorrect, One RCP in each loop is stopped at SIAS.

D. Incorrect, No SG pressure given.

Question Level: 1
Question Source: bank
Exam: SRO only
KA: G2.3.11
Importance: 3.2
References: 0702825-6 Steam Generator Tube Rupture Event and Procedure, EOP-4, SRO lesson plan CEN 152 and EOP review 0902704-3

4.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] **15. Isolate the MOST Affected S/G** When RCS hot leg temperature is less than 510°F, Then ISOLATE the **MOST** affected S/G. **REFER TO** Appendix R, Steam Generator Isolation.	
[*] **16. Maintain ISOLATED S/G below 915 psig (930 psia)** MAINTAIN the ISOLATED S/G pressure less than 915 psig (930 psia) by **ANY** of the following: **A.** Manual operation of the MSIV Bypass valve. (If condenser vacuum exists). **B.** Manual operation of the associated ADV. **C.** Local operation of the associated ADV.	
[ ] **17. Verify Correct S/G was Isolated** VERIFY the **MOST** affected S/G is isolated by observing **ALL** of the following: • S/G sample activities • SGBD monitor radiation levels • SJAE exhaust monitor radiation level • S/G levels	**17.1** If the wrong S/G was isolated, Then RESTORE feeding and steaming capability to the isolated S/G. **17.2** When RCS heat removal has been re-established on the least affected S/G, Then ISOLATE the most affected S/G. **REFER TO** Appendix R, Steam Generator Isolation.

Question 68

Unit 1 is stable at 100% power with all systems in normal alignment. An RCS leak rate surveillance IAW OP 1-0010125A, Data Sheet 1 'Reactor Coolant System Water Inventory Balance' is 60 minutes into the required 120 minute period.

Which of the following conditions will invalidate this surveillance?

A. The RCO adds 30 gallons of water to the VCT.

B. Quench tank level increases from 56% to 58%.

C. Letdown is diverted to the HUT.

D. Charging pump seal leakage increases to 0.5 GPM.

A. Incorrect, would be correct if letdown is not in service

B. Incorrect, adjusted for on Data Sheet

C. **Correct**

D. Incorrect, adjusted for on Data Sheet

Question level: 1
Question source: New
Exam: RO/SRO
K/A: G2.2.12
Importance: 3.4
References: OP 1-0010125A Data Sheet 1, 'Reactor Coolant System Water Inventory Balance' (0702841-T)

ST. LUCIE UNIT 1
OPERATIONS PROCEDURE NO. OP-1-0010125A, REVISION 62
SURVEILLANCE DATA SHEETS

DATA SHEET 1
REACTOR COOLANT SYSTEM WATER INVENTORY BALANCE
(Page 1 of 2)

A. Instructions:

1. The unit must be at steady state conditions during this test. Any change in RCS temperature or diverting of letdown to the WMS will invalidate the test.

2. The test should be conducted for a minimum period of 2 hours unless steady state conditions cannot be maintained.

3. If letdown is NOT in service, Then any addition of boric acid and/or water to the VCT will invalidate the inventory balance.

4. The primary method for leak rate data acquisition of VOLUME CONTROL TANK level, QUENCH TANK level, and PRESSURIZER level, should be from the ERDADS user trend (DO NOT ROUND VALUES OFF). IF ERDADS data points are not available THEN obtain the leak rate data, for the above mentioned parameters, from the appropriate RTGB indicators.

5. The change in the PRESSURIZER level and the QUENCH TANK level parameters are to be accounted for in each leak rate calculation even if the differences are equal to zero.

6. CHARGING PUMP primary seal leakage for all running and standby CHARGING PUMPS is to be accounted for in each leak rate calculation. This is a cumulative value obtained by quantifying any increase in the running and standby charging pumps seal tanks that is NOT related to operator actions. Seal tank levels should be assessed for a minimum period of one (1) hour. This value is not valid for a valved out charging pump and would therefore, not be required in the leak rate calculation.

7. IF the calculated leak rate exceeds one (1) gallon per minute, THEN refer to Technical Specifications 3.4.6.2 and 4.4.6.2 AND notify the Nuclear Plant Supervisor.

S 1 OPS

DATE________
DOCT Data Sheet
DOCN OP-1-0010125A
SYS OPS
COMP ------
ITM DS-1

Question 69

Unit 2 is at 100% power steady state. Containment pressure is approaching the Technical Specification limit. Which of the following is initiated to prevent exceeding the Containment pressure Technical Specification limit?

Initiate:

A. Containment purge using HVE-8A or HVE-8B through the Shield building ventilation filter trains

B. Containment mini-purge using HVE-7A or HVE-7B through the Shield building ventilation filter trains.

C. Containment purge using HVE-8A or HVE-8B through the Continuous Cntmt/H2 Purge system filter trains

D. Containment mini-purge using HVE-7A or HVE-7B through the Continuous Cntmt/H2 Purge system filter trains.

A. Incorrect, HVE-8A and HVE-8B not used for mini-purge

B. Incorrect, Sheild building ventilation not used.

C. Incorrect, HVE-8A and HVE-8B not used for mini-purge

D. **Correct**

Question Level: 1
Question Source: New
Exam: SRO Only
KA: G2.3.9
Importance: 3.4
References: 0702602-4, 0711602 Containment and Shield Building Ventilation, 10CFR.55.43.b5

6.0 INSTRUCTIONS (continued) INITIAL

6.1 Continuous Containment Purge System Operation (continued)

6. PERFORM the following Continuous Containment Purge Valve Alignment:

COMPONENT ID	COMPONENT NAME	POSITION	PERF INITIAL
FCV-25-34	H2 Purge Disch to A SBVS	CLOSED	
FCV-25-29	H2 Purge Disch to B SBVS	CLOSED	
FCV-25-20	Continuous Cntmt Purge Iso Vlv	OPEN	
FCV-25-21	Continuous Cntmt Purge Suction	OPEN	
FCV-25-9	Control Valve Filter Inlet	OPEN TO 5%	
FCV-25-28	Control Valve Bypass	CLOSED	
FCV-25-35	Continuous Cntmt/H2 Purge Exhaust Valve	OPEN	

NOTE

FCV-25-26 and FCV-25-36 will NOT OPEN until HVE-7A or 7B starts and a negative differential pressure exists in Containment.

7. PLACE the Control Switch for FCV-25-26, Continuous Cntmt Purge Make-up, in OPEN. ______

8. PLACE the Control Switch for FCV-25-36, Continuous Cntmt Purge Make-up, in OPEN. ______

§2

CAUTION

If a CIAS occurs, HVE-7A and HVE-7B must be shut down manually.

9. START one Continuous Containment Purge Fan:

A. HVE-7A, Continuous Cntmt/H2 Purge Fan. ______

OR

B. HVE-7B, Continuous Cntmt/H2 Purge Fan. ______

Question 70

You are reviewing a Liquid Release Permit in preparation to release the 1B Waste Monitor Tank. The Liquid Release radiation monitor R-6627 has been out of service for 10 days. Which of the following would you expect to see attached to the Liquid Release permit as a result of R-6627 being out of service?

A. Two independent release rate calculations

B. Figure 1 from ADM-17.18 'Temporary System Alteration' documenting R-6627 being out of service

C. Chemistry Supervisor letter giving permission to release the tank

D. Plant General Manger letter giving permission to release the tank

A. Correct

B. Incorrect, TSA not required

C. Incorrect, Chemistry Supervisor only approves permit if high activity

D. Incorrect, Plant General Manager approval required for Containment Purge in Modes 1-4, not liquid release with monitor out of service.

Question Level: 1
Question Source: new
Exam: SRO Only
KA: G2.3.6
Importance: 3.1
References: 1-NOP-06.01 Controlled Liquid Release To The Circulating Water Discharge, 10CFR.55.43.b5

6.0 INSTRUCTIONS

INITIAL

6.1 Initial Conditions

1. ENSURE Section 3.0, Prerequisites, completed. ______

2. REVIEW Section 4.0, Precautions / Limitations. ______

3. REVIEW the Liquid Release Permit for appropriate signatures under AUTHORIZATION.

   Permit Number______________________

   Tank releasing____________________

> **CAUTION**
>
> If the Liquid Waste Monitor is Out of Service, C-200, ODCM Control 3.3.3.9 requires two independent tank sample / analysis and two independent valve alignments to verify the discharge line valving.

4. ¶1 REVIEW the Equipment Out of Service Log and determine if Channel R-6627, Liquid Waste Monitor has been declared Out of Service.

5. If Channel R-6627 is Out of Service, Then PERFORM the following:

		YES	NO
A.	Has the Monitor been Out of Service for less than 14 days?	____	____
B.	Has Chemistry attached two independent Radioactivity analysis of the tank to the Release Permit?	____	____
C.	Has Chemistry attached two independent Release Rate Calculations for the tank on the Release Permit?	____	____
D.	Have you arranged for independent verification of the discharge valve alignment?	____	____

FIGURE 1
(LIQUID RELEASE PERMIT) UNIT 1
(Page 1 of 1)

I. TANK DATA

A. IRP Permit # B. Date and Time C. Tank Name D. Discharge Volume (Gallons)

II. PRE-RELEASE DATA (μCi/ml = micro curies per milliliter)

A.	Total Concentration Of Solids			μCi/ml
B.	Total Activity Of Solids			μCi
C.	Tank Recirced As Per COP-01.05		________	Initials
D.	Minimum Pumps During Release	CWPs		ICWPs
E.	Maximum Release Rate During Release			GPM
F .	Fraction Of 10 CFR 20 Limits At Canal Canal (Solids) (Admin Limit < 0.8)			Fl
G.	Total Noble Gas Activity After Dilution (Gases) (Admin Limit < 1.60E-04)			Fg
H.	Liquid Radwaste Monitor Settings Alert Setting _______ μCi/ml High Setting _______ μCi/ml I Have Verified These Settings Are Entered On The Monitors Control Module In The Control Room.		________	Initials
I.	Liquid Rad Waste Monitor Source Check Performed By:		________	Initials
J.	LRP LIMS Number ________ Monitor Source Check LIMS Number ________			

III. AUTHORIZATION

A.	Permit Preparer Verifies Release Will Not Exceed Admin Limits	________	Signature
B.	Release Approved By Permit Preparer If II.B Is ≤ 25000 μCi	________	Signature
C.	Release Approved By Chemistry Supv If II.B Is > 25000 μCi	________	Signature
D.	Release Conditions Approved by ANPS:	________________________	Signature

IV. ACTUAL RELEASE DATA

A.	Number Of Pumps Running	________CWPs	________	ICWPs
B.	Tank Level At Start Of Release		________	
C.	Date And Time At Start Of Release		________	
D.	Date And Time At End Of Release		________	
E.	Tank Level At End Of Release		________	
F .	Reviewed By ANPS		________________________	Signature

V. POST RELEASE DATA

A.	Total Volume This Release	________	Gallons
B.	Total Activity Of Solids Released	________	μCi
C.	Post Release Reviewed By Chemistry Supervisor	____________________	Signature

S__OPS

DATE________________
DOCT________________
DOCN________________
SYS________________
COMP________________
ITM________________

FIGURE 1
TEMPORARY SYSTEM ALTERATION
(Page 1 of 3)

A. PREPARATION (TO BE COMPLETED BY SPONSOR):				
TSA #	NPWO #	UNIT #		
Component and System Affected:				
Reason for Request:				
Scheduled Closure Date: ____/____/____ Outage Milestone (If Refueling):________ Responsible Dept. Head Signature / Date: ____________				
Expected Duration:				
Action Necessary / Dept.s Responsible to Restore Normal Configuration:				
Document Issued to Track Restoration:____________				
Permanent plant change required (PCM or DCR)? ☐ YES ☐ NO				
Sponsor (Print):	Signature:	Date:	Dept:	Ext:
A. PREPARATION (TO BE COMPLETED BY IMPLEMENTING DEPARTMENT):				
Description and Location of TSA:				
Drawings Affected / Attached:			Total # Tags	
Post-Implementation Testing:				
Post-Restoration Testing:				

Implementing Department Representative (Print):	Dept.
Signature:	Date:
Acceptability of Post-Implementation and Post-Restoration Testing	
PMT Group Signature:	Date:

S___OPS
DATE________
DOCT________
DOCN________
SYS________
COMP________
ITM________

1.0 TITLE:

CONTROLLED GASEOUS BATCH RELEASE TO ATMOSPHERE

2.0 REVIEW AND APPROVAL:

See cover page.

3.0 PURPOSE:

This procedure provides instructions for making a controlled release of the contents of a Gas Decay Tank (GDT) or performing a containment purge to the atmosphere.

4.0 PRECAUTIONS AND LIMITS:

4.1 Prior to a GDT release, the tank contents shall be sampled and analyzed or a post decay calculation made if the tank has been isolated since last sample and a Gas Release Permit issued and approved in accordance with Chemistry Procedure COP-01.06, Processing Gaseous Wastes.

4.2 Prior to a containment purge, the containment atmosphere shall be sampled, analyzed and a Gaseous Release Permit issued and approved in accordance with Chemistry Procedure COP-01.06, "Processing Gaseous Wastes."

4.3 The operator shall perform a release only after receipt of an approved Gaseous Release Permit. Form similar to Figure 1.

4.4 The Gaseous Discharge Monitor, Channel 42 on the GDT gas discharge header, shall be in operation or else the conditions of the C-200, "Offsite Dose Calculation Manual (ODCM)," Section 3.3.3.9 shall be met.

¶2 4.5 Utilization of the Containment Purge System in Modes 1 - 4 for purposes of a gaseous release to atmosphere requires prior Plant General Manager approval. Aspects to be considered in granting this approval include documentation of the following:

1. Sufficient need is demonstrated.

2. Alternatives have been reviewed.

3. Operability status of the Containment Purge System is confirmed prior to opening the purge valves.

4. Impact on the IST Program is evaluated.

Question 71

During SPTA's (EOP-01) the RCO informs you he has performed the contingency action of closing the Main Steam Isolation Valves (MSIV's).

Which of the following safety function is maintained by this action?

A. Reactivity control

B. Core Heat Removal

C. Maintenance of Vital Auxiliaries

D. RCS Pressure control

A. Incorrect, not action in EOP-01 to maintain reactivity control

B. Incorrect, not action in EOP-01 to maintain Core Heat removal

C. Correct, performed if Turbine has not tripped to maintain Vital Aux.

D. Incorrect, not action in EOP-01 to maintain RCS pressure control

Question level: 1
Question source: New
Exam: RO/SRO
K/A: G2.4.49
Importance: 4.0
References: 1(2)-EOP-01 Standard Post Trip Actions, LP 0702822-5 Reactor Trip Event and Recovery Procedures.

4.0 **OPERATOR ACTIONS** (continued)

MAINTENANCE OF VITAL AUXILIARIES
(AC & DC POWER)

INSTRUCTIONS	CONTINGENCY ACTIONS
☐ 2. DETERMINE Maintenance of Vital Auxiliaries acceptance criteria are met:	
A. VERIFY the Turbine is tripped by **ALL** GVs and TVs indicate CLOSED.	**A.1** PERFORM **ALL** of the following: 1. Manually TRIP the Turbine. 2. VERIFY Turbine First Stage pressure indicates 0 psig. 3. VERIFY Turbine speed is LOWERING. **A.2** If the Turbine is NOT tripped, Then PERFORM the following **AS NECESSARY** to isolate steam to the turbine: 1. Locally TRIP the Turbine. 2. CLOSE **BOTH** MSIVs.

(Continued on next page) **(Continued on next page)**

APPENDIX E
EOP OPERATING PHILOSOPHY
(Page 5 of 15)

Emergency Operating Procedure Implementation: (continued)

1. F. (continued)

5. NWE or Additional RCO:

a. Assist non-licensed operators in field operations.

b. Assist NPS in off-site communications.

c. Complete appropriate EOP checklists, as directed.

d. Annunciator response.

e. Throttle AFW flow with ANPS concurrence.

f. EOP-99 Appendices with ANPS concurrence.

G. EOP Implementation Strategy

NOTE
Conduct of Operations EOP Implementation Strategy is developed as departmental philosophy. All Reactor Control Operators (RCO) receive the same training, therefore the Board RCO and the Desk RCO are equally qualified, and either can perform all actions stipulated in EOP Implementation Strategy as mandated by plant conditions.

1. The Board RCO immediately verifies Reactivity Control Safety Function from memory and reports "Reactor Tripped" and / or contingency actions taken. These contingencies (e.g., manually tripping the Reactor, emergency boration, etc.) are Immediate Actions that do not need ANPS concurrence, but should be communicated to the ANPS as soon as possible.

2. Desk RCO immediately verifies Maintenance of Vital Auxiliaries Safety Function (Throttle and Governor valves closed only) from memory and reports "Turbine Tripped" and / or contingency actions taken. These contingencies (e.g., manually tripping the turbine, closing MSIVs and directing the turbine to be tripped locally, etc.) are Immediate Actions that do not need ANPS concurrence, but should be communicated to the ANPS as soon as possible.

/R135

Question 72

Unit 2 is on SDC, mid-loop operations with the following conditions:

- Time to boil has been calculated to be 14 minutes
- 2A LPSI pump is running with 2B LPSI in standby mode

An RCS leak develops and the RCS level stabilizes at 29' 5" with the leak isolated. The 2A LPSI pump has been secured. ONP 2-0440030 'Shutdown Cooling Off-Normal' has been entered.

Which of the following states the Immediate Operator Actions and procedure implementation for the given conditions?

A. Start the 2B LPSI pump, perform safety function status check per 2-ONP-01.04 'PC4-SDC in Operation-Reduce Inventory Operations'.

B. Re-start the 2A LPSI pump, perform safety function status check per 2-ONP-01.04 'PC4-SDC in Operation-Reduce Inventory Operations'

C. Evacuate the Containment and initiate Containment closure. Perform safety function status check per 2-ONP-01.04 'PC4-SDC in Operation-Reduce Inventory Operations'

D. Evacuate the Containment and initiate Containment closure. With the leak isolated, exit ONP 2-0440030 'Shutdown Cooling Off-Normal'

A. Incorrect, LPSI pumps are not to be started at <29' 9.7"

B. Incorrect, LPSI pumps are not to be started at <29' 9.7"

C. Correct

D. Incorrect, ONP Shutdown Cooling Off-Normal' exit criteria not met.

Question level: 2
Question source: New
Exam: SRO Only
K/A: G2.4.11
Importance: 3.6
References: ONP 2-0440030 'Shutdown Cooling Off-Normal', 10CFR.55.43.b5

7.0 OPERATOR ACTIONS:

7.1 Immediate Operator Actions:

INSTRUCTIONS	CONTINGENCY ACTIONS
1. Check LPSI pump amps stable.	1. Perform the following: A. Throttle LPSI header valves. B. If pump amps do NOT stabilize, Then stop the LPSI pump(s).
2. If RCS level is greater than or equal to 29 ft, 9.7 inches, Then start standby SDC loop in accordance with Appendix C, Restoration of SDC.	
3. Check at least ONE LPSI pump operating.	3. §$_3$ If **BOTH** of the following conditions exist: • Time to core boiling is less than 30 minutes. • RCS level is less than or equal to 33 ft elev. Then evacuate the Containment and initiate Containment closure as follows: A. Close penetrations in accordance with 2-MMP-68.02. B. Close all penetrations listed in the open penetration log.

END OF SECTION 7.1

7.0 OPERATOR ACTIONS: (continued)

7.2 Subsequent Operator Actions:

INSTRUCTIONS	CONTINGENCY ACTIONS

NOTE

If conditions continue to degrade or this procedure is NOT succeeding in stabilizing plant conditions, the Low Mode Off-Normal Procedure (LMONP) for the current plant condition should be implemented.

INSTRUCTIONS	CONTINGENCY ACTIONS
1. Perform safety function status check per Low Mode Off-Normal Procedure, Appendix A, for the current plant condition every 15 minutes until exit conditions are met.	
2. Record the time SDC was lost and RCS temperature on Data Sheet 1.	

CAUTION

- If LPSI pump is lost due to level dropping below 29 ft, 9.7 inches, do NOT attempt to restart the LPSI pump until the cause has been identified and corrected.
- If SDC is lost, it may be necessary to isolate the tygon level hose to prevent overpressurizing the hose.

INSTRUCTIONS	CONTINGENCY ACTIONS
3. Check Core Alterations NOT in progress.	3. Stope Core Alterations.

5.0 ENTRY CONDITIONS: (continued)

3. Any of the following conditions exist.

   A. Shift Supervisor directs that LMONP be entered.

   B. LMONP Safety Function Status Checks for the current plant conditions are NOT being met.

   C. Off-Normal Operating Procedure NOT adequately mitigating the event.

   D. Any condition, or pattern of symptoms, with no immediately apparent diagnosis or cause OR for which off-normal guidance can NOT be identified.

6.0 EXIT CONDITIONS:

1. Appropriate acceptance criteria are met as indicated by either of the following conditions:

   A. The plant meets safety function acceptance criteria for the original plant condition prior to the event:

      1. Plant parameters still meet the definition of the original plant condition.

      2. The safety function acceptance criteria for the original plant condition prior to the event are being satisfied.

OR

   B. The plant has changed such that a new plant condition is applicable:

      1. The plant meets the definition of a plant condition other than the original plant condition.

      2. The safety function acceptance criteria for this plant condition are being satisfied.

AND

2. An appropriate, approved procedure to perform exists or has been approved by the Plant Technical Support Center.

Question 73

Unit 1 has entered 1-EOP-06 Total Loss of Feedwater. Other than attempting to re-gain Feedwater, which of the following is performed to mitigate the event?

A. Cooldown the RCS to less than 510°F.

B. Reducing subcooling to minimum values.

C. Stopping one RCP in each loop.

D. Stabilize and control RCS T_{cold} less than 535°F.

A. Incorrect, this is performed during a SGTR

B. Incorrect, this is performed for loss of RCS inventory

C. Incorrect, all RCP's are stopped to reduce heat input.

D. Correct, this will conserve S/G inventory.

Question level: 1
Question source: New
Exam: SRO Only
K/A: G2.4.7
Importance: 3.8
References: 1-EOP-06 Total Loss of Feedwater, LP-0702827-7 Loss of Feedwater event, 10CFR.55.43.b5

4.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] **12. Control RCS Temperature** STABILIZE and CONTROL RCS T_{COLD} less than 535°F using SBCS.	**12.1** CONTROL RCS temperature using ADVs. **12.2** If local operation of ADVs is required, Then **REFER TO** Appendix U, Local Operation of Unit 1 ADVs. **12.3** CONTROL RCS temperature using 1C AFW Pump and alternate steaming flow paths on the available S/G(s). **REFER TO** Table 12, Alternate S/G Heat Removal Paths.

NOTE

ALL of the following are necessary for restoration of Letdown:

- Instrument Air
- Non-essential sections of MCCs 1A6 and 1B6 energized
- SIAS and CIAS Reset

INSTRUCTIONS	CONTINGENCY ACTIONS
[ ] **13. Restore Letdown** If Letdown is ISOLATED, and is needed or desired, Then PERFORM **BOTH** of the following: **A.** DIRECT HP to monitor the VCT hallway for rising radiation levels.	
B. RESTORE Letdown. **REFER TO** 1-ONP-02.03, Charging and Letdown.	**B.1** If SIAS has isolated Letdown, Then **REFER TO** Appendix P, Restoration of Components Actuated by ESFAS.

Question 74

The RCS is in Mode 5 with the Pressurizer manway off. RCS level is 35 feet. Which of the following mechanisms are utilized to prevent loss of SDC due to certain failures.

	Unit 1	Unit 2
A.	HCV 3657 SDC Temp. control and FCV-3306 SDC return flow are locally positioned.	Pressurizer Pressure Instruments PC 1103, 1104, 1105, 1106 are de-energized.
B.	HCV 3657 SDC Temp. control and FCV-3306 SDC return flow are locally positioned.	Hot leg suction valves V3480, 3481, 3651, and 3652 are de-energized.
C.	Hot leg suction valves V3480, 3481, 3651, and 3652 are de-energized.	HCV 3657 SDC Temp. control and FCV-3306 SDC return flow are locally positioned.
D.	Pressurizer Pressure Instruments PC 1103, 1104, 1105, 1106 are de-energized.	Hot leg suction valves V3480, 3481, 3651, and 3652 are de-energized.

A. Incorrect, Pzr. Inst. are not de-energized. Hot leg suction valves are de-energized.

B. Correct

C. Incorrect, reversed

D. Incorrect, Pzr. Inst are not de-energized or Hot leg suction valves de-energized on Unit 1. Unit 1 high pressure interlock for SDC valves has been defeated.

Question level: 2
Question source: New
Exam: SRO Only
K/A: 025.G2.2.3
Importance: 3.3
References: 2-NOP-01.03 Draining the RCS, 2-0440030 SDC Off-Normal, 1-NOP-03.05 SDC , 10CFR.55.43.b5

6.2 Initial Conditions for Draining the RCS from 30 to 40% in the Pressurizer to Above the 33 Foot Elevation (continued) INITIAL

17. (continued)

B. PLACE caution tags on the breakers and valve control switches which state: ______

"(valve number) is OPEN. Breaker is off to defeat SDC suction valve overpressure closure interlock. Do NOT turn breaker ON unless plant conditions allow V3545 to be closed. Refer to 2-NOP-03.05.

COMPONENT ID	COMPONENT NAME	TAGGED (√)	POSITION	PERF INITIAL
V3480	SDC Loop 2A		OPEN	
V3481	SDC Loop 2A		OPEN	
V3651	SDC Loop 2B		OPEN	
V3652	SDC Loop 2B		OPEN	
2-42013	SDC Isol Valve V-3480 (480V MCC 2B5)		OFF	
2-41204	SDC Isol Valve V-3481 (480V MCC 2A5)		OFF	
2-42121	SDC Isol Valve V-3651 (480V MCC 2B6)		OFF	
2-41243	SDC Isol Valve V-3652 (480 V MCC 2A5)		OFF	

18. §9 If **BOTH** of the following conditions are met:

- All four SDC suction valve breakers are turned OFF.

AND

- 2B LPSI Pump is operating.

Then PERFORM the following:

A. CLOSE V3545, Tie Isolation Valve,. ______

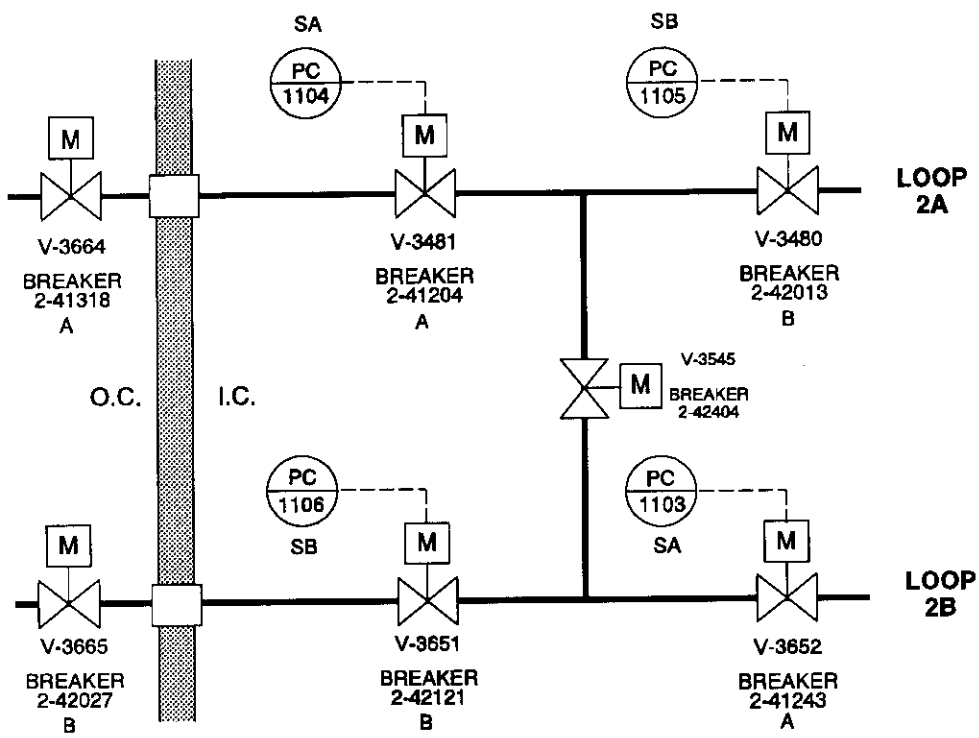
B. PLACE a caution tag on the valve which states the following: ______

"V3545 is required to be closed during certain plant conditions. Refer to 2-NOP-03.05 to determine when V3545 can be opened.

FIGURE 3

HOT LEG SUCTION VALVE CONFIGURATION

(Page 1 of 1)



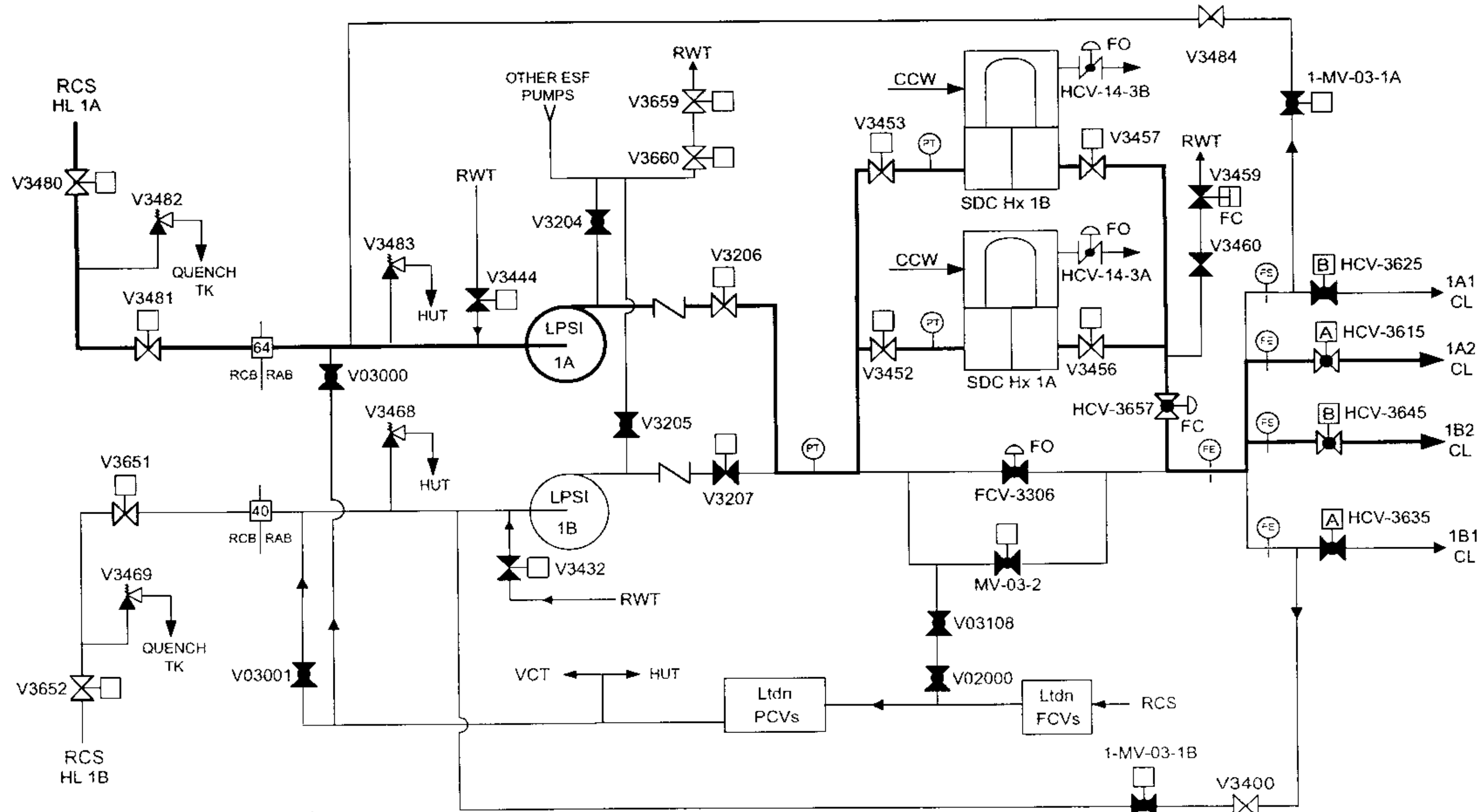
(0440030C.WPG)

/R37A

FIGURE 2

UNIT 1 SDC SYSTEM – 1A IN SERVICE, 1B IN STANDBY

(Page 1 of 1)



(P/OPS/1-NOP-03.05F2-R0)

6.2 Placing SDC Loop 1A in Operation (continued) INITIAL

NOTE

During initial plant cool down, HCV-3657, SDC Temp Control, is throttled open to control the cool down. When HCV-3657 is full open, FCV-3306, SDC Return Flow, is throttled closed. HCV-3657 will normally remain full open and FCV-3306 will normally remain full closed until plant heat up is under way. Once FCV-3306 is full closed, both valves may be locally positioned using their handwheel to preclude loss of SDC due to single failure.

11. PERFORM the following, as necessary, to maintain the desired RCS temperature / cooldown rate and required SDC flows:

A. ADJUST the Atmospheric Dump Valves. _______

B. If FCV-3306, SDC Return Flow, is full open, Then THROTTLE HIC-3657, SDC Temp Control. _______

C. If HCV-3657, SDC Temp Control, is full open, Then THROTTLE FIC-3306, SDC Return Flow.

D. THROTTLE the following valves, as necessary, and MAINTAIN SDC alignment and total SDC flow in accordance with Figure 1, SDC & LPSI Pump Flow Requirements. _______

COMPONENT ID	COMPONENT NAME	FI	FLOW	PERF INITIAL
HCV-3615	LPSI Header To Loop 1A2 Valve	FI-3312		
HCV-3625	LPSI Header To Loop 1A1 Valve	FI-3322		
HCV-3635	LPSI Header To Loop 1B1 Valve	FI-3332		
HCV-3645	LPSI Header To Loop 1B2 Valve	FI-3342		
		TOTAL		

ANPS Review ______________________ Date ___________

END OF SECTION 6.2

Question 75

Which of the following is the largest contributor of hydrogen concentration inside the Containment during a core melt event, and the preferred method of removal?

A.	Radiolysis of water	Hydrogen Recombiner
B.	Zirc/water reaction	Hydrogen Recombiner
C.	Corrosion of Aluminum and Zinc.	Hydrogen Purge
D.	Zirc/water reaction.	Hydrogen Purge

A. Incorrect, Not largest contributor

B. Correct

C. Incorrect, Not largest contributor, or preferred removal

D. Incorrect, not preferred removal

Question Level: 1
Question Source: Bank
Exam: RO/SRO
K/A:028, K5.03
Importance: SRO 3.6
References: 0702832-2 Core Melt Event, 0711824 Loss of Coolant Accident Event and Procedure 'Lesson Text'

{PRIVATE }2.3.5 Containment Isolation{tc \l 3 "2.3.5 Containment Isolation"}

Containment Isolation, during a LOCA, should occur automatically by CIAS generated by SIAS on low pressurizer pressure or high containment radiation. For the smaller break LOCAs, manual actuation of containment isolation may be warranted based on evaluation of plant condition such as containment temperature, pressure, and radiation level combined with confirmed diagnoses of the LOCA.

{PRIVATE }2.3.6 Containment Temperature and Pressure Control{tc \l 3 "2.3.6 Containn

Containment Temperature and Pressure Control is satisfied by use of the containment fan coolers and containment spray. These systems are designed to remove heat from the containment following a LOCA, thus keeping the temperature and pressure within the design limits of the containment.

{PRIVATE }2.3.7 Containment Combustible Gas Control{tc \l 3 "2.3.7 Containment Combustible Gas Control"}

Containment Combustible Gas Control is of concern during a LOCA because of the hydrogen that can be generated. The primary goal of this safety function is to prevent a hydrogen burn that could cause the containment pressure to exceed its design limit. The preferred mode of combustible gas control is the use of the hydrogen recombiners to reduce the hydrogen concentration. If recombiner operation is not possible or is insufficient, the containment hydrogen purge system can be used as determined by the Technical Support Center.

The generation of hydrogen during LOCAs is a result of three different processes: a) metal-water reaction involving zircaloy or stainless steel in the RCS, b) corrosion of aluminum and zinc caused by the boric acid in the containment spray, and c) radiolysis of water by fission product decay.

Question 76

Due to numerous A side AC electrical failures, Unit 1 has entered 1-0910054 'Loss of a Safety Related AC Bus' with the following malfunctions:

- The 1AB 480V load center is de-energized and unable to be restored.
- The 1A DC bus has no Battery Chargers available to supply the bus.

Which of the following options are available to align the 1A DC bus to another DC bus that has an operable battery charger?

Tie the:

A. 1AB DC bus to the 1A DC bus through the 1B DC bus

B. 1A DC bus directly to the 1B DC bus

C. 1C DC bus to 1AB DC bus, 1AB DC bus to the 1A DC bus.

D. 1C DC bus directly to the 1A DC bus.

A. Incorrect, 1AB DC bus is de-energized due to 1AB 480V AC bus de-energized

B. Incorrect, not possible to tie 1A directly to 1B DC bus

C. Correct

D. Incorrect, 1C DC bus must tie to 1AB DC bus to energize 1A DC bus.

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 058.AA1.01
Importance: 3.5
References: Loss of Safety Related AC bus 1-0910054, LP 0702503-1, 125V DC System

APPENDIX D

<u>RESTORATION OF 1A2 (1B2) 480V LOAD CENTER</u>

(Page 2 of 4)

1. (continued)

   B. (continued)

   4. Realign the 1AB load center so that it is being powered from the 1B2 load center, if necessary, as follows:

      a. Open breakers 1-40702 then 1-40204 (1A2 to 1AB tie breakers).

      b. Close breaker 1-40504 (1B2/1AB tie), then close breaker 1-40706 (1AB/1B2 tie).

      c. Align the 1AB battery charger to the 1A DC bus per OP 1-0960020, "125 VDC Class 1E Power System Normal Operation."

   5. <u>If</u> the 1AB load center can NOT be reenergized, <u>Then</u> perform the following:

      a. There are no battery chargers supplying the 1A battery; consider cross tying the 1C (1D) DC bus to the 1A DC bus, as follows:

         1. Ensure the 1AB DC bus is aligned to the 1A DC bus per OP 1-0960020, "125 VDC Class 1E Power System Normal Operation."

         2. Close breaker 1-60710 (1-60910) - 1C (1D) DC bus supply to the 1AB DC bus.

         3. Close breaker 1-60311 (1-60312) - 1AB DC bus supply from the 1C (1D) DC bus.

   6. Send an operator to the switchgear to check for relay indications and any other possible problems.

   7. Call the Electrical Department for assistance.

   8. Monitor the 1A diesel fuel oil day tank levels, as they will NOT automatically fill.

UNIT 1-125 VDC SYSTEM

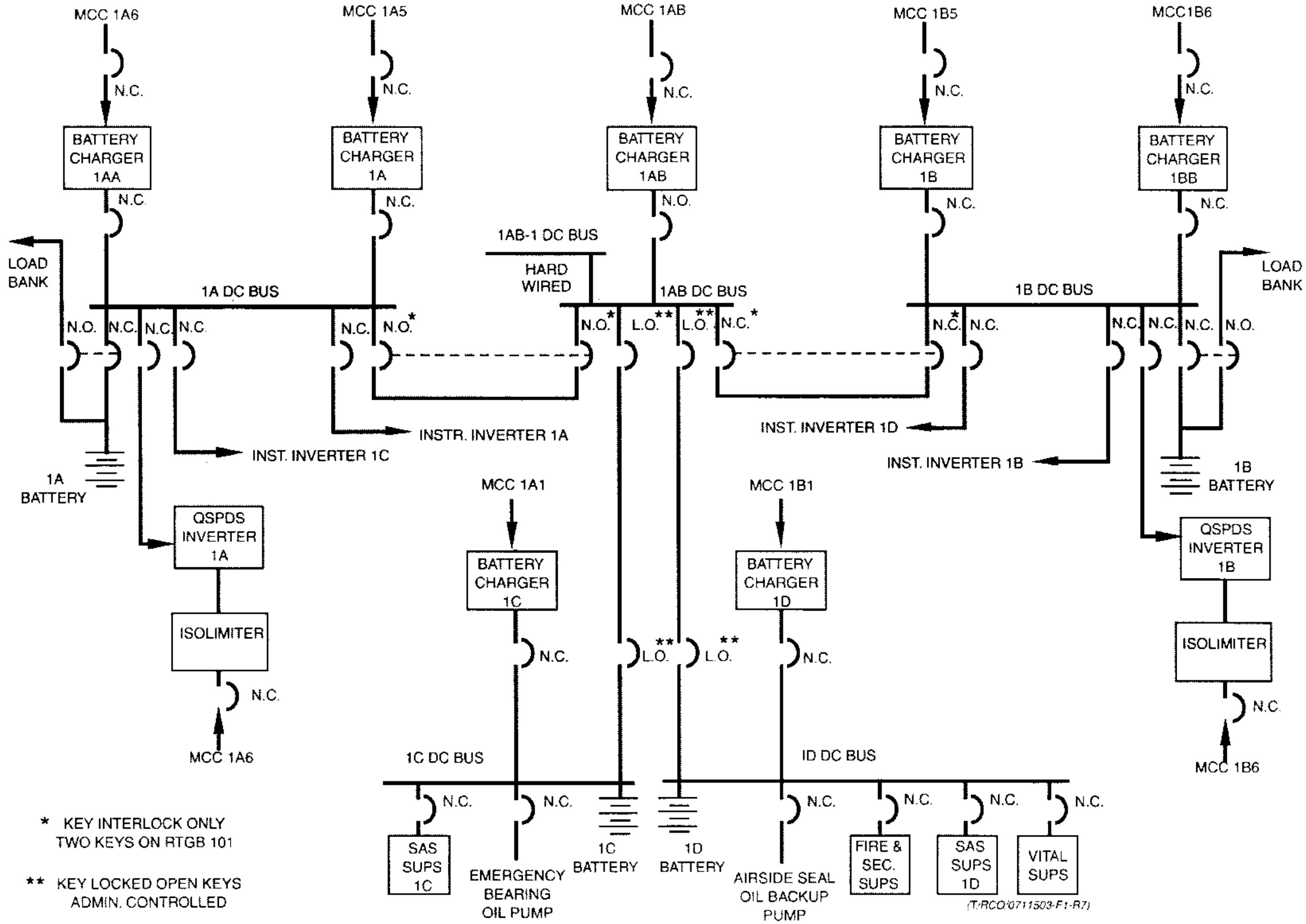


FIGURE 1

Question 77

Unit 2 Diesel fuel oil storage tanks are filled to Tech. Spec limit. A Loss of Offsite power occurs with the 2A Diesel out of service. The 2B Diesel is fully loaded. With both Diesel oil storage tanks supplying the 2B Diesel, when will the Unit 2 fuel oil storage tanks run dry?

A. 4 days

B. 7 days

C. 8 days

D. 14 days

A. Incorrect, Unit 1 capacity with 2 Diesels fully loaded

B. Incorrect, Unit 2 capacity with 2 Diesels fully loaded

C. Incorrect, Unit 1 capacity with 1 Diesel fully loaded

D. Correct

Question level: 1
Question source: New
Exam: RO/SRO
K/A: 064.K1.03
Importance: 4.0
References: Lesson Text 0711501 Diesel Generators, LP 0702501-11B

TABLE E, EDG FUEL SUPPLY UNIT COMPARISON

STORAGE TANKS	UNIT 1	UNIT 2
Quantity / Capacity	(2) 19,175 Gal/each	(2) 43,430 Gal/each
Run Time Using Both Storage Tanks	4 Days w/2 EDGs Loaded 8 Days w/1 EDG Loaded	7 Days w/2 EDGs Loaded 14 Days w/1 EDG Loaded
Tech Spec Volume	(2) > 16,450 Gal/tank	(2) > 40,000 Gal/tank

ENGINE TANKS	UNIT 1	UNIT 2
Quantity / Capacity	(2/set) 200 Gal/each	(2/set) 343 Gal/each
Run Time	120 mins (full level) 75 mins (minimum level)	120 mins (full level) 60 mins (minimum level)
Tech Spec Volume	(2/set) > 152 Gal/each	(2/set) > 200 Gal/each
Float Switch Operation	2 each: Tank 1A2/1B2: 1 – Start Fill 1 – Stop Fill Tank 1A1/1B1: 1 – High Alarm 1 – Low Alarm (Alarms are local only)	5 each: 1 – Start Fill (to both tanks) 1 – Stop Fill (requires both tanks sat) 1 – Hi-Hi Alarm @ Local Panel 1 – Lo-Lo Alarm @ Local Panel 1 – Lo-Lo Alarm @ C.R.

UNIT 2 - DIESEL GENERATOR FUEL OIL SYSTEM

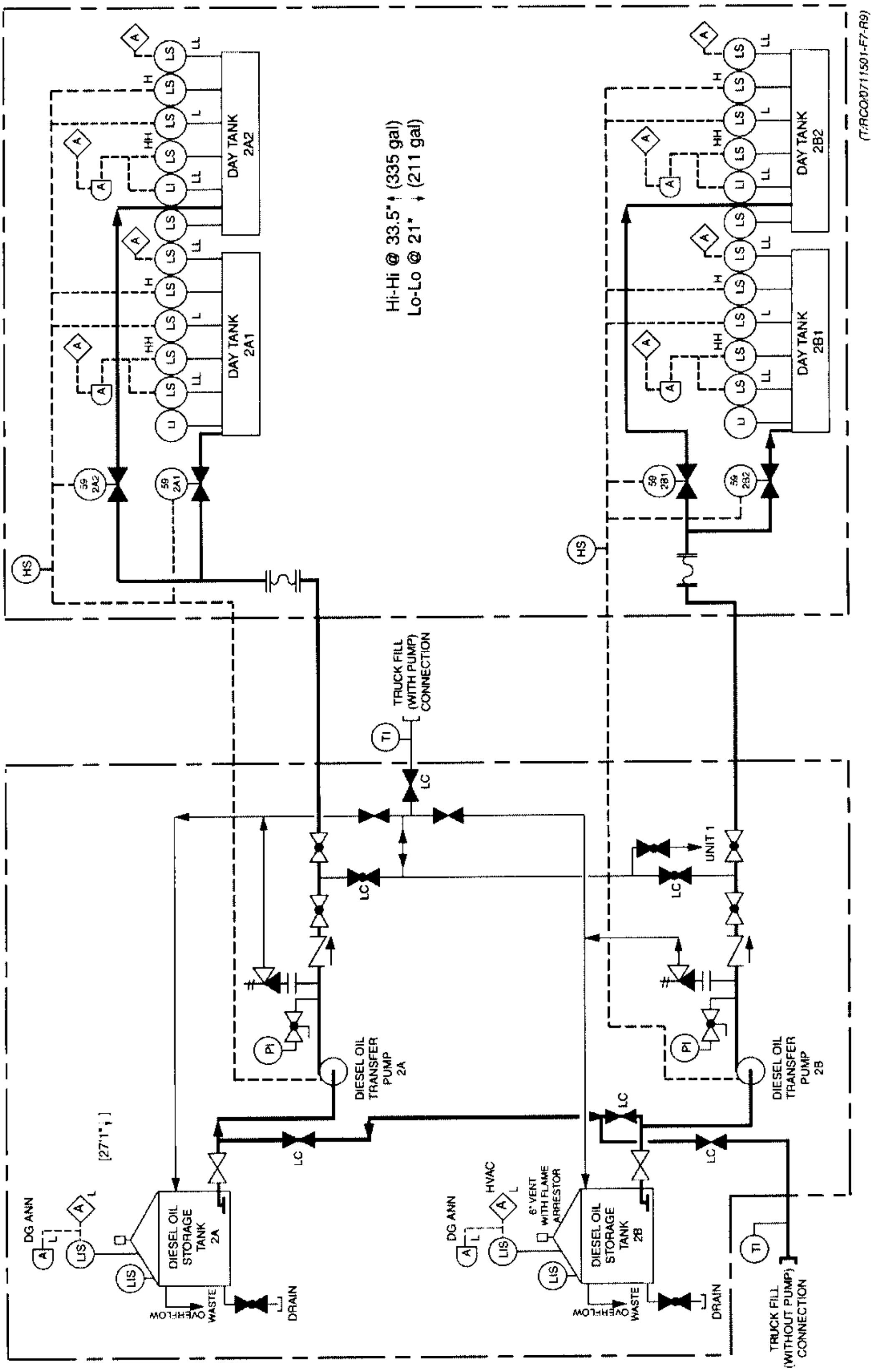


FIGURE 9

UNIT 1 - DIESEL GENERATOR FUEL OIL SYSTEM

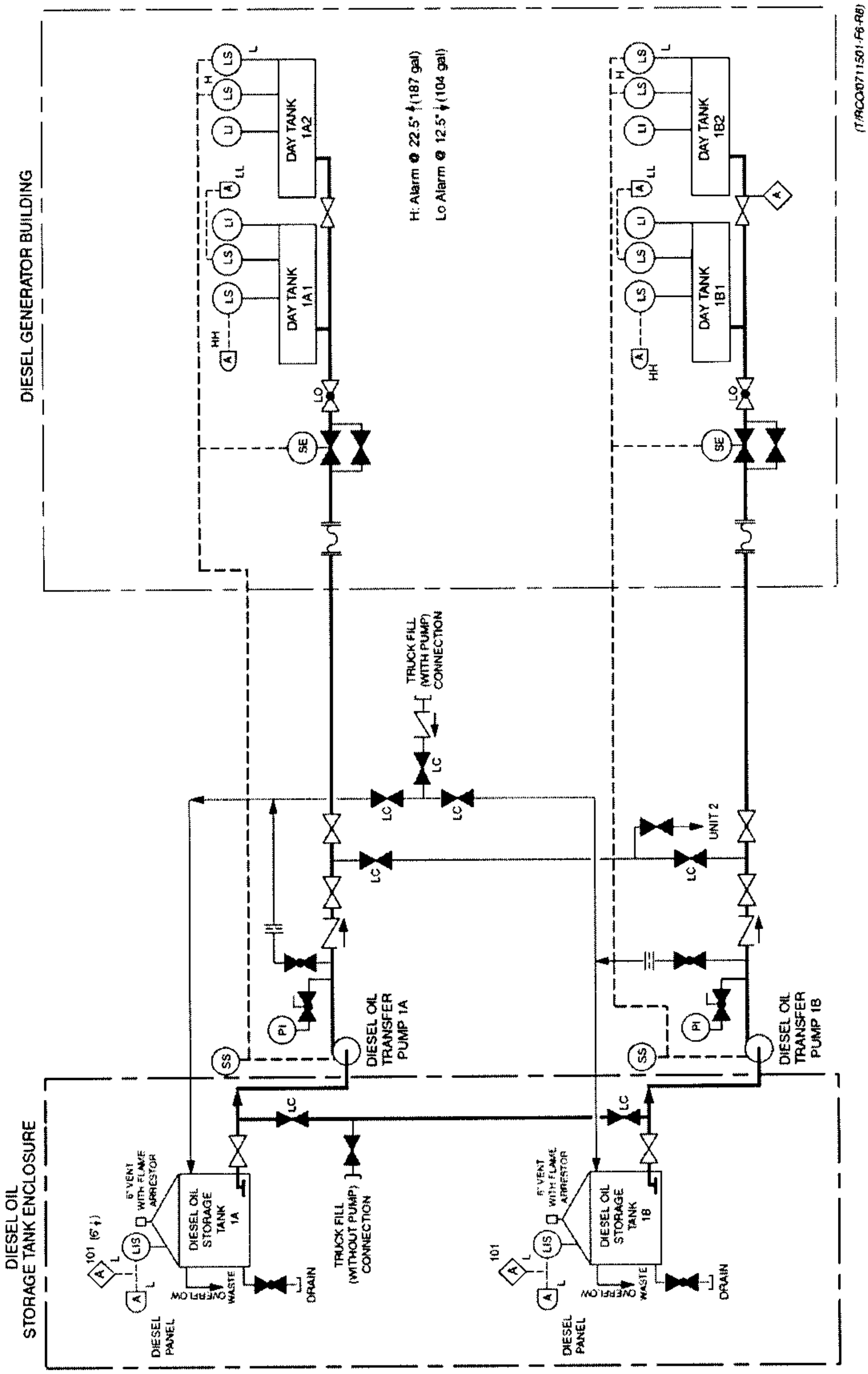


FIGURE 8

Question 78

Unit 2 has the following CCW alignment:

- 2A CCW pump has been shut down due to a major oil leak and declared inoperable
- 2B CCW pump is operable
- 2C CCW pump was started on the A header
- 2AB 4.16 KV bus is aligned to the 2B3 4.16 KV bus

If the 2C CCW pump is used to satisfy the requirements of the CCW Tech Spec, which of the following states the Conduct of Operations AP-0010120 requirements?

Re-align the 2AB 4.16 KV bus to the 2A3 4.16 KV bus within:

A. 2 hours and verify proper electrical and mechanical alignment every 24 hours.

B. 2 hours and verify proper electrical and mechanical alignment every 12 hours.

C. 24 hours and verify proper electrical and mechanical alignment every 24 hours.

D. 72 hours and verify proper electrical and mechanical alignment every 12 hours.

A. Correct

B. Incorrect, verification time incorrect

C. Incorrect, re-alignment time incorrect

D. Incorrect, 72 hours is Tech Spec action statement if one CCW train operable, verification time incorrect.

Question level: 1
Question source: New
Exam: SRO Only
K/A: G2.1.33
Importance: 4.0
References: AP0010120 Conduct of Operations, 10CFR.55.43.b5

APPENDIX G
TECHNICAL SPECIFICATION GUIDANCE
(Page 15 of 20)

8. B. 3. (continued)

b. If conditions are determined to be favorable for the fans to remain out of service during pump operation or for maintenance activities, Then VERIFY the Intake Structure room temperature to be less than 120°F at least once per shift.

c. If pump operating conditions degrade and temperatures are expected to exceed 120°F, Then RESTORE fan operability.

4. When the reactor is in Modes 5, 6 or defueled and both HVE-41A or HVE-41B, Intake Structure Ventilation System Exhaust Fans are removed from service, Then perform the following actions:

- VERIFY the Intake Structure room temperature to be less than 120°F at least once per shift.
- If the Intake Structure room temperature is expected to reach 120°F, Then INSTALL temporary ventilation equipment.

C. CCW / ICW Alignment

1. If the "C" CCW and / or ICW pump is used to satisfy the Tech Spec requirement for a header, it shall be electrically and mechanically aligned to that header within 2 hours. Proper alignment shall be verified every 24 hours.

2. If it is necessary or desirable to misalign a "C" CCW and / or ICW pump by providing electrical power from one train while the "C" CCW and / or ICW pump is mechanically aligned to the opposite train, Then declare the "C" CCW and / or ICW pump and the header that is mechanically aligned to inoperable and enter the applicable Tech Spec Action Statement.

Question 79

Unit 2 is at Mid-Loop during a refueling outage, with the following conditions:

- Unit has been shutdown for 28 days and refueling is complete
- RCS temperature is 120 °F
- Penetration 50 is open to support the outage

If SDC cooling were lost with Penetration 50 open, what is the maximum time to establish Containment integrity?

A. 22 minutes

B. 28 minutes

C. 30 minutes

D. 32 minutes

A. Incorrect, correct for initial RCS temperature of 140 °F

B. **Correct for initial RCS temperature of 120 °F 28 days shutdown**

C. Incorrect, correct for 110 °F

D. Incorrect, correct for shutdown of 26 days

References required

Question level: 2
Question source: New
Exam: SRO Only
K/A: 069.AA2.01
Importance: 4.3
References: OP 2-1600023 Refueling Sequencing Guidelines, 10CFR.55.43.b5

APPENDIX B
DATA SHEET 1
CONTAINMENT OPEN PENETRATION LOG
(Page 1 of 1)

¶3

1. COMPLETE the following information:

Penetration opening authorized by: ☐ Work Control Center / ☐ Control Room (check one)

Penetration Number:_____ Affected system:_____ Expected restoration time/date:____________

Responsible Department / primary clearance holder:______________________________

Reason (Clearance #, if applicable) for penetration being inoperable/open:_______________
____

Person responsible for closing penetration (A person is required to be identified for each shift.):
Mids:____________________ Days:____________________ Peaks:____________________

Communication method (Phone number, radio channel, etc.):__________________________

> NOTE
> - Penetration closure time is required to be the shortest of the following times: 1) time to core boiling as determined from ONOP 2-0440030, Shutdown Cooling Off-Normal, Figure 1, or 2) less than 30 minutes.
> - Tools necessary to close penetration are required to be staged at penetration.

Contingency actions and tools necessary to return the integrity of the penetration prior to core boiling or in less than 30 minutes, which ever is shortest. (List below and/or attach additional sheets):____
____

Contingency actions and taking penetration out-of-service approved by:
______________________________________ Date____/____/____
☐ WCCS / ☐ NPS / ☐ ANPS (check one)

Date and time the penetration is removed from service/opened:____________ ______

2. FORWARD this form to the Control Room. ______

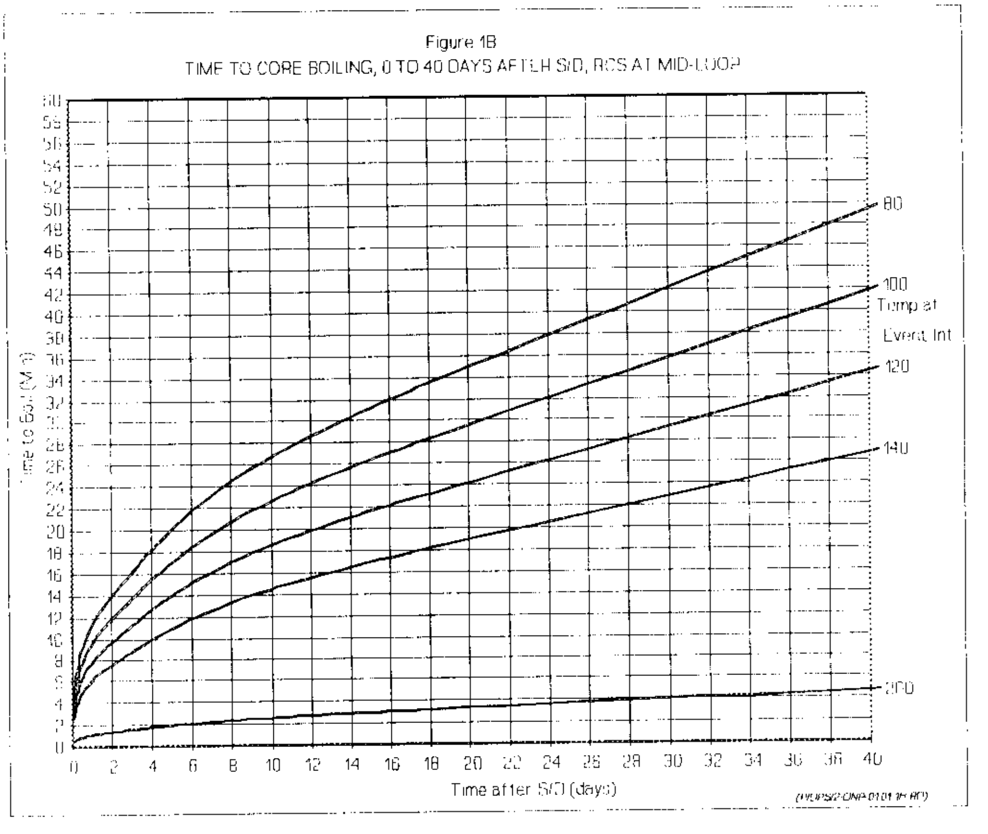
3. ENSURE an OOS log entry is made in accordance with 0-NOP-100.01, Equipment Out-Of-Service. ______

4. When the Clearance Order is released and PMT is completed, Then COMPLETE the OOS log to put the penetration back in service. ______

FIGURE 1

TIME TO CORE BOILING

(Page 2 of 3)



REFER TO FIGURE 1C FOR ADJUSTING TIME TO BOIL

Question 80

Unit 1 has entered 1-EOP-15 in preparation for once through cooling. Which of the following is the correct sequence to open the PORV's and the positive indication that the PORV's are open?

Pull two RPS Hi pressure bistables and:

A. position the PORV override switches to override. Verify PORV red lights lit.

B. position the PORV override switches to override. Verify acoustic flow monitors indicate flow.

C. ensure PORV control switches in normal. Verify PORV red lights lit.

D. ensure PORV control switches in normal. Verify acoustic flow monitors indicate flow.

A. Incorrect, override position is to close PORV, PORV red lights are not positive indication of position on Unit 1. Red/Green lights are pilot valve indication.

B. Incorrect, override position is to close PORV.

C. Incorrect, PORV red lights are not positive indication of position on Unit 1. Red/Green lights are pilot valve indication.

D. Correct

Question level: 1
Question source: New
Exam: RO/SRO
K/A: 074.EA1.05
Importance: 4.1
References: 1-EOP-15 Functional Recovery

4.6 RCS and CORE HEAT REMOVAL – HR-3 (continued)

Success Path 3 – Once-Through-Cooling (continued)

INSTRUCTIONS	**CONTINGENCY ACTIONS**
1. (continued)	
F. ENSURE **BOTH** of the following: 1. **BOTH** HPSI pumps are RUNNING. 2. **ALL** cold leg injection valves are OPEN.	F.1 If **NO** HPSI pumps are operating, or **NO** cold leg flow path exists Then: A. ENSURE **BOTH** PORV Block Valves are CLOSED, and **BOTH** PORV control switches are in OVERRIDE. B. **GO TO Step 15 Contingency Actions for success path HR-3.**
G. ENSURE **ALL** available charging pumps are RUNNING.	
H. ENSURE **BOTH** PORV block valves are OPEN.	
I. When at least **ONE** HPSI pump is RUNNING with a cold leg flowpath, Then OPEN **BOTH** PORVs. 1. ENSURE PORV control switches are in NORMAL. 2. PULL at least **TWO** RPS Hi Pressure bistables.	

pressure, allowing spring force to fail closed the valve.

The Unit 1 DC solenoid operates auxiliary contacts that energize indicating lamps (green for closed, red for open) on RTGB-103 above each PORV control switch.

> **CAUTION** - It is important to realize that this does not provide Unit 1 positive valve position indication, it only indicates whether or not the DC solenoid is energized.

- Unit 1 positive PORV valve position indication is discussed in the section describing the acoustic monitor system, which measures actual flow through the valve.

[Unit 2 has reed switches on the valve stem for positive position indication, which energize position indicating lamps (green for closed, red for open) on RTGB-203 above each PORV control switch].

RTD, **TE-1106**, installed in the combined PORV relief line, indicates that one or both PORVs have lifted or are leaking, by actuating an alarm to warn of high tailpipe temperature. The detector also supplies an input to TIA-1106, on RTGB-103.

[Unit 2 has a temperature element located in each PORV discharge pipe:
PORV V1474 RTD is **TE-1110**, PORV V1475 RTD is **TE-1106**. They supply independent temperature indicators on RTGB-203. Each temperature indicator inputs to a common alarm for high tailpipe temperature.]

PORV Control Overview{tc \l2 "PORV Control} (Figures 18 and 19)

- Each Unit 1 PORV has a three position (LOW RANGE/NORMAL RANGE/OVERRIDE) switch on RTGB-103.

- [Each Unit 2 PORV has a two position (LTOP/NORMAL) mode select switch and a three-position (OFF/OVERRIDE/TEST) switch on RTGB-203.]

- The NORMAL RANGE [NORMAL] position allows auto opening at **2400 [2370] psia**, via RPS bistables.

- Low Range [LTOP] position allows auto opening at 530 psia if ≤ 304°F, or 350 psia if ≤ 215°F [470 psia if ≤ 255°F], via low range pressure instruments and temperature interlocks.

Question 81

Which of the following states the response of MV-21-2 and MV-21-3 (Turbine Cooling Water and Open Blowdown Cooling system valves) and the reason for the response, upon receipt of a SIAS signal?

MV-21-2 and MV-21-3 will receive:

A. an open signal to ensure cooling flow to the OBCS heat exchangers for secondary sampling capability.

B. an open signal to ensure cooling flow to the OBCS heat exchangers in the event blowdown needs to be put in service during a SGTR.

C. a close signal to ensure the ICW pumps will not be at runout flow if the CCW TCV's failed open.

D. a close signal to ensure sufficient cooling flow to the CCW heat exchangers.

A. Incorrect, secondary sampling is cooled by CCW

B. Incorrect, blowdown will be aligned to the waste management system during a SGTR.

C. Incorrect, runout flow is prevented by use of restriction orfice and TCV open limits.

D Correct

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 062.AK3.02
Importance: 3.9
References: Design Basis Document DBD-ICW-1

COMPONENT FUNCTIONS
Section 7.4

Component ID	Description
I-MV-21-2, 3	**TCW/OBCS Isolation Valves**

Safety-Related Functions

1. Shall isolate ICW flow to the TCW and OBCS heat exchangers upon receipt of a SIAS to ensure sufficient cooling flow is available to the CCW heat exchangers during accident conditions.
   Reference: FSAR Section 3.2.1.1e (Ref 10.1.1)

2. Shall passively maintain the ICW system pressure boundary integrity.

Quality Related Function

NONE

Not Nuclear Safety Functions

1. Shall pass the required ICW flow to remove TCW and OBCS heat loads.

water flow necessary to mitigate any of the FSAR analyzed Design Basis Accidents (DBAs). Under these conditions, the "C" pump will not auto start but can be started manually on the train it is aligned to if that train's pump fails to start.

All components associated with the "A" train are powered from safety related "A" power. All components associated with the "B" train are powered from safety related "B" train power. The "C" pump is an installed spare and is powered from the safety related "AB" bus. This bus can be powered from either the "A" or "B" train safety related bus, but is normally powered from the "B" train (on Unit 1), which corresponds to the physical alignment of the ICW system as discussed earlier. Alignment of the "AB" bus to the "A" train can be accomplished manually from the control room via a "dead bus" transfer. This power swap not only requires the manual re-alignment of the ICW system cross-tie valves, but the CCW cross-tie valves as well. Since "AB" power can only come from either the "A" or "B" train but not both simultaneously, the physical alignment of the ICW and CCW systems ("cross-tie" valve configuration) must be to the same train as the electrical lineup. This is necessary in order to ensure the proper system configuration exists to the backed up train. This is particularly important when the "C" pump is operating as a replacement for one of the two required pumps. Control room annunciation will alert the operators if the electrical alignments are not in agreement.

The Turbine Cooling Water System and Open Blowdown Cooling System are classified as non-nuclear safety related systems and are therefore automatically isolated from the safety related portions of the ICW system upon receipt of a safety injection actuation signal (SIAS). The circulating water pump lube water supply lines are separated from the ICW system by Quality Group C, seismic qualified orifices. This effectively isolates these non-essential lube water supply lines from the essential portions of the ICW system. Thermal overload protection for these SIAS actuated motor operated isolation valves is bypassed for all operations except testing. Isolation of the non-essential portion from the essential portions of the ICW system can also be accomplished manually either locally or from the control room.

Automatic temperature control valves (TCVs), located at the outlet of each ICW supplied heat exchanger, will automatically control ICW flow through the heat exchangers. These valves are automatically modulated by the shell side water temperature of the respective heat exchanger. The ICW TCVs that control the CCW temperature will fail to a safe (i.e. "full open") position on a loss of air. The maximum opening of this TCV, along with the downstream installed restriction orifices in each ICW discharge header, will assure enough system backpressure to prevent pump runout flow under maximum flow conditions (i.e. SIAS with the CCW TCV failed full open). The orifice also provide for overall system flow balancing and provide a positive pressure downstream of the CCW heat exchanger TCVs, which minimizes the pressure drop, and thus the vibration or "chatter" across these valves.

Question 82

Unit 2 is at 100% power. The 2A3 4.16 KV bus is de-energized with the 2A Diesel Generator running with it's output breaker open. Which of the following caused this condition?
(assume the diesel output breaker is operating as designed)

A. A degraded voltage condition.

B. A under voltage condition.

C. A differential current condition.

D. A overcurrent condition.

A. Incorrect, bus tie breakers will open after time delay and Diesel breaker will close on bus

B. Incorrect, Diesel breaker will close on bus

C. Correct

D. Incorrect, overcurrent on individual component breakers, should not de-energize bus

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 062.K3.02
Importance: 4.4
References: Main Power Distribution Text 0711502, 2-0910054 Loss of Safety Related A.C. Bus, LP 0702502-7

Question 82

Unit 2 is at 100% power. The 2A3 4.16 KV bus is de-energized with the 2A Diesel Generator running with it's output breaker open. Which of the following caused this condition?
(assume the diesel output breaker is operating as designed)

A. A degraded voltage condition.

B. A under voltage condition.

C. A differential current condition.

D. A overcurrent condition.

A. Incorrect, bus tie breakers will open after time delay and Diesel breaker will close on bus

B. Incorrect, Diesel breaker will close on bus

C. Correct

D. Incorrect, overcurrent on individual component breakers, should not de-energize bus

Question level: 2
Question source: New
Exam: RO/SRO
K/A: 062.K3.02
Importance: 4.4
References: Main Power Distribution Text 0711502, 2-0910054 Loss of Safety Related A.C. Bus, LP 0702502-7

APPENDIX A

RESTORATION OF 2A3 (2B3) 4160V BUS

(Page 2 of 6)

1. (continued)

> CAUTION
>
> Resetting the differential current lockout relay will immediately result in the diesel output breaker closing and the diesel loading onto the bus.

E. If no apparent damage exists, one attempt may be made to reset the lockout.

F. Attempt to energize the bus from the 2A (2B) diesel generator, as follows:

1. Ensure the 2A (2B) diesel generator is up to full speed and voltage. Attempt a manual start of the engine if necessary.
2. When the diesel generator is ready to synchronize, insert the synchronize plug and make only one attempt to close in the 2A (2B) diesel output breaker 2-20211 (2-20401).
3. If the diesel generator did NOT start, or is NOT running correctly, send an operator to the diesel building to investigate.
4. Refer to applicable appendices to repower load centers.

G. If the bus has NOT been reenergized, Then attempt to cross tie the bus to the 2A2 (2B2) 4160V bus as follows:

1. Ensure breakers to be closed are first "greenflagged."
2. Make one attempt to close the 2A2/2A3 (2B2/2B3) tie breaker 2-20109 (2-20309).
3. Insert the synchronize plug and make only one attempt to close the 2A3/2A2 (2B3/2B2) tie breaker 2-20209 (2-20411).

H. Call the Electrical Department for assistance, if breaker(s) will NOT close.

closed simultaneously.

- An annunciator is actuated in each Control Room if the respective unit's AB 4.16 kV Bus is not aligned properly.

Emergency buses A3 and B3 are protected against an undervoltage (loss of voltage or degraded voltage) condition by fixed time undervoltage relays. Refer to subsequent sections of this text for the description of 4160V and 480V undervoltage protection. When actuated, these relays automatically initiate:

- starting of the Emergency Diesel Generator (EDG)
- bus load shedding
- open the emergency bus main feeder breaker

This isolates the emergency buses from the rest of the main power distribution system. Each EDG set is automatically started and loaded by controls and circuitry that are independent of those used to start the other EDG. To prevent EDG overloading, all but a few selected load breakers open (load shedding). These loads are referred to as the first load block and are energized as soon as the EDG breaker closes (0.0-0.2 seconds). The following three ESFAS actuated pumps are included in the first load block of the EDG loading sequence on both units:

- High Pressure Safety Injection (HPSI) Pumps
- Charging Pumps (From LC A2 / B2)
- Boric Acid Makeup (BAM) Pumps

Following this initial loading of the diesels, load sequencing relays sequentially load major safety-related loads back on their respective buses at a fixed timed sequence. Load sequencing differs slightly depending on whether there is just a loss of off-site power or a loss of off-site power with an ESFAS actuation. Refer to Unit 1 and Unit 2 UFSAR table 8.3-2 for the complete EDG loading sequence.

Each 4.16 kV bus is provided with the following protection:

- A bus lockout relay, mounted on the front of each 4.16 kV bus, is actuated by the bus differential current relay and causes all possible power <u>sources</u> to the bus to open.

- Undervoltage and overcurrent relays that protect the bus loads. The undervoltage relays are located on the bus. The overcurrent relays are in the individual bus load circuits.

- The incoming feeder breakers are protected by overcurrent relays. Backup relaying to trip preferred or normal power sources is provided on the <u>A2 and B2 Buses only</u>.

The 4.16 kV emergency buses incoming breakers and all 4.16 kV outgoing breakers are rated 250 MVA interrupting capacity and 80,000 amp momentary capacity. The 4.16 kV normal buses incoming breakers have 350 MVA interrupting capacity.

The bus lockout relay can only be reset at the switchgear, only after the fault is cleared, and the Relay Department has determined it safe to reclose incoming breakers.

- Resetting the bus lockout on the A3 or B3 bus could result in EDG breaker closure. Refer to the Operating Experience Section of this text.

STATION SERVICE TRANSFORMERS{TC \L2 "STATION SERVICE TRANSFORMERS}

Unit 1 has seven 4160/480 volt station service (SS) transformers. [Unit 2 has nine.] All seven Unit 1 SS transformers, including the steam generator blowdown treatment facility (SGBTF), are dry-type air cooled transformers. On Unit 2, the SGBTF transformer and pressurizer heater transformers (2A3/2B3) are dry-type air cooled transformers. The other six Unit 2 SS transformers are oil filled concentric wound transformers with a forced air cooling system.

The Unit 2 SS transformers are sealed units with dry nitrogen cover gas installed to prevent moisture from contaminating the oil. Because the transformers are sealed, it is expected that the pressure will rise and fall with the oil temperature. They are designed to operate in the range of +8 to -8 psig. A relief valve set at 10 psig protects the transformer "tanks".

The electrical faults resulted from several factors including:

- Several insulators supporting the isophase bus conductor failed, either due to age or fatigue, or during the event due to the fault currents.

- Smoke and molten aluminum from the fault in the isophase bus were carried down the isophase duct which contributed to causing phase to ground faults between the 'A' and 'B' isophase bushings at the 'B' main transformer.

- Foreign material, including a cold chisel, a wire brush, and ventilation damper blades were present in the isophase duct.

Refer to SER 1-90, Unplanned Plant Transient and Damage to Major Electrical Buses Due to Ground Faults, for more information.

Loss of the 1A3 4160V Bus at St. Lucie Unit 1

On St. Lucie Unit 1 in 1986, the 1A3 4160V bus was deenergized for approximately 10 minutes due to an inadvertent actuation of a differential current protective relay. The differential current lockout prevented EDG 1A from reenergizing the bus. The loss of the bus resulted in the loss of various instrumentation and controls, isolation of letdown flow, loss of the 1A ICW pump. Adverse effects included an increase in PZR level and pressure along with an increase in 'A' train CCW temperatures. However, the plant remained at 100% power throughout the event. Once the relay was reset, the diesel energized the bus. A short time later, the bus was realigned to the A2 4160V bus.

- The cause of this event was a cognitive personnel error by a maintenance technician when he failed to ensure that the breaker cubicle door was fully open while inserting the breaker. The breaker shorted out two contacts on the door mounted relay causing it to activate.

excellent arc quenching capability as well as exceptionally good electrical insulating characteristics. The moving electrical stab, which is moved from outside the sealed gas enclosure by a connecting cylinder rod, makes or breaks a contact in each phase simultaneously. The arc is quenched by SF_6 gas blasted against the closing and opening contacts by a puffer cylinder riding with the moving contact. The electrical current flow is transported into and out of the gas enclosure by gas filled bushing assemblies, six total or two per phase.

Air Circuit Breakers (ACB){tc \l2 "Air Circuit Breakers (ACB)}

Air circuit breakers are used in most other system applications, including some high voltage applications where large ACBs are necessary. ACBs use forced air as the medium that removes main contact heat and prevents arcing. The breaker is shut and tripped open by individual shutting and trip springs, each actuated by an electric coil.

Breaker Trip Conditions{tc \l2 "Breaker Trip Conditions}

In order to protect the breaker itself or its associated supply component or load, most breakers are protected by relays that will trip the breaker. The following are general definitions of some of the more common trip conditions:

- **Differential Current** - Phase currents into and out of a differential zone are compared. Too great a differential will cause a breaker trip.

- **Fault/Overload Current** - Excessive current will cause a breaker trip.

- **Fault Pressure** - Sudden pressure change in a transformer. For the startup and auxiliary transformers this fault pressure actuates a relay causing the main generator to trip. A fault pressure as sensed in the main transformers only results in an alarm being generated.

Breaker Numbering{tc \l1 "Breaker Numbering}

The switchyard numbering system uses the Florida Power and Light Switch Numbering Code. The plant uses individual unit numbering systems in each Unit.

Question 83

Which of the following will automatically initiate Containment Spray flow on Unit 1? (Assume initiate logic has been met)

A. RCS pressure of 1600 PSIA for SIAS OR containment pressure of 10.0 PSIG for CSAS.

B. RCS pressure of 1736 PSIA for SIAS AND containment pressure of 5.0 PSIG for CSAS.

C. Containment pressure of 3.5 PSIG for SIAS OR containment pressure of 5.0 PSIG for CSAS.

D. Containment pressure of 5.0 PSIG for SIAS AND containment pressure of 10.0 PSIG for CSAS.

A. Incorrect, Setpoints are met but CSAS requires both SIAS and Containment pressure.

B. Incorrect, 1736 is the unit-2 setpoint for SIAS on RCS pressure and Containment pressure isn't high enough.

C. Incorrect, CSAS requires SIAS actuation and Containment pressure greater than 9.4 PSIG.

D. Correct

Question Level: 1
Question Source: Bank
Exam: RO/SRO
K/A:022.A3.01
Importance: 4.3
References: 0711401, 0702401-2 ESFAS, 1-ARP-01-R1 and R5

SYSTEM DATA

ESFAS DATA TABLE

SIGNAL	PARAMETER	APPROXIMATE SETPOINT UNIT 1	APPROXIMATE SETPOINT UNIT 2	DESIGN BASES EVENT
SIAS	LO Pzr Pressure	1600 psia	1736 psia	LOCA
	HI Cntmt Pressure	5.0 psig	3.5 psig	
CIS	HI Cntmt Pressure	5.0 psig	3.5 psig	LOCA
[CIAS]	SIAS Actuation	---	---	
	HI Cntmt Radiation	10 R/hr	10 R/hr	
	(Refueling)	90 mr/hr	90 mr/hr	
MSIS	LO S/G Pressure	600 psia	600 psia	Stm Line Break
	[HI Cntmt Pressure]	N/A	3.5 psig	
CSAS	HI Cntmt Pressure...	10 psig	5.4 psig	LOCA
	with SIAS Actuation	w/SIAS	w/SIAS	Stm Line break
RAS	LO RWT Level	4 ft.	6 ft.	LOCA

DSS*	HI Pzr Pressure	2450 psia	2450 psia	ATWS total loss of FW with No RPS trip

NOTE: The AFAS-1 and AFAS-2 signals are considered by the FSAR and Technical Specification to be part of the ESFAS. For instructional purposes, due to the difference in flowpath and operational design, they are taught in the AFAS/Auxiliary Feedwater Lesson Text.

Loss of power to safety related buses is addressed in the ESFAS Technical Specifications, but is addressed instructionally in Main Power Distribution text.

* The DSS is <u>not</u> an ESFAS signal, but is functionally identical to other ESFAS signals. Since the DSS equipment is located in the ESFAS cabinets, it is described in this text.

REVISION: 0	PROCEDURE TITLE: ANNUNCIATOR RESPONSE PROCEDURE	PANEL: R
PROCEDURE NO: 1-ARP-01-R1	ST. LUCIE UNIT 1	WINDOW: 1

ANNUNCIATOR PANEL R

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

CSAS
CHANNEL A/B
ACTUATION

R-1

DEVICE:	LOCATION:	SETPOINT:
CSAS Channel A Actuation Relay	ESC-SA	Energized
PB 302-1/CSAS ON	RTGB-106	Depressed (Coincident with CSAS ON)
CS/302-1/CHANNEL A CSAS	RTGB-106	CSAS ON (Coincident with Think button depressed)
BA102/202/302/402 (CSAS)	ESC-MA/MB/MC/MD	At least two of the bistables TRIP lights are LIT
CSAS Channel B Actuation Relay	ESC-SB	Energized
PB 303-1/CSAS ON	RTGB-106	Depressed (Coincident with CSAS ON)
CS/303-1/CHANNEL B CSAS	RTGB-106	CSAS ON (Coincident with Think button depressed)
BA102/202/302/402 (CSAS)	ESC-MA/MB/MC/MD	At least two of the bistables TRIP lights are LIT

ALARM CONFIRMATION:

1. RED light above CHANNEL A CSAS control switch is LIT
2. RED light above CHANNEL B CSAS control switch is LIT.
3. At least two Containment Pressure ESFAS indications (PIS-07-2A/2B/2C/2D) are above 9.4 psig.

OPERATOR ACTIONS:

1. If at least two Containment Pressure ESFAS channels (PIS-07-2A/2B/2C/2D) indicate above 9.4 psig, Then ENSURE CSAS is ACTUATED.
2. If an ESFAS Containment Pressure channel is failed, Then IMPLEMENT 1-ONP-99.01, Loss of Tech Spec Instrumentation.

CAUSES: Alarm may be caused by **EITHER** of the following conditions:

- Containment Pressure high due to RCS leak or steam leak
- Containment Pressure ESFAS instrumentation failure

REFERENCES:

1. CWD CWD 8770-B-327 sheets 302 and 303
2. I&C 1-1400052

ANNUNCIATOR PANEL R

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

SIAS
CHANNEL A/B
ACTUATION

R-5

DEVICE:	**LOCATION:**	**SETPOINT:**
SIAS Channel A Actuation Relay	ESC-SA	De-energized
PB 246-1/SIAS ON	RTGB-106	Depressed (Coincident with SIAS ON)
CS/246-1/CHANNEL A SIAS	RTGB-106	SIAS ON (Coincident with Think button depressed)
BA101/201/301/401 (SIAS)	ESC-MA/MB/MC/MD	At least two of the bistables TRIP lights are LIT
BA106/206/306/406 (SIAS)	ESC-MA/MB/MC/MD	At least two of the bistables TRIP lights are LIT
SIAS Channel B Actuation Relay	ESC-SB	De-energized
PB 248-1/SIAS ON	RTGB-106	Depressed (Coincident with SIAS ON)
CS/248-1/CHANNEL A SIAS	RTGB-106	SIAS ON (Coincident with Think button depressed)
BA101/201/301/401 (SIAS)	ESC-MA/MB/MC/MD	At least two of the bistables TRIP lights are LIT
BA106/206/306/406 (SIAS)	ESC-MA/MB/MC/MD	At least two of the bistables TRIP lights are LIT

ALARM CONFIRMATION:

1. RED light above CHANNEL A SIAS control switch is LIT.
2. RED light above CHANNEL B SIAS control switch is LIT.
3. At least two Pressurizer Pressure ESFAS indications (PI-1102ALL/BLL/CLL/DLL) are below 1612.5 psia.
4. At least two Containment Pressure ESFAS indications (PIS-07-2A/2B/2C/2D) are above 4.4 psig.

OPERATOR ACTIONS:

1. If at least two Pressurizer Pressure ESFAS channels (PI-1102ALL/BLL/CLL/DLL) indicate below 1612.5 psia, Then ENSURE SIAS is ACTUATED.
2. If at least two Containment Pressure ESFAS channels (PIS-07-2A/2B/2C/2D) indicate above 4.4 psig, Then ENSURE SIAS is ACTUATED.
3. **If SIAS is actuated, Then GO TO 1-EOP-1, Standard Post Trip Actions.**
4. If an ESFAS Pressurizer Pressure or Containment Pressure channel is failed, Then IMPLEMENT 1-ONP-99.01, Loss of Tech Spec Instrumentation.

CAUSES: Alarm may be caused by **ANY** of the following conditions:

- Pressurizer Pressure low due to an RCS leak, excessive steam demand or malfunction of the Pressurizer pressure control system
- Containment Pressure high due to RCS leak or steam leak
- Pressurizer Pressure or Containment Pressure ESFAS instrumentation failure

REFERENCES:

1. CWD 8770-B-327 sheets 246 and 248
2. I&C 1-1400052

REVISION: 0A	PROCEDURE TITLE: ANNUNCIATOR RESPONSE PROCEDURE	PANEL: S
PROCEDURE NO: 2-ARP-01-S7	ST. LUCIE UNIT 2	WINDOW: 7

ANNUNCIATOR PANEL S

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

CSAS
CHANNEL A/B
ACTUATION
S-7

DEVICE:	**LOCATION:**	**SETPOINT:**
CSAS Channel A Actuation Relay	ESC SA	Energized
PB 302-1/CSAS ON	RTGB 206	Depressed (Coincident with CSAS ON)
CS/302-1	RTGB 206	CSAS ON (Coincident with Think button depressed)
BA 102/202/302/402	ESC-MA/MB/MC/MD	At least two bistable TRIP lights LIT
CSAS Channel B Actuation Relay	ESC SB	Energized
PB 303-1/CSAS ON	RTGB 206	Depressed (Coincident with CSAS ON)
CS/303-1	RTGB 206	CSAS ON (Coincident with Think button depressed)
BA 102/202/302/402	ESC-MA/MB/MC/MD	At least two bistable TRIP lights LIT
PIS-07-2A thru PIS-07-2D	RTGB 206	5.31 psig two out of four logic and SIAS signal present

ALARM CONFIRMATION:

1. CSAS on Channel A, RED light LIT
2. CSAS on Channel B, RED light LIT
3. At least two Containment Pressure ESFAS indications (PIS-07-2A/2B/2C/2D) are above 5.4 psig.

OPERATOR ACTIONS:

1. If at least two Containment Pressure ESFAS indications (PIS-07-2A/2B/2C/2D) are above 5.4 psig, Then ENSURE CSAS is ACTUATED.
2. If any Containment Pressure instruments are failed, Then IMPLEMENT 2-ONP-99.01, Loss of Tech Spec Instrumentation.

CAUSES: Alarm may be caused by **EITHER** of the following conditions:

- Containment Pressure high due to RCS leak or steam leak.
- Containment Pressure ESFAS instrumentation failure.

REFERENCES:

1. CWD 2998-B-327 SH 302, 303, 295
2. Technical Specifications
3. 2-IMP-69.02
4. 2-IMP-69.03

/R0A/R0A

REVISION:	PROCEDURE TITLE:	PANEL:
0A	ANNUNCIATOR RESPONSE PROCEDURE	R
PROCEDURE NO:		WINDOW:
2-ARP-01-R6	ST. LUCIE UNIT 2	6

ANNUNCIATOR PANEL R

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

SIAS
CHANNEL A/B
ACTUATION

R-6

DEVICE:	LOCATION:	SETPOINT:
SIAS Channel A Actuation Relay	ESC-SA	De-energized
PB 246-1/SIAS ON	RTGB-206	Depressed (Coincident with SIAS ON)
CS/246-1/CHANNEL A SIAS	RTGB-206	SIAS ON (Coincident with Think button depressed)
BA101/201/301/401 (SIAS)	ESC-MA/MB/MC/MD	At least two of the bistables TRIP lights are LIT
BA106/206/306/406 (SIAS)	ESC-MA/MB/MC/MD	At least two of the bistables TRIP lights are LIT
SIAS Channel B Actuation Relay	ESC-SB	De-energized
PB 248-1/SIAS ON	RTGB-206	Depressed (Coincident with SIAS ON)
CS/248-1/CHANNEL B SIAS	RTGB-206	SIAS ON (Coincident with Think button depressed)
BA101/201/301/401 (SIAS)	ESC-MA/MB/MC/MD	At least two of the bistables TRIP lights are LIT
BA106/206/306/406 (SIAS)	ESC-MA/MB/MC/MD	At least two of the bistables TRIP lights are LIT

ALARM CONFIRMATION:

1. RED light above CHANNEL A SIAS is LIT.
2. RED light above CHANNEL B SIAS is LIT.
3. At least two Pressurizer Pressure ESFAS indications (PIA-1102ALL/BLL/CLL/DLL) are below 1740 psia.
4. At least two Containment Pressure ESFAS indications (PIS-07-2A/2B/2C/2D) are above 3.4 psig.

OPERATOR ACTIONS:

1. If at least two Pressurizer Pressure ESFAS channels (PIA-1102ALL/BLL/CLL/DLL) indicate below 1740 psia, Then ENSURE SIAS is ACTUATED.
2. If at least two Containment Pressure ESFAS channels (PIS-07-2A/2B/2C/2D) indicate above 3.4 psig, Then ENSURE SIAS is ACTUATED.
3. **If SIAS is actuated, Then GO TO 2-EOP-1, Standard Post Trip Actions.**
4. If an ESFAS Pressurizer Pressure or Containment Pressure channel is failed, Then IMPLEMENT 2-ONP-99.01, Loss of Tech Spec Instrumentation.

CAUSES: Alarm may be caused by **ANY** of the following conditions:

- Pressurizer Pressure low due to an RCS leak, excessive steam demand or malfunction of the Pressurizer pressure control system
- Containment Pressure high due to RCS leak or steam leak
- Pressurizer Pressure or Containment Pressure ESFAS instrumentation failure

REFERENCES:

1. CWD 2998-B-327 sheets 246 and 248
2. 2-IMP-69.02
3. 2-IMP-69.03

/R0A/R0A

Question 84

The Unit 2 ‘A’ Channel Boron Dilution Monitor has gone into alarm due to an instrument failure. Which instrument has failed?

A. The boronometer.

B. The ‘A’ log Startup channel.

C. The ‘A’ Wide Range Log Safety channel.

D. The ‘A’ Excore Neutron Flux Monitoring System.

A. Incorrect, Boronometer does not input into this alarm.

B. **Correct**

C. Incorrect, Wide Range not input

D. Incorrect, Unit-1 uses the Excore Neutron Flux Monitoring System.

Question Level: 1
Question Source: Bank
Exam: RO/SRO
K/A:032.G2.1.27
Importance: 2.9
References: 0711403, 0702403-3 Nuclear Instrumentation

TABLE 2, Nuclear Instrumentation Unit Differences

WIDE RANGE SAFETY CHANNELS

Unit 1	Unit 2
Audio Count Rate from WR Log	(Audio Count rate from BF_3)
Remote Meters Indication in CPS and %	[% only]
>10^3 CPS, remote lamp swaps to % Log Power, CPS light off (1 Fission Chamber operation)	[No extended/source range monitoring] (uses BF_3 for source)
ZPMB LED B/S @ < 0.1%	[< 0.5%]
PDIL on CEAPDS	[On ADS]
2 Fission Chambers/Channel	1 Fission Chamber/Channel, with one installed spare.
1 Recorder, w/channel select pushbutton on RTGB	1 Recorder/Channel on RTGB

EXCORE NEUTRON FLUX MONITORING SYSTEM (APP. "R")

Unit 1	Unit 2
Dixon Meters on RTGB 104	Versatile Meters on RTGB 204 Dixon meters on the RSCP
Boron Dilution Alarm	(from BF_3 source range)

LINEAR POWER RANGE SAFETY CHANNELS

Unit 1	Unit 2
Comparator Average	N/A
Subchannel Deviation	N/A

TABLE 2, Nuclear Instrumentation Unit Differences (Cont'd)

LINEAR POWER RANGE CONTROL CHANNELS

Unit 1	Unit 2
N/A	Combined Drawer w/Startup Channel
N/A	Meter Select Switch for Alternate Inputs
HV Supply B/S Alarm	Trouble Alarm

LOG STARTUP CHANNELS (UNIT 2 ONLY)

BF_3 Detectors
Hi Voltage Cut Out @ 10,000 CPS
1 Recorder on RTGB 204/(2 speeds) for Startup
Audio Count Rate
Boron Dilution Alarm

ANNUNCIATOR PANEL K

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

CHAN A EXCORE
NI SYS
TROUBLE/
BORON DILUTION
K-31

DEVICE:	LOCATION:	SETPOINT:
RY-26-80A2	RAB/43/N-RA3/W-RA1	Multiple
High voltage power supply low	Data Processor	Between 820 and 920V DC
+15V DC power supply low	Data Processor	Between +14.5 and 15.5V DC
-15V DC power supply low	Data Processor	Between -14.5 and 15.5V DC
Cable continuity low	Data Processor	Preset
RIC-26-80A	RTGB-104	Signal Microprocessor (multiple of neutron count rate)

ALARM CONFIRMATION:

1. Trouble:
   - Monitor failure.
   - Excore Neutron Monitoring Channel A meter and indicator failed.
2. Boron Dilution:
   - Rising count rate on Excore Neutron Monitoring System.
   - Rising count rate on Wide Range Nuclear Instrumentation.
   - Shutdown Monitor red ALARM light is LIT.
   - Boronometer indicates dilution.

OPERATOR ACTIONS:

1. If Monitor failure is indicated, Then MONITOR Excore Neutron Monitoring Channel B. /R1
   A. NOTIFY I&C to investigate the cause.
2. If Boron dilution is indicated, Then PERFORM the following:
   A. STOP diluting. /R1
   B. NOTIFY Chemistry to sample the RCS.
   C. GO TO 1-ONP-01.07, Recovery From Dilution of RCS Loops. /R1

CAUSES: This annunciator may be caused by a detector, detector cable or power supply malfunction. It may also be caused by a boron dilution event.

REFERENCES:
1. CWD 8770-B-327 sheets 58 and 399
2. VTM 8770-11291

REVISION:	PROCEDURE TITLE:	PANEL:
3	ANNUNCIATOR RESPONSE PROCEDURE	L
PROCEDURE NO:		WINDOW:
2-ARP-01-L31	ST. LUCIE UNIT 2	31

ANNUNCIATOR PANEL L

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

BORON
CONCENTRATION
LOW
CHANNEL 1
L-31

DEVICE:
Boron Dilution Calculator

LOCATION:
RTGB-204

SETPOINT:
Variable

ALARM CONFIRMATION:
1. JR-005/006, Start up Channel, indicates counts are rising.
2. Start up Nuclear Instruments, at the RRS, indicate counts are rising.
3. JI-001A thru JI-OO1D, Wide Range % Power, indicate counts rising.
4. JR-001A thru JR-001D, Wide Range % Power, indicate counts rising.
5. Boronometer indicates boron concentration is Lower.
6. Audio Count Rate, if selected to channel #1, indicates rising counts.

NOTE

BDAS alarm error codes are as follows:
E.01 Boron Dilution Event
E.02 Computer Board Malfunction
E.03 Computer Board Malfunction

OPERATOR ACTIONS:
1. PERFORM a Channel Check with Channel 2 Boron Dilution system to Validate alarm.
2. If the alarm is not valid, Then IMPLEMENT 2-ONP-99.01, Loss of Tech Spec Instrumentation.
3. If a dilution is in progress, Then STOP the dilution.
4. If monitor failure is indicated, Then NOTIFY I&C to investigate the cause.
5. GO TO 2-ONP-01.07, Recovery From Dilution of RCS Loops.

CAUSES: This annunciator can be caused by the Startup control channel detecting a dilution event by raising count rate, or a failed Linear Range Nuclear Instrument in the Reactor Regulating System.

REFERENCES:
1. CWD 2998-b-327 SH 64, 55, 57, 60, 405
2. VTM 2998-15561
3. USFAR Sections 7.7.1.1.11, 15.4.2.3.9 & 15.4.2.4

/R3

- The operator can also manually remove detector voltage with the switches mounted on RTGB 204.
- MUST manually energize the detectors when decreasing power (at ~10^{-4}%) following shutdown.
- A pushbutton on the drawer enables viewing either the Startup or Control Channel detector voltage.

Audible Countrate Circuitry

The audio count rate (ACR) circuit provides an audible indication of startup detector counts. Because the range of the startup channel is from 1 to 10^5 counts per second, it is necessary to divide the input count rate to provide the operator with a discernible audio level change during increasing or decreasing counts. The divider network provides a voltage that is proportional to the input frequency. This voltage level is used as an input to a tone generator. The tone generator is capable of producing five tone output frequencies, dependent on the input voltage, increasing in frequency with counts.

The audio count rate circuit provides two audio outputs. One supplies an audio signal to speakers located in the containment, and the other supplies speakers in the control room. The volume controls for the speakers are located inside RTGB 204; audio output on/off switches are located inside RTGB 204; a toggle switch, located on the vertical section of RTGB 204, allows the operator to select detector A or B. A scaler control allows the operator to determine the multiple the output is divided by (1, 10, 100, 1000). **Recall that audible count rate is from the Wide Range Log Power Channel on Unit 1.**

Unit 2 Boron Dilution Alarm System

The startup channels provide the CPS signal that is monitored by the Boron Dilution Alarm System. Each Boron Dilution Alarm Module displays one of two indications: Countrate or Alarm Setpoint. The flux/setpoint button changes the display between the two. Whichever display is being shown (flux or setpoint) will be backlit. The reset button resets the setpoint to a value that is a higher voltage than the current countrate voltage. This value above the countrate voltage is determined by a switch inside the

Question 85

A fire has been reported in the Unit 1 Turbine Switchgear room. The NWE who is currently the fire team leader is at the site medical facility. Which of the following individuals can be used to fill the team leader vacancy? (assume shift is at minimum complement IAW AP 0010120, "Conduct of Operations")

A. Unit 1 Desk RCO (qualified as SRCO)

B. Unit 1 SNPO (qualified as SNPO)

C. Unit 1 NPO (qualified as NPO)

D. Unit 1 ANPO (qualified as ANPO)

A. Incorrect, part of minimum shift complement

B. **Correct**

C. Incorrect, not listed as fire team leader replacement

D. Incorrect, not listed as fire team leader replacement

Question Level: 1
Question Source: Bank
Exam:RO/SRO
K/A: 067.G2.4.26
Importance: 3.3
References: 0010120 Conduct of Operations, 1800022 Fire Protection Plan

APPENDIX B
SHIFT STAFFING
(Page 1 of 2)

1. Minimum shift crew complement shall be maintained as follows, regardless of the operating mode of either unit:

   1 Nuclear Plant Supervisor (NPS)

   1 Assistant Nuclear Plant Supervisor (ANPS) per unit

   1 Fire Brigade Leader (NWE / SNPO)

   2 Licensed Reactor Operators (RCO / SRCO) per unit

   1 Senior Nuclear Plant Operator (SNPO) or Nuclear Operator (NO) per unit

   1 Nuclear Plant Operator (NPO) or Nuclear Turbine Operator (NTO) per unit

   1 Associate Nuclear Plant Operator (ANPO)

   1 Shift Technical Advisor (STA)

2. Except for the shift supervisor, If a member of the minimum shift crew complement becomes sick or disabled, Then immediate action shall be taken to fill the vacancy. The vacancy shall be filled within two hours.

3. §5 Shift Technical Advisor – Technical Specification Amendments 173 (Unit 1) and 113 (Unit 2) allow the use of a dual role SRO / STA function in lieu of a stand alone dedicated non-licensed STA. The following are the four possible ways of filling the STA position:

   A. One individual holding a SRO license (active) and satisfying the qualification requirements of T.S. 6.3.1 fulfilling the Shift Supervisor (NPS) and STA role concurrently.

   B. Two individuals both holding SRO licenses (active) and satisfying the qualification requirements of T.S. 6.3.1 fulfilling the Unit SRO (ANPS) and STA roles concurrently. If one unit is in Mode 5 or 6, Then that unit's ANPS is NOT required to concurrently satisfy the STA role.

   C. One individual holding a SRO license (active or inactive) and satisfying the qualification requirements of T.S. 6.3.1 fulfilling the STA role with no individual unit command and control responsibilities.

8.0 INSTRUCTIONS: (continued)

8.7 (continued)

6. (continued)

A. Fire Brigade Qualifications

The following requirements must be accomplished for qualification as a Fire Brigade member:

1. Pass annual Fire Brigade or Licensed Operator Physical.
2. Satisfactory completion of initial and requalification training.
3. Attendance at a minimum of two (2) Fire Brigade drills annually
4. Annual participation in Fire Brigade practical field exercises
5. Respirator qualified

B. Composition and Responsibility

A Shift Fire Brigade of at least five members shall be maintained on site at PSL at all times. Fire brigade shift composition may be less than the minimum requirements for a period of time not to exceed two hours in order to accommodate unexpected absence of Fire Brigade members, provided immediate action is taken to restore the Fire Brigade shift to within the minimum requirements. Off duty fire brigade members are subject to recall to duty when necessary. The fire brigade shift shall not include the Nuclear Plant Supervisor, nor the three other members of the minimum shift crew necessary for safety shutdown of the unit and any personnel required for essential functions during a fire emergency. Each shift will have a Fire Brigade Leader assigned. A list of all qualified Fire Brigade members is maintained in a current, up-to-date condition in the Personnel Qualification Database (PQD).

Question 86

Unit 2 is operating at 100% power steady state with only the 2B charging pump running. The following annunciator is received:

- M-31 2B Charging pump trouble

You notice the 2B Charging pump has tripped. Which of the following has caused the Charging pump to trip and what are the required operator actions as a result of the charging pump tripping?

The Charging pump has tripped on low:

A. oil level, start the standby charging pump.

B. oil pressure, isolate letdown.

C. seal tank level, fill seal tank and re-start charging pump.

D. seal tank level, isolate letdown.

A. Incorrect, oil level will not trip the charging pump

B. Correct

C. Incorrect, charging will not trip on tank level, must isolate letdown

D. Incorrect, charging will not trip on tank level

Question Level: 2
Question Source: New
Exam: RO/SRO
K/A: 022.AA1.01
Importance: 3.3
References: 2-ARP-01-M31, 2-ONP-02.03 Charging and Letdown

ANNUNCIATOR PANEL M

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

2B CHARGING PUMP TROUBLE

M-31

DEVICE:	**LOCATION:**	**SETPOINT:**
63Y/187	RAB/5/S-RA2/E-RAD	Energized
PS-2234Y (Oil pressure)	RAB/4/S-RA2/E-RAE	4 psig
LIA-2233Y/177 (Oil level)	RAB/3/S-RA2/E-RAE	LOW (Microswitch at oil sightglass)
71Y/187	RAB/5/S-RA2/E-RAD	Energized
LS-2234Y/177 (Seal Tank level)	RAB/3/S-RA2/E-RAE	10 inches WC

ALARM CONFIRMATION:

1. 2B Charging Pump indicating lights (Breaker will trip on low oil pressure).

OPERATOR ACTIONS:

1. DISPATCH an operator to check 2B Charging Pump oil pressure, oil level and Seal Tank level.
   A. If 2B Charging Pump oil pressure is <4.0 psig, Then PERFORM the following: /R0A
      1. STOP 2B Charging Pump.
      2. **GO TO 2-ONP-02.03, Charging and Letdown.**
   B. If 2B Charging Pump Reducing Unit oil level is low, Then START the standby charging pump and STOP 2B Charging Pump in accordance with 2-NOP-02.02, Charging and Letdown. /R0B
   C. If the 2B Charging Pump Seal Tank level is low, Then PERFORM the following:
      1. FILL the Seal Tank as directed by the NPS/ANPS.
      2. MONITOR 2B Charging Pump leakage and take any required action based on observed leakage as specified in 2-NOP-02.02, Charging and Letdown. /R0A

CAUSES: Alarm may be caused by **ANY** of the following:

- Low oil pressure (4 psig) if pump is operating (15 second TD on pump start)
- Low oil level in the speed reducing unit
- Low water level in the stuffing box seal tank

REFERENCES

1. CWD 2998-B-327 sheet 178 and 187
2. P&ID 2998-G-078 sheets 105B and 122
3. TEDB

6.0 OPERATOR ACTIONS

INSTRUCTIONS	CONTINGENCY ACTIONS
1. If letdown flow is lost, Then STOP the charging pumps. **A.** RETURN the charging pump control switches to AUTO.	

> **CAUTION**
> Severe thermal stress and flashing may occur in the Regenerative Heat Exchanger if letdown flow is NOT immediately isolated.

INSTRUCTIONS	CONTINGENCY ACTIONS
2. If charging flow is lost, Then ISOLATE letdown.	**2.1** ISOLATE Letdown by the following: **A.** CLOSE V2515, Stop Valve-IC **B.** CLOSE V-2516, Containment Isol Valve-IC. **C.** CLOSE V2522, Containment Isol Valve-OC.

> **NOTE**
> With Charging and Letdown isolated pressurizer level will lower slowly due to RCP controlled bleedoff flow.

INSTRUCTIONS	CONTINGENCY ACTIONS
3. If charging and letdown flow has been lost, Then MAINTAIN Reactor power and RCS temperature constant to minimize pressurizer level deviations.	
4. VERIFY all applicable automatic actions have occurred. Appendix A contains a listing of expected automatic actions.	

Question 87

Unit 1 is experiencing an unexplained Gas Decay Tank pressure decrease of 15 psig per hour. Area radiation monitors are alarming in response to the leaking Gas decay tank. Other than alarms, which of the following, if any, will be the automatic actions?

A. No automatic actions will occur

B. The ECCS exhaust fans will start

C. The backup RAB supply and exhaust fans will start

D. The running RAB supply and exhaust fans will stop

A. Correct

B. Incorrect, ECCS exhaust fans start on SIAS

C. Incorrect, no auto start feature, procedure requires manual start

D. Incorrect, no auto stop feature

Question Level: 2
Question Source: New
Exam: RO/SRO
K/A: 060.AA2.05
Importance: 4.2
References: 1-0530031 Uncontrolled Release of Radioactive Gas

5.2 Radioactive Gas Leak:

1. Symptoms:

   A. High radiation alarm on Process Radiation Monitor Channel 42.

   B. High radiation alarm on Plant Vent Process Monitoring System.

   C. An area radiation monitor alarm.

   D. An unexplained loss of gas from the system.

      1. § If a Gas Decay Tank loses greater than 1 psig per 8 hours for 9 consecutive 8 hour shifts,

         OR

         9 psig in 72 hours

         AND

         the losses were determined to be to the Reactor Auxiliary Building Atmosphere, Then the following actions should be initiated:

         - Commence Leak Searching to locate the source of the leak per Appendix A.
         - Shift Gas Decay Tanks to determine if the in-service tank was leaking.
         - Temporarily Isolate the Gas Analyzer from the in-service tank to verify the Gas Analyzer is not the source of the leak,

           AND

           Notify Chemistry to commence Tech Spec 4.11.2.5.1 (FUSAR) grab sampling requirements for Gas Analyzer not continuously monitoring the in-service tank.

           OR

5.2 Radioactive Gas Leak: (continued)

1. **D.** (continued)

2. § From C-200, ODCMs Definition of an Unplanned Release, If a Gas Decay Tank loses greater than 2 psig per 8 hours for 9 consecutive 8 hour shifts,

OR

18 psig in 72 hours,

AND

the losses were determined to be to the Reactor Auxiliary Building Atmosphere, Then DECLARE the losses as an Unplanned Gas Release,

AND

NOTIFY Chemistry to obtain required grab samples per COP-01.06 for an Unplanned Gas Release from a Gas Decay tank.

E. Audible or visual observations.

2. Automatic Actions:

None.

3. Immediate Operator Action:

None.

4. Subsequent Action:

A. Verify one Reactor Auxiliary Building supply fan and one Reactor Auxiliary Building exhaust fan are running.

B. Notify personnel to evacuate the affected areas.

C. Isolate source of gas leak if possible.

Question 88

Given the following Unit 2 plant conditions:

- RCS level is at mid loop
- All CCW flow is lost

Assuming no operator action, the operator would observe an increase in:

A. LPSI pump amp fluctuation.

B. Steam Generator pressure.

C. SDC purification flow.

D. LPSI pump discharge pressure.

A. **Correct**

B. Incorrect, steam Generators are uncoupled from the RCS.

C. Incorrect, LPSI pump discharge pressure will not increase due to the RCS being vented. SDC purification flow is manually controlled by the letdown backpressure controller.

D. Incorrect, RCS is vented.

Question Level: 2
Question Source: New
Exam: RO/SRO
K/A: 025.AK2.03
Importance: 2.7
References: 0702207-4, 2-0440030 Shutdown Cooling Off-Normal

3.0 REFERENCES: (continued)

§7 3.21 JPN-PSL-SEMP-91-029, Rev 0, Engineering Evaluation of Shutdown Cooling System Transient Response.

3.22 2-MMP-68.02, Emergency Closure of Containment Penetrations, Personnel Hatch, and Equipment Hatch.

4.0 RECORDS REQUIRED:

The completed (signed off) portion of this procedure, including applicable Appendixes (with sign offs), Data Sheets, or Figures shall be maintained in the plant files in accordance with QI-17-PSL-1, "Quality Assurance Records."

5.0 ENTRY CONDITIONS:

5.1 Shutdown cooling is lost or degraded as indicated by one or more of the following:

1. Loss of shutdown cooling flow.

2. Increasing shutdown cooling temperature.

3. Closure of hot leg suction valves (High RCS pressure).

4. Fluctuating LPSI pump amps.

6.0 EXIT CONDITIONS:

6.1 Any of the Safety Function Status Checks Acceptance Criteria from the Low Mode Off-Normal Procedures for the current plant condition are NOT met.

OR

6.2 Normal decay heat removal is established with the Shutdown Cooling System.

OR

6.3 Decay heat removal is accomplished via the S/Gs.

AND

6.4 An approved procedure is available for implementation.

Question 89

Unit 1 has received alarm Q-36 'Radiation Monitoring Power Failure.'

Which of the following indication would confirm this alarm and what would be the consequences assuming this alarm is valid?

A. Blue FAIL light is lit, detector is inoperable due to power failure.

B. Blue FAIL light is NOT lit, detector is inoperable due to power failure.

C. Amber light is lit, detector is inoperable due to an internal failure.

D. Red light is NOT lit, detector is inoperable due to an internal failure.

A. Incorrect, fail light lit is normal condition

B. Correct

C. Incorrect, Amber light is 'Alert' indication for increasing radiation not internal failure.

D. Incorrect, Red light is 'Alarm' indication for increasing radiation not internal failure.

Question Level: 2
Question Source: New
Exam: RO/SRO
K/A: 061.AK3.02
Importance: 3.6
References: ARP 1-ARP-01-Q36, 1-ONP-26.02 Area Radiation Monitors, LP 0702410-08

REVISION: 0	PROCEDURE TITLE: ANNUNCIATOR RESPONSE PROCEDURE	PANEL: Q
PROCEDURE NO: 1-ARP-01-Q36	ST. LUCIE UNIT 1	WINDOW: 36

ANNUNCIATOR PANEL Q

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

RADIATION MONITORING POWER FAILURE

Q-36

DEVICE:
Affected Radiation Monitor Failure Alarm Relay

LOCATION:
Radiation Monitoring Panels

SETPOINT:
De-energized

ALARM CONFIRMATION:
1. Affected Radiation Monitor blue FAIL light is NOT LIT.
2. Affected Radiation Monitor selector switch positioned to OFF or position other than OPERATE.

OPERATOR ACTIONS:
1. DETERMINE which Radiation Monitor has failed.
3. REFER TO plant drawings to determine power supply for the affected Radiation Monitor.
4. CHECK the power supply circuit for the affected Radiation Monitor to ensure power is available.
5. If the annunciator remains in ALARM, Then DIRECT I&C to troubleshoot and repair.

CAUSES: The alarm may be caused by **EITHER** of the following conditions:
- Power supply to at least one of the Radiation Monitors is lost
- At least one of the Radiation Monitors has an internal failure

REFERENCES: 1. CWD 8770-B-327 sheets 457, 454, 439, 440, 441, 442, 443, 444, 445, 446, 453, 353, 455, 452.

4.0 OPERATOR ACTIONS

4.1 Containment Isolation Radiation Monitors

INSTRUCTIONS	**CONTINGENCY ACTIONS**

NOTE

- A Containment Isolation signal is generated when at least two of the following monitors exceed the HIGH-HIGH alarm setpoint:
  - RIS-26-3-1
  - RIS-26-5-1
  - RIS-26-4-1
  - RIS-26-6-1
- Testing a second CIS monitor with one monitor in a HIGH-HIGH alarm condition will generate a CIS signal.

1. VERIFY the CIS monitor alarm is valid as follows:

A. VERIFY the blue FAIL SAFE light is LIT, indicating power available and no component failures.

B. CHECK the meter of the affected monitor to verify alarm conditions exist.

C. PERFORM the following to verify the HIGH ALARM and/or HIGH-HIGH ALARM setpoint:

1. PLACE the function selector switch in ALARM SET.

1.1 If at least **ONE** of the following conditions exists:

- FAIL SAFE light is NOT LIT
- Meter indication does NOT indicate an alarm condition exists

Then GO TO Appendix A, Inoperable Monitor.

Question 90

suspect

Unit 1 is experiencing a large break loss of coolant. All RCP's are off. It is suspected core damage is occurring. Which of the following is used to ~~confirm~~ core damage and what mitigation step will have the greatest impact on regaining core cooling?

A. CET temperature is >22 °F superheat, verify ECCS flow meets figure 2.

B. CET temperature is >22 °F superheat, verify Steam Generators are feeding and steaming.

C. Thot indicates saturation conditions, verify ECCS flow meets figure 2.

D. Thot indicates saturation conditions, verify Steam Generators are feeding and steaming.

A. Correct

B. Incorrect, Steam Generators are 'uncoupled' during large break LOCA's.

C. Incorrect, Thot is not used when RCP's are off

D. Incorrect, Thot is not used when RCP's are off, Steam Generators are 'uncoupled' during large break LOCA's

Question Level: 2
Question Source: New
Exam: SRO Only
K/A: 017.A2.02
Importance: 4.1
References: 1-EOP-03 LOCA, Plant specific technical guidelines LOCA 1-75, 1-109, LOCA lesson text 0711824, LOCA LP 0702824-2, 10CFR.55.43.b5

Technical Justifications for Deviations:

1. As stated in PSL-ENG-SEIS-01-046, "This engineering limit is based on the saturation temperature of the RCS. The intent of the engineering limit is to provide an indication that can be used by the operator to assess the status of core heat removal and coorborate core covered or core uncovered with the aid of Reactor Vessel Level Monitoring System (RVLMS). A rising superheated reading is indication that core uncovery is occurring and that core heat removal is inadequate. During the progression of an inadequate core cooling event, true vessel fluid temperature will plateau at the saturation point while vessel level decreases towards the top of the fuel. The QSPDS Rep CET algorithm includes a bias term that is added to the true average, to ensure the calculated temperature is conservative. The bias is based on the number of valid CETs and the standard deviation, but is also limited to 20 degrees F above the highest individual CET. Due to this bias, the Rep CET temperature is expected to read up to 20 degrees superheat (rather than the true average fluid temperature of 0 degrees F) during this plateau time, as level is lost in the upper plenum region. Once core uncovery occurs, the exposed length of the fuel bundles will superheat the rising steam. The amount of superheat will then rapidly increase as the exposed fuel bundle length is increased. In Non-LOCA EOPs a setpoint of no superheat is conservatively used. During a LOCA event, actual saturation conditions are expected to be reached in the reactor vessel. Therefore, the LOCA safety function status checks must account for the bias above the true average CET temperature to prevent unnecessarily exiting to (1-EOP-15) the Functional Recovery Procedure. The value of 22 degrees F superheat has been historically used in the EOPs. This value accounts for the maximum built-in bias of 20 degrees F (algorithm bias) and includes 2 degrees F for uncertainty of the highest individual CET." Therefore, the QSPDS algorithm has biased the calculation in the conservative direction. Due to historical and human factor considerations, the value of 22 degrees F superheated will remain in the LOCA (1-EOP-03) EOP and no superheat will be used for non-LOCA EOPs. The intent of the EPG is maintained.

Amplifying Bases Information:

PSL-ENG-SEIS-01-046, Unit 1 PSTG EOP Setpoint Document.

Figure 2, 1-EOP-99, Safety Injection Flow vs. RCS Pressure

CEN-152, EPG Bases, Ensure Heat Removal Under Two Phase Natural Circulation.

FSAR Section 7.5.3, TMI Related Additional Accident Monitoring Instrumentation.

FSAR Section 7.5.4.2, Qualified Safety Paramenter Display System.

ENG-SPSL-01-0128, Engineering Evaluation, Alternate Method to Determine Reactor Vessel Level.

Technical Justifications for Deviations:

1. RCS T-hot is an adequate indication of core exit temperature (CET) when forced circulation is in effect as the core and hot legs are hydraulically coupled. T-hot is higher than Representative CET temperature during forced circulation conditions and is therefore more conservative in the determination of the subcooled margin. During natural circulation conditions Representative CET temperature is used to determine subcooling since RCS loop flow is reduced such that Representative CET temperature more accurately reflects core exit temperature. In accordance with the EPG bases, the intent of the operational limit is to ensure that: (1) adequate RCS inventory control has been established [ie., the core is covered] and (2) provide extra margin in the plenum to ensure that the hot legs are covered to support natural circulation, prior to stopping or throttling HPSI, or securing from Once-Through-Cooling. Both verifications are based on RVLMS indications, and are taken in conjunction with other indications of adequate inventory control. The availability of QSPDS is based on the availability of its power supply. The intent of the EPG is maintained.

2. The EOP step is technically equivalent to the EPG step. Appendix S, of 1-EOP-99, gives a more detailed instruction to perform the actions needed to throttle safety injection and for restoration. The intent of the EPG is maintained.

Amplifying Bases Information:

PSL-ENG-SEIS-01-046, Unit 1 PSTG EOP Setpoint Document.

Appendix S, 1-EOP-99, Safety Injection Throttling and Restoration

ENG-SPSL-01-0128, Engineering Evaluation, Alternate Method to Determine Reactor Vessel Level.

CEN-152, EPG Bases, HPSI Pump Throttle Criteria.

FSAR Section 6.3, Emergency Core Cooling System.

FSAR Section 7.5.3, TMI Related Additional Monitoring Instrumentation.

FSAR Section 7.5.4.2, Qualified Safety Parameter Display System.

As represented in Figure 4, for larger break sizes a greater fraction of the core decay heat is removed from the RCS by the break flow. Thus, less dependence is placed on heat transfer across the S/Gs. At approximately a 0.1 ft^2 (4.5" ID pipe) break size, the break flow will remove all of the core decay heat. In this case the primary side temperature and saturation pressure need not be higher than the corresponding secondary side values to effect heat transfer. The primary side temperature and pressure will then drop in accordance with the heat balance resulting from decay heat input to the RCS and break flow removal of RCS heat. For this condition some heat may actually flow across the S/Gs from secondary to primary.

{PRIVATE }1.3.2 Large Break LOCA{tc \l 3 "1.3.2 Large Break LOCA"}

The event characteristics for a large break LOCA are different from those of a small break LOCA. Following a large break in the primary system piping, a large amount of RCS fluid will flow through the break into the containment building. The break flow will carry the majority of the stored fluid energy. Heat transfer to the secondary side is not significant and, in fact, will only occur for a brief time.

Because of the high removal of mass and energy through the break, the RCS pressure will rapidly fall below the secondary saturation pressure and will continue to drop to about the containment pressure. An example of the transient RCS pressure for a large break (double-ended cold leg) is shown in Figure 5. It is seen from this figure that the pressure decreases to an equilibrium position with the containment atmosphere in about 25 seconds. This time is too short for the operators to assess the situation and to take corrective action. The automatic engineered safety response will act to replenish the core with cooling water. The operator's role will be to verify automatic actions, assure that all RCP's are turned off and later in the event realign the HPSI's to provide long-term core cooling and prevent boron precipitation. A representation of the RCS heat removal process following a large cold leg break is shown in Figure 6.

4.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] **5. Maximize SI Flow**	
If SIAS is present, Then PERFORM **ALL** of the following:	
A. ENSURE **ALL** available SI Pumps are RUNNING.	
B. VERIFY adequate SI flow. **REFER TO** Figure 2, Safety Injection Flow vs. RCS Pressure.	**B.1** TAKE actions to restore SI flow: • ENSURE electrical power to SI pumps and valves • ENSURE correct SI valve alignment • ENSURE operation of necessary auxiliary systems
C. ENSURE **ALL** available Charging Pumps are RUNNING.	**C.1** If the Charging Header is NOT available, Then CONSIDER charging to the HPSI header. **REFER TO** Appendix T, Alternate Charging Flow Path to RCS Through Aux. HPSI Header.

4.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

[*] 31. **Ensure Two Phase Natural Circulation**

If **NO** RCPs are operating,
and single phase natural circulation can NOT be maintained,
Then ENSURE **ALL** of the following conditions exist:

- **ALL** available Charging pumps are RUNNING
- SI flow is within the SI flow delivery curve.
  REFER TO Figure 2, Safety Injection Flow vs. RCS Pressure
- At least **ONE** S/G is available for RCS heat removal with level being maintained or restored to between 60 and 70% NR
- Rep CET temperature is less than 22°F superheated

[*] 32. **RCP Restart**

If RCP restart is desired,
and **BOTH** of the following conditions are met:

- Single phase natural circulation flow has existed in the RCS for at least 20 minutes
- RCP restart criteria are met.
  REFER TO 1-NOP-01.02, Reactor Coolant Pump Operation

Then START **ONE** RCP in **EACH** loop.

Question 91

Unit 1 is at steady state 80% power with the following conditions:

- Charging pumps A and C are running
- Charging and letdown are balanced and Pressurizer Level is steady

Which of the following failures will result in letdown flow diverting to the waste management system? (assume no Operator actions)

A. Selected Pressurizer level channel failing low.

B. Selected Pressurizer level channel failing high.

C. Selected RRS Tave program failing high.

D. Letdown backpressure valves failing open.

A. Incorrect, would cause minimum letdown and lowering VCT level

B. Correct, maximum letdown fills VCT to divert setpoint

C. Incorrect, same as Pzr. Level failing low

D. Incorrect, level control valves control level

Question Level: 2
Question Source: New
Exam: RO/SRO
K/A: 068.K1.01
Importance: 2.6
References: CVCS Lesson text 0711205

If LT2227 should fail high, the Divert Valve (a 3-way air operated valve), V2500, would open while the charging pumps continue to draw off the VCT. At 5%, due to the failed LT, the VCT Discharge fails to close and the RWT outlet fails to open. Since the gravity feed valves, (V2508, V2509), the Load Control Valve, (V2525), and the Emergency Borate Valve, (V2514), are in Manual and only open on SIAS or by HS manipulation, the charging pumps will become gas bound and will trip on low suction pressure.

Upon conditions of increased letdown flow as demanded by the pressurizer level control system, VCT level will tend to increase. Increasing water level can also cause excessive pressure in the VCT as the gas is compressed into a smaller area. When the level reaches 88 [92]% (Unit 2 reset 83%), valve V2500 will automatically divert the letdown flow to the waste management system thereby precluding further level increase. The handswitch for V2500 must be in the auto position to accomplish this function.

Summary of System Actions vs VCT Level

Unit 1	**Unit 2**	
90 ↑	94 ↑	VCT High Level Alarm
88 ↑	92 ↑	Divert Valve to WMS (V2500)
	83 ↓	Divert Valve to VCT (V2500)
55 ↑	54 ↑	Auto Makeup Stops if in AUTO
40 ↓	40 ↓	Auto Makeup Starts if in AUTO
35 ↓	37 ↓	VCT Low Level Alarm
5% ↓	5% ↓	VCT Lo-Lo Level Alarm
		VCT Outlet (V2501) Valve Closes(Reopens at 15%↑)
		RWT Suction (V2504) to Charging Opens (Closes 15%↑)

CHARGING{tc \l1 "E. CHARGING}

Charging flow is the feed portion of the feed and bleed process used for RCS purification. As discussed in the previous section, the letdown flow, after being purified, is directed to the VCT.

Question 92

Unit 1 had a transient which resulted in the plant tripping at Pressurizer pressure of 2450 psia. Which of the following explains the mechanism that tripped the plant?

High Pressurizer pressure through the:

A. Reactor Protection System, which opened line contactors, which in turn opened the CEA MG set output breakers.

B. Reactor Protection System, which opened eight TCB's.

C. Engineered Safety Feature Actuation System, which opened line contactors, which in turn opened the CEA MG set output breakers.

D. Engineered Safety Feature Actuation System, which opened eight TCB's.

A. Incorrect, ATWAS (DSS) goes through the ESFAS

B. Incorrect, not through the RPS and not through the TCB's

C. Correct

D. Incorrect, ESFAS to line contactors which open the MG set output breakers.

Question Level: 2
Question Source: New
Exam: RO/SRO
K/A: 029.EK2.06
Importance: 3.1
References: ESFAS Lesson text 0711401

These isolation relays are located externally to the ESFAS cabinets. A separately fused 125 VDC power supply in cabinets "SA and SB" prevents a recurrence.]

To warn the operator of a loss of 125 VDC power to these relays which would prevent MSIS/ESFAS on the opposite side S/G, a new relay (74-1) is wired into annunciators Q-47 (Q-49) [P-47 (P-49)], MSIV HCV-08-1A (HCV-08-1B) AIR PRESS LOW/DC FAILURE.

{PRIVATE }ATWS DIVERSE SCRAM SYSTEM (DSS){tc \l 1 "ATWS DIVERSE SCRAM SYSTEM"}

Background{PRIVATE }{tc \l 2 "Diverse Scram System (DSS)"}

In July 1984, the Code of Federal Regulations (CFR) was amended to include requirements for improvements in the design and operation of nuclear power plants to reduce the likelihood of a failure to automatically trip the reactor following anticipated transients.

The combination of a RPS failure and an anticipated transient outside the existing design basis had to be re-analyzed by C.E. It was determined that a total loss of feed with a failure of the reactor to trip would result in RCS pressure well beyond the design service pressure of the pressure vessel (3200 psia).

For St. Lucie, the prevention of an ATWS takes the form of the DSS, the purpose of which is to independently trip the reactor diverse from the RPS. Mitigation of an ATWS is via turbine trip by reactor trip, and AFAS actuation. The combination of prevention and mitigation will limit peak RCS pressure to within acceptable limits.

{PRIVATE }Operation{tc \l 2 "Operation"}

- The DSS is an **energize to actuate** signal that opens a line contactor in series with each of the CEA MG set breakers on a 2/4 hi-hi pzr pressure of **2450 psia** (FSAR).

Its arrangement and components are essentially identical to ESFAS RAS and CSAS signals in that it must energize to trip. Although it is safety related, it is not a Tech Spec required signal.

ATWS/DSS BLOCK DIAGRAM (ENERGIZE TO ACTUATE)

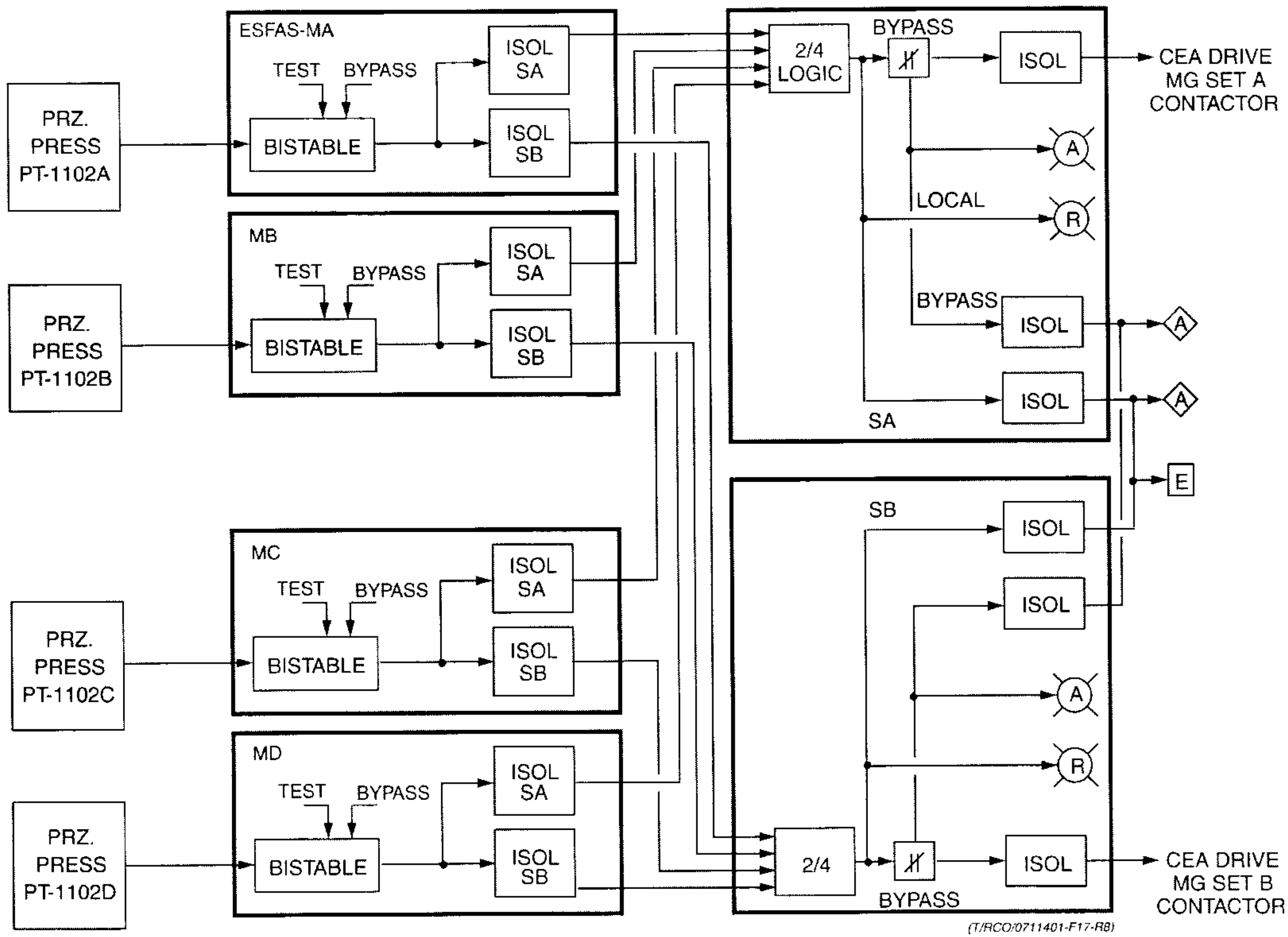


FIGURE 18

The line contactor in series with each CEA MG set output breaker is interlocked with its output breaker such that the contactor must be closed before the output breaker can be closed and the output breaker will open if the line contactor is opened.

- The DSS can NOT be manually actuated or blocked from the RTGB, but can be key bypassed at the ESFAS cabinet at either the measurement or actuation channel level.

There are two annunciators associated with the DSS:

- Q-45 [Q-15], ATWS CHANNEL ACTUATION
- Q-35 [Q-5], ATWS CHANNEL BYPASS

{PRIVATE }Signal Development{tc \l 2 "Signal Development"}

The pzr pressure input signals from PT-1102A-D (safety channels on RTGB 106/206) are sent to four bistable modules, one in each measurement cabinet. The bistables produce an output, on high pressure, which is sent to each actuation cabinet. In each actuation cabinet, an actuation module accepts the four signals and applies 2/4 logic to produce its output. The actuation module output (relay) opens the CEA MG set line contactors. Refer to Figure 18 for the DSS block diagram.

Question 93

Unit 2 is performing a rapid downpower due to a Steam Generator tube leak. Assuming the leak rate stays constant as the unit is downpowered, which of the following radiation monitors will show significant decreasing trends as the unit is downpowered?

A. Steam Generator blowdown due to high activity isolating the sample and the trapped sample decaying over time.

B. Condenser air ejector due to decreasing steam flow.

C. Condenser air ejector due to decreasing levels of Nitrogen 16.

D. Main Steam line due to decreasing levels of Nitrogen16.

A. Incorrect, trapped sample will decay but not to the level of N-16

B. Incorrect, steam flow not relevant to trending of activity

C. Incorrect, N-16 long decayed off by the time the sample reaches Air Ejector

D. Correct

Question Level: 2
Question Source: New
Exam: RO/SRO
K/A: 073.K5.01
Importance: 3.0
References: SGTR Lesson text 0702825-3

TABLE 6
Process Monitors - Non Safety-Related

MONITOR	DETECTOR TYPE	DETECTOR LOCATION	RM-80 LOCATION
Liquid Waste	γ scintillation	Distribution Hdr to Circulating Water	Boric Acid Condensate Tank
Steam Gen. Blowdown – A	γ scintillation	Blowdown Sample Line	RAB 19.5' - PASS Rm
Steam Gen. Blowdown – B	γ scintillation	Blowdown Sample Line	RAB 19.5' - Pass Rm
BA/Waste Evap. Condensate	γ scintillation	Condensate Recovery Tank Drain Line	Adjacent to Pre-concentrator
*Plant Vent-Wide Range Gas	scintillation & Geiger-Mueller	Bldg on RAB Roof Behind Control Rm	Bldg on RAB Roof Behind Control Rm
Waste Gas	γ scintillation	Gaseous Waste Mgt Discharge Line	Letdown Filter Hallway
Condensate Air Ejector	β,γ scintillation	Downstream of After Condenser Discharge	Turbine Switchgear Room
*Steam Line A	Geiger-Mueller	Adjacent MSL	Steam Trestle Near MSL Shield Bldg
*Steam Line B	Geiger-Mueller	Adjacent MSL	Steam Trestle Near MSL Shield Bldg.
*Fuel Handling Bldg. Effluent	β,γ scintillation	Bldg on RAB Roof Near FHB Stack	Bldg on RAB Roof Near FHB Stack

*Tech Spec Monitors

The detector assembly's output is directed to a logarithmic ratemeter and, from there, to a hard-copy, two-pen-strip recorder. The logarithmic ratemeter measures gross gamma activity with a range from 1 to 10^6 counts per minute.

The ratemeter is provided with a four-function selector switch, a check source button and ALERT, HIGH and FAIL alarms. The operation/function of each is similar to those described for the ratemeter used in the Letdown Process Radiation Monitor. In addition to the above, each of the steam generator blowdown monitors has an associated trip system. The HIGH alarm for each is adjusted following an isotopic analysis of the liquid phase of the secondary side of the steam generators. The blowdown water normally contains no radioactivity, so the alarm/trip setpoint is usually set slightly above the activity determined from the analysis but below the applicable release limits. If a high radiation alarm occurs on the 'A' blowdown monitor, valves FCV-23-3, 4 and 7 shut, securing S/G 1A **Blowdown and Sampling**. If a high radiation alarm occurs on the 'B' blowdown monitor, valves FCV-23-5, 6, and 9 shut, securing S/G 1B **Blowdown and Sampling**. These valves also close on CIS.

Since the shut signal isolates the blowdown sampling lines, the Blowdown Radiation Monitor for that steam generator is isolated. The process monitor will then record only the stagnant sample left in the isolated piping, therefore the ratemeter should stabilize, although activity could still be increasing in the steam generator. The alarm on the Steam Generator Blowdown Process Monitor may have either been preceded, or followed by an alarm on the Air Ejector Radiation Process Monitor. The Air Ejector Process Monitor will be the only indication of the possible buildup of radioactivity in an alarming S/G whose Process Monitor has been isolated by a HIGH ALARM. The blowdown flow from a S/G in alarm may be diverted to the Blowdown Treatment Building. If the blowdown flow discharges directly to the discharge canal, a S/G in alarm has to be sampled for radioactivity prior to restoring flow to this discharge path.

If a CIS or High Radiation signal is present, the blowdown isolation and sampling isolation valves will close. To sample the S/Gs or monitor for activity, the sampling flowpath must be re-established by overriding the closing signal to the sampling

INTRODUCTION TO THE SGTR EVENT – Continued

- Flow rate – Max expected is ~700 gpm
  - Flow proportional to dp, for large dp can reach sonic velocity - "choke" flow.
  - Each SG tube is 5/8" diam., a break size of 3/8" effective diam. would exceed capability of pzr. level control system

Ask students how to determine the leak rate.

- Event Characteristics EO-4
  - S/G tube rupture (inventory loss exceeds capacity of pzr. LCS
    - Pzr. level decreases rapidly. PLCS responds but cannot maintain level. VCT level decreases.
    - Pzr pressure decreases due to rapid inventory loss. TM/LP trip occurs. When pzr level decreases below 27[28]% all heaters are de-energized.
    - Reactor vessel (RVL) voiding may occur in reactor vessel upper head if rapid depressurization occurs.
    - Secondary response:
      - Secondary radiation alarms on Condenser off gas, blowdown and steam line RMs
        - BLOWDOWN rad monitor response may be delayed by significant loop transport times, loss of power, and location of the tube leak in the tube bundle. Hi Rad will auto isolate the Blowdown RM Sample valves.
        - Pre trip N-16 Gamma response causes indication on the affected Main steam line monitor. Post trip N-16 decay causes indication to go away.
      - Prior to the trip may see a small increase in S/G level and reduction in FW flow.
      - Post trip S/G press increases and S/G level decreases due to shrink. S/G safety valves will cycle if trip from 100%.

Question 94

Unit 1 is in Mode 3 with the following conditions:

- 1230 psia Pressurizer pressure
- Zero Power Mode Bypass in service on all channels.
- All RCP's running

RPS Channel A Wide Range channel has failed high. Which of the following RPS Bistables has automatically changed state?

A. LPD

B. High power

C. High Pressurizer pressure

D. TMLP

A. Incorrect, calculation from Linear Range NI's

B. Incorrect, calculation from Linear Range NI's

C. Incorrect, not power dependent

D. Correct

Question Level: 2
Question Source: New
Exam: RO/SRO
K/A: 015.A4.03
Importance: 3.9
References: RPS Lesson text 0711404

Once the channel is bypassed, the system changes from a 2/4 to a 2/3 coincidence trip logic. The RPS continues to provide full protection, even in the event of a single failure in one of the unbypassed channels.

Automatic bypass

The following trips are affected by automatic bypass:

- High startup rate
  - Bypassed below 10^{-4}% and above 15%

- LPD
  - Bypassed below 15%

- Loss of load
  - Bypassed below 15%

The 10^{-4}% bypass is accomplished in the wide range logarithmic channels. The 15% bypass is accomplished in the Linear Power Range Safety Channel. Refer to Figure 6.

Removal of a power range safety channel or a logarithmic channel results in removal of the bypasses associated with the channel. An annunciator is actuated whenever a bypass is in effect.

Zero Power Mode Bypass (ZPMB)

This key bypass is required when the plant is shutdown to permit maintenance or shutdown operation.

- This bypass is manually initiated when it is desired to raise the CEAs for drop testing or for low power physics testing when the RCS is depressurized and there is no RCP flow.

- The following are affected by this bypass:

  - ΔT power signal to CPC-2
  - RCS Low Flow Trip
  - TM/LP Trip

- Automatic removal of this bypass occurs above .1% [0.5%] as sensed by wide range logarithmic neutron flux power. (Unit 1 Tech Specs specify 1%.)

The initiation of these bypasses is controlled by four key lock switches, one located on each RPS Auxiliary Logic Assembly. Refer to Figure 28. In order for the bypass to be fully effective, all four key switches must be turned. This method of initiation was chosen to allow for complete channel separation. Operation of the pretrip alarm is unaffected by the bypass switch.

Figure 29 shows a simplified sketch of the ZPMB circuitry. Actuation of the switch applies +15V to the base of the transistor that drives the trip relays in the trip unit. The trip unit remains untripped regardless of the input signal level, as long as the +15 volts is applied to the transistor base. Normally open contacts in series with the bypass switch allow auto bypass removal.

To prevent erroneous ΔT power signals when coolant temperature is below the normal operating range, a block of ΔT power to CPC-2 is incorporated into RPS. This block is accomplished by actuation of the ZPMB switch. Refer to Figure 30. This switch energizes a relay in the Auxiliary Logic Assembly that blocks the ΔT power signal to a maximum selector (which selects the greater of ΔT power or nuclear power) in CPC-2. This block, when in effect, is annunciated on the RPSCIP. The block is automatically removed when wide range logarithmic neutron flux power increases above .1% [0.5]% power. (Tech Spec Unit 1 value is 1.0%.)

Low Steam Generator Pressure Trip Bypass

To allow CEA testing while shutdown, a manual key-operated bypass is provided on the Auxiliary Logic Assembly for all four RPS channels.

- The S/G low pressure trip may be bypassed below **700 [720] psia**.

By placing the key-operated switch in the bypass position, the low pressure trip is prevented by the application of a constant +15V signal. The bypass is removed regardless of the manual switch position if either steam generator pressure exceeds **700 [720] psia**.

- To re-enable the bypass, the switch must be returned to OFF and then back to BYPASS when pressure decreases to less than **700 [720] psia**.

Question 95

Given the following information:

2 reactors are at 25% power. The reactors are identical in every way except reactor "A" is BOC and reactor "B" is EOC. If a continuous rod withdrawal occurs in each reactor, which reactor will have the largest coolant temperature change.

A. "A" because FTC is more negative.

B. "A" because MTC is less negative.

C. "B" because FTC is less negative.

D. "B" because MTC is more negative.

A. Incorrect, FTC is less negative at beginning of cycle.

B. **Correct**

C. Incorrect, FTC is more negative at end of cycle.

D. Incorrect, MTC being more negative at EOC will decrease the amount temperature increases.

Question Level: 2
Question Source: New
Exam: RO/SRO
K/A: 001.AK1.17
Importance: 3.7
References: 0702107r5-14a Reactor Theory, 0711100r6 Reactor Theory

Assuming the Doppler Defect is constant over core cycle the Moderator Defect at EOC would be:

Moderator Defect = -2000-(-1000 pcm)
= -1000 pcm

> {PRIVATE }The change in Power Defect over core cycle is due to the change in Moderator Defect, Doppler Defect essentially stays constant.

Example: If differential boron worth is 11.5 pcm/ppm, how much must boron be changed to raise power from 50% to 100% at EOC, neglecting Xenon changes?

Solution: The power defect at 50% is -1000 pcm and at 100% is -2000 pcm. The change is:

To *Power Defec* raise power to 100% would require a 87 ppm dilution.

In *Boron Char* summary, as power is increased from 0-100%, the operator must dilute C_B to compensate for the (-) reactivity from power defect.

As power is reduced from 100-0%, the operator must borate C_B to compensate for the (+) reactivity from power defect.

The RCO controls dilution/boration to keep T_{ave} matched with T_{ref}. If no action, then as power increased, T_{ave} would decrease by an amount corresponding to pcm worth of doppler defect. Conversely, for power reduction, T_{ave} would increase by that equivalent amount.

Fuel, burnable poison, xenon, samarium and rod values have been discussed in previous chapters.

Boron thumbrule 10 pcm/ppm.

MTC BOC 0 pcm/°F_{mod}
MOC 12.5 pcm/°F_{mod}
EOC 25 pcm/°F_{mod}

0-100% ΔT_{mod} - 40°F

MTD (0-100%)	BOC	0 pcm
[MTC x ΔT_{mod}]	MOC	500 pcm
	EOC	1000 pcm

FTC BOC 1.0 pcm/°F_{fuel}
EOC 1.1 pcm/°F_{fuel}

0-100% ΔT_{fuel}	BOC	1000°F
	EOC	900°F

FTD (0-100%) BOC 1000 pcm
[FTC x ΔT_{fuel}] EOC 1000 pcm
(FTC ↑ 10%) x (ΔT_{fuel} ↓ 10%) = FTD ↔

Power Defect (0-100%)	BOC	1000 pcm
(MTD & FTD)	MOC	1500 pcm
	EOC	2000 pcm

Question 96

Unit 2 is in mode 2 at 2% power, withdrawing CEA's. Group 5 is currently at 115" withdrawn. Channel "A" Linear Range Safety Channel fails high. Which of the following states the effect on CEA motion and the reason why?

A. CEA motion stops due to Power Dependent Insertion Limit setpoint change.

B. CEA motion stops due to Pre-Power Dependent Insertion setpoint change.

C. CEA motion continues, one channel failure is not sufficient to stop CEA motion.

D. CEA motion continues, actual reactor power is too low to stop CEA motion.

A. Correct

B. Incorrect, 2 out of 4 pretrips are required to receive a CWP.

C. Incorrect, highest Qpower causes PDIL setpoint to be set at a higher CEA position which causes a CMI.

D. Incorrect, highest Qpower not actual reactor power causes PDIL setpoint to be set at a higher CEA position which causes a CMI.

Question Level: 2
Question Source: New
Exam: RO/SRO
K/A: 014.A1.03
Importance: 3.8
References: 0702405r9-10, 0711405r12 Control Element Drive System, 0711404r11 Reactor Protection System 2-ONP-99.01 Loss Of Tech Spec Instrumentation, 2-ARP-01-K11&K11 Annunciator Response Procedure

REVISION: 0	PROCEDURE TITLE: ANNUNCIATOR RESPONSE PROCEDURE	PANEL: K
PROCEDURE NO: 2-ARP-01-K11	ST. LUCIE UNIT 2	WINDOW: 11

ANNUNCIATOR PANEL K

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

CEA MOTION INHIBIT

K-11

DEVICE:	LOCATION:	SETPOINT:
CEDMCS	CEDMCS Logic Cabinet	Multiple Inputs
CMIRP	CEDMCS Logic Cabinet	Shutdown CEA ≤129 in.
CMISH	CEDMCS Logic Cabinet	Reg Group ≥10 in. (low limit)
Group Out of Sequence (Withdraw)	ADS Computer Cabinet	Reg Group <87.2 in. with next higher Reg Group >10 in.
Group Out of Sequence (Insert)	ADS Computer Cabinet	Reg Group <123.5 in. with next higher Reg Group >38.3 in.
Group Deviation	CEDMCS Logic Cabinet	>6 in. differential (high to low)
PDIL Violation (CEAPDS)	CEDMCS Logic Cabinet	Variable as a function of Q-Power

ALARM CONFIRMATION:

1. Annunciator K-27, GROUP OUT OF SEQUENCE (ADS), is ALARMED.
2. Annunciator K-29, CEA PDIL (ADS), is ALARMED.
3. Annunciator K-30, CEA POSITION DEVIATION MOTION BLOCK (ADS), is ALARMED.
4. CEA position on CEA Display.
5. CEA position on DDPS.

OPERATOR ACTIONS:

1. DETERMINE the cause of the alarm.
2. **<u>If</u> any CEA is misaligned or dropped, <u>Then</u> GO TO ONOP 2-0110030, CEA Off-Normal Operation and Realignment.**

CAUSES:

- CEA Motion Inhibit for Regulating Groups (CMIRP) results when any Shutdown Group CEA is not withdrawn to at least 129 inches. This is a Regulating Group Withdraw permissive.
- CEA Motion Inhibit for Shutdown Groups (CMISH) results when all Regulating Group CEAs are not inserted to at least 10 inches.
- Group Out of Sequence results when Regulating Groups do not conform to the programmed sequence.
- Group Deviation results from the highest and lowest CEA in any group exceeding 6 inches differential.
- Power Dependent Insertion Limit (PDIL) Violation

REFERENCES: 1. CWD 2998-B-327 sheets 397 and 1097

REVISION: 1	PROCEDURE TITLE: ANNUNCIATOR RESPONSE PROCEDURE	PANEL: K
PROCEDURE NO: 2-ARP-01-K29	ST. LUCIE UNIT 2	WINDOW: 29

ANNUNCIATOR PANEL K

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

CEA
PDIL
(ADS)
K-29

DEVICE:
ADS

LOCATION:
RTGB-204

SETPOINT:
Variable

ALARM CONFIRMATION:
1. Annunciator K-11, CEA MOTION INHIBIT, is ALARMED.
2. DDPS CEA position information.
3. RPS highest Q-Power.
4. CEA position on ADS.
5. Backup Display System indication.

OPERATOR ACTIONS:
1. STOP CEA insertion.
2. If necessary to maintain Shutdown Margin, Then IMPLEMENT 2-ONP-02.02, Emergency Boration.
3. **If any CEA is misaligned or dropped, Then GO TO ONOP 2-0110030, CEA Off-Normal Operation and Realignment.** /R1
4. WITHDRAW CEAs as necessary to clear the annunciator.

CAUSES: This annunciator informs the operator that at least one CEA is inserted to or below acceptable insertion limits based on Q-Power.

REFERENCES: 1. CWD 2998-B-327 sheets 398 and 1097

4.2 Nuclear Instrumentation Malfunction (continued)

INSTRUCTIONS **CONTINGENCY ACTIONS**

NOTE

The linear range power drawer provides trip signals to the Variable High Power, Local Power Density (LPD), and Thermal Margin / Low Pressure (TM / LP) bistables and automatic bypasses for the High Startup Rate (HI RATE) and Loss of Load (LOSS LOAD) trip functions. Additionally, a CEA Withdrawal Prohibit (CWP) is initiated by two out of four pretrips on these trip bistables.

3. If a malfunction of a Linear Range Safety Channel (RPS A, B, C, or D) has occurred,
Then PERFORM the following:

A. PLACE the failed channel Variable High Power, TM / LP, and LPD Trip unit bistables in Bypass or Trip.

B. If power level is greater than or equal to 15%,
Then PLACE the affected channel LOSS LOAD trip bistable in Bypass or Trip.

C. If power level is at or between 10^{-4}% and 15%,
Then PLACE the HI RATE bistable in the Bypass or Trip.

D. DECLARE the failed channel out of service.

E. NOTIFY the I&C Department as soon as practical.

{PRIVATE }Inhibit from Shutdown Group (ISH){tc \l 3 "Inhibit from Shutdown Group (ISH)"}

An ISH alarm is generated when any Shutdown CEA is inserted below the ISH limit. When the ISH alarm is activated, an "ISH" alarm indicator is displayed on all pages. The Shutdown Group(s) causing the alarm turn red on the affected display page(s).

- ISH Setpoint is approximately 129"

{PRIVATE }Inhibit from Regulating Group (IRG OFF){tc \l 3 "Inhibit from Regulating Group (IRG OFF)"}

The IRG OFF alarm is generated when all the Regulating Group CEAs are inserted below the IRG setpoint. When the IRG alarm is activated, an "IRG OFF" alarm indicator is displayed with a green background on all pages.

- IRG Setpoint is approximately 10"

Pre-power and Power Dependent Insertion Limit Requirement (PPDIL, PDIL)

The PPDIL and PDIL have variable setpoints. The setpoints are generated as a function of current reactor power as provided by RPS. These generated setpoints are shown on each of the Regulating Groups displays as a yellow dashed line for the PPDIL setpoint and a yellow solid line for the PDIL setpoint. When any CEA rod in any group is inserted past the setpoint, the appropriate, "PPDIL" or "PDIL" alarm indicator is displayed on all pages. The regulating Group(s) causing the alarm to turn red on the affected page(s).

{PRIVATE }Technical Specification Timer{tc \l 3 "Technical Specification Timer"}

The Technical Specifications allow operation with some non-ideal CEA configurations for limited periods of time. The requirement for monitoring the CEA position/time history in accordance with Technical Specifications are defined in this section.

Two Essential Areas will be Monitored

1. Operation with a misaligned CEA.
2. Operation beyond the Long Term Steady State Insertion Limit

- At 100% power, the TM/LP trip setpoints (P_{VAR}) are approximately 2040 psia for Units 1 and 2.

- The TM/LP pretrip signal is obtained by adding **50 psi** to the P_{VAR} signal.

Pzr pressure is fed into the TM/LP trip unit and compared with the trip and pretrip setpoints coming from CPC-1. If pressure decreases below either setpoint, appropriate pretrip or trip action will occur.

TM/LP Summary{tc \l4 "TM/LP Summary}

There are four basic parameters that affect the thermal margin to DNB:

- RCS pressure
- Flow
- Power
- Water temperature

Flow is always assumed to be 100% of design flow; if it isn't, the low flow trip will cause a trip. The water temperature is measured by the T_{COLD} instruments and the highest T_{COLD} signal is used (the higher the water temperature the closer you are to DNB). Since the DNB phenomenon occurs on the fuel cladding surface it is a local situation and therefore fuel power should be measured in a localized fashion. Local power cannot be directly measured with our RPS but by applying axial and radial correction factors to amplify the power signal Q we get a close approximation called Q_{DNB}. Increasing Q_{DNB} puts you closer to DNB and trip.

Power Ratio Calculator (PRC){tc \l2 "Power Ratio Calculator}

The power ratio calculator provides three [two] functions:

1. HI and HI-HI channel deviation alarms setpoints calculation (Unit 1 Only)
2. Selection of the $Q_{CEAPDS\ [ADS]}$ signal from the maximum of four Q_{pwr} CPC developed inputs for PPDIL & PDIL
3. The power ratio signal calculation to PRC recorder red blue, and green pens on RTGB104[204]

POWER RATIO CALCULATOR

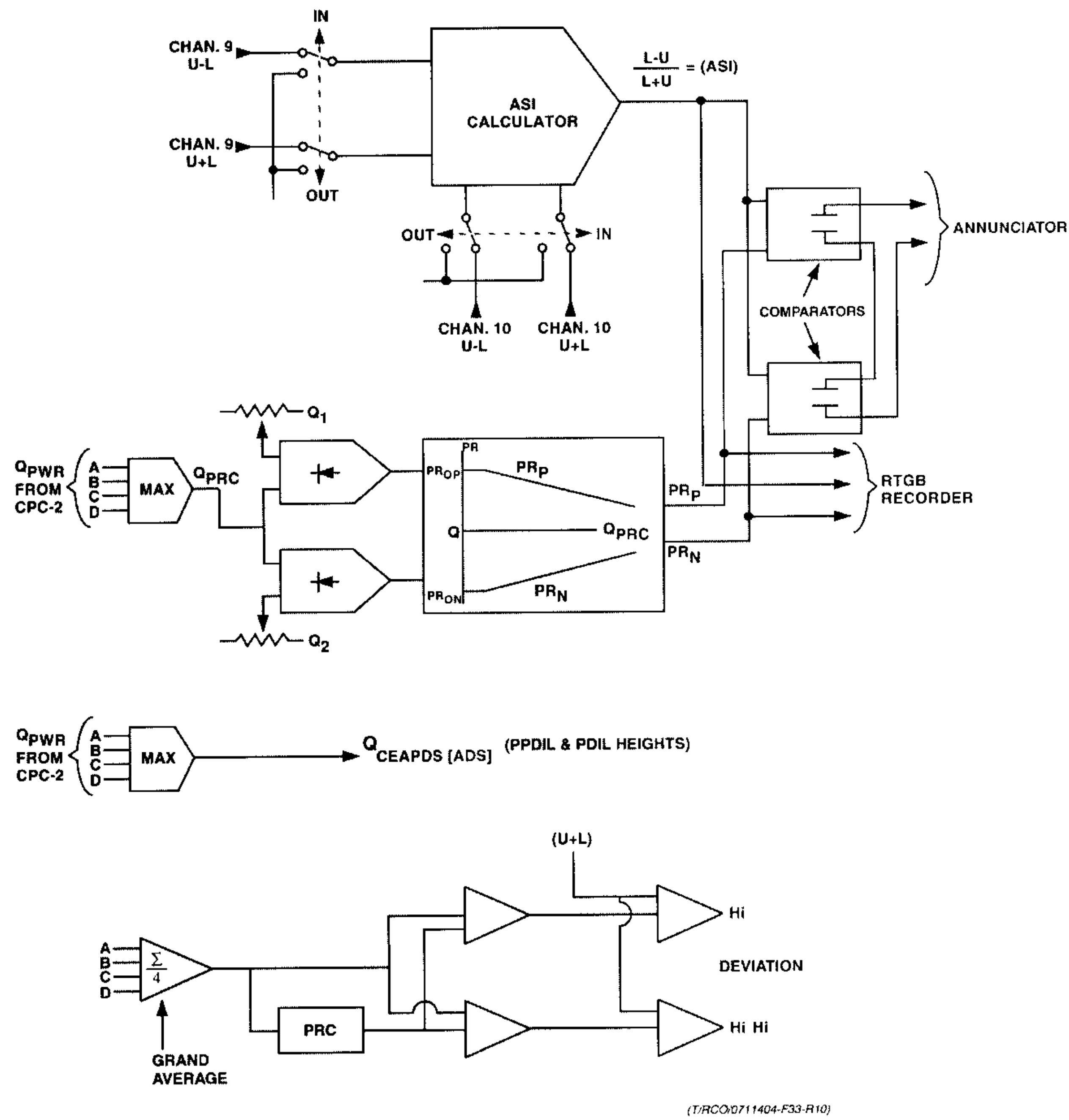


FIGURE 21

Question 97

During the performance of the Control Element Assembly Quarterly Exercise 1-OSP-66.01, it was determined that a CEA in Regulating Group "5" is inoperable due to mechanical binding. Which of the following actions must be taken? (Assume normal 100% power with all rods at 136 inches.)

A. Reduce power to less than 70%.

B. Place unit in mode-3 within 1 hour.

C. Calculate shutdown margin within 1 hour.

D. Manually trip the reactor and turbine.

A. Incorrect, reducing power to less than 70% is required for misaligned or dropped CEAs that are not realigned within the allowed time frame, not mechanically bound CEAs.

B. Incorrect, after shutdown margin is verified the reactor is required to be in mode-3 in the next 6 hours.

C. Correct

D. Incorrect, other CEA malfunctions require a reactor trip i.e. 2 dropped CEAs.

Question Level: 1
Question Source: New
Exam: SRO Only
K/A: 005.G2.2.22
Importance: 4.1
References: Unit-1 Tech Specs, ONOP 1-0110030 CEA Off-Normal Operation And Realignment, 10CFR.55.43.b2

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

FULL LENGTH CEA POSITION

LIMITING CONDITION FOR OPERATION

3.1.3.1 The CEA Block Circuit and all full length (shutdown and regulating) CEAs shall be OPERABLE with each CEA of a given group positioned within 7.5 inches (indicated position) of all other CEAs in its group.

APPLICABILITY: MODES 1* and 2*.

ACTION:

a. With one or more full length CEAs inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in HOT STANDBY within 6 hours.

b. With the CEA Block Circuit inoperable, within 6 hours either:

   1. With one CEA position indicator per group inoperable, take action per Specification 3.1.3.3, or

   2. With the group overlap and/or sequencing interlocks inoperable, maintain CEAs in groups 3, 4, 5 and 6 fully withdrawn and withdraw the CEAs in group 7 to less than 5% insertion and place and maintain the CEA drive system mode switch in either the "Manual" or "Off" position, or

   3. Be in at least HOT STANDBY.

c. With one full length CEA inoperable due to causes other than addressed by Action a above, but within its above specified alignment requirements and either fully withdrawn or within the long term steady state insertion limits if in CEA group 7, operation in MODES 1 and 2 may continue.

d. With one or more full length CEAs misaligned from any other CEAs in its group by more than 7.5 inches but less than 15 inches, operation in MODES 1 and 2 may continue, provided that within one hour the misaligned CEA(s) is either:

   1. Restored to OPERABLE status within its above specified alignment requirements, or

---

* See Special Test Exceptions 3.10.2 and 3.10.5.

LIMITING CONDITION FOR OPERATION (continued)

2. Declared inoperable and satisfy SHUTDOWN MARGIN requirements of Specification 3.1.1.1. After declaring the CEA inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6 for up to 7 days per occurrence with a total accumulated time of $\leq$ 14 days per calendar year provided all of the following conditions are met:

   a) Within 1 hour, the remainder of the CEAs in the group with the inoperable CEA shall be aligned to within 7.5 inches of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits shown on COLR Figure 3.1-2; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.6 during subsequent operation.

   b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.

Otherwise, be at least HOT STANDBY within the next 6 hours.

e. With one full length CEA misaligned from any other CEA in its group by 15 or more inches, operation in MODES 1 and 2 may continue provided that the misaligned CEA is positioned within 7.5 inches of other CEAs in its group in accordance with the time constraints shown in COLR Figure 3.1-1a.

f. With one full length CEA misaligned from any other CEA in its group by 15 or more inches beyond the time constraints shown in COLR Figure 3.1-1a, reduce power to $\leq$ 70% of RATED THERMAL POWER prior to completing ACTION f.1 or f.2.

1. Restored the CEA to OPERABLE status within its specified alignment requirements, or

2. Declare the CEA inoperable and satisfy the SHUTDOWN MARGIN requirements of Specification 3.1.1.1. After declaring the CEA inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6 provided:

   a) Within 1 hour, the remainder of the CEAs in the group with the inoperable CEA shall be aligned to within 7.5 inches of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits shown on COLR Figure 3.1-2; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.6 during subsequent operation.

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN - T_{avg} > 200 °F

LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be within the limits specified in the COLR.

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

ACTION:

With the SHUTDOWN MARGIN not within limits immediately initiate and continue boration at ≥ 40 gpm of greater than or equal to 1720 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be within the COLR limits:

a. Within one hour after detection of an inoperable CEA(s) and at least once per 12 hours thereafter while the CEA(s) is inoperable. If the inoperable CEA is not fully inserted, and is immovable as a result of excessive friction or mechanical interference or is known to be untrippable, the above required SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable CEA(s).

b. When in MODES 1 or 2#, at least once per 12 hours by verifying that CEA group withdrawal is within the Power Dependent Insertion Limits of Specification 3.1.3.6.

c. When in MODE 2## at least once during CEA withdrawal and at least once per hour thereafter until the reactor is critical.

d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading, by consideration of the factors of e below, with the CEA groups at the Power Dependent Insertion Limits of Specification 3.1.3.6.

---

* See Special Test Exception 3.10.1.

\# With $K_{eff} \geq 1.0$.

\## With $K_{eff} < 1.0$.

APPENDIX B
<u>ONE OR MORE CEA(S) INOPERABLE</u>
(Page 1 of 2)

1. Ensure the following:

   A. CEDS in OFF.

   B. Turbine power adjusted to equal reactor power.

2. Ensure Appendix A "CEA Investigation for Operability" has been performed.

> <u>CAUTION</u>
> Emergency boration may be required if one CEA is <u>NOT</u> fully inserted and known to be untrippable or immovable due to mechanical interference or excessive friction.

§1 3. With <u>more than one</u> CEA known to be untrippable, or immovable due to excessive friction or mechanical interference immediately commence emergency boration, as per 1-ONP-02.02, "Emergency Boration" and be in Hot Standby within six hours, in accordance with 1-ONP-22.01, "Rapid Down Power". Ensure adequate shutdown margin, as per 1-OSP-100.14, "Surveillance Requirements for Shutdown Margin, Modes 1 and 2 (Critical)".

§1 4. With <u>one</u> CEA <u>NOT</u> fully inserted and known to be untrippable, or immovable due to excessive friction or mechanical interference, immediately ensure adequate shutdown margin as per 1-OSP-100.14, "Surveillance Requirements for Shutdown Margin, Modes 1 and 2 (Critical)" and be in Hot Standby within six hours, as per NOP-1-0030125, "Turbine Shutdown - Full Load to Zero Load".

APPENDIX D
ONE CEA MISALIGNED BY GREATER THAN OR EQUAL TO 15 INCHES BUT NOT A DROPPED CEA
(Page 1 of 3)

1. Ensure the following:

   A. CEDS Panel in OFF.

   B. Turbine power adjusted to equal reactor power.

   C. CEA motion inhibit.

> **NOTE**
> If in the previous 8 hours a dropped or slipped CEA has been successfully retrieved, upper plant management will make the decision to retrieve the CEA and continue operation.

¶2 2. Maintain reactor power at or below, but NOT to exceed the power level which resulted from the CEA insertion.

3. Determine from symptoms and CEA position indications, the operability of the CEA in accordance with Appendix A.

¶2 4. During determination of the cause of the misaligned CEA, maintain reactor power at or below, but NOT to exceed the power level which resulted from the CEA insertion.

5. If CEA determined to be inoperable for any reason, Then refer to Appendix B.

> **NOTE**
> If difficulty is experienced in CEA realignment, Then a power reduction to less than or equal to 70% rated thermal power should be initiated.

6. If in Mode 3, Then REALIGN the CEA in accordance with Appendix H and proceed to Step 8.

§1 7. If in Modes 1 and 2, Then refer to plant curve book and obtain the most recent F_R^T value. This value, when interpreted on COLR Figure 3.1-1a in Appendix E of the Plant Physics Curve Book, will indicate the amount of time to restore the CEA within 7.5 inches of all other CEAs in its group.

APPENDIX D
ONE CEA MISALIGNED BY GREATER THAN OR
EQUAL TO 15 INCHES BUT NOT A DROPPED CEA
(Page 2 of 3)

7. (continued)

A. Within the time allowed by COLR Figure 3.1-1a in Appendix E of the Plant Physics Curve Book, RESTORE the CEA in accordance with Appendix H to within 7.5 inches of all other CEAs in its group.

§3

NOTE
Technical Specification Bases, B 3/4.1.3, requires a prompt realignment of the misaligned CEA. Therefore, it is expected that the remainder of this step is completed within 1 hour following expiration of the time allowed by COLR Figure 3.1-1a in Appendix E of the Plant Physics Curve Book, in order to be in full compliance with Specification 3.1.3.1.

B. If the CEA has not been realigned within the time allowed, Then reduce power to less than or equal to 70% of rated thermal power.

CAUTION
During the unit downpower, CEA realignment shall NOT be performed unless reactor power is stabilized.

§1 C. When reactor power is less than or equal to 70% of rated thermal power, Then COMPLETE either of the below substeps.

1. Realign the CEA (per Appendix H) to within 7.5 inches of all the other CEAs in its group.

OR

Question 98

The operators are maintaining the plant in Hot Standby on natural circulation. Which of the following operator actions would enhance natural circulation flow?

A. Atmospheric steam dump controllers are adjusted from 30% output to 20% output.

B. Steam Generator blowdown is decreased from 100 gpm to 30 gpm.

C. Pressurizer spray is operated to reduce subcooling from 90°F to 40°F.

D. Aux feedwater flow is adjusted from 150 gpm to 200 gpm to increase S/G level.

A Incorrect, would reduce steam flow

B. Incorrect, feed rate will have to be increased to maintain S/G levels.

C. Incorrect, as long as the RCS remains subcooled, reducing RCS pressure will have no effect.

D. **Correct.**

Question level: 1
Question source: Bank
Exam: RO/SRO
K/A: 035.A4.05
Importance: 4.0
References: 2-ONP-0120039 Natural Circulation, 0702835 Loss of Offsite Power/ Natural Circulation

1. Station Blackout - DC bus is required to open air start solenoids and provide field flash.

2. Residual magnetism in windings can provide enough flashing up to 24 hours after any diesel generator loading.

d. RCS Heat Removal

1) Feed Rate Note is to avoid water hammer and damage to feed ring upon initiation of cold AFW to hot steam filled feed system and drained feed ring.

Reference Steps of EOP-09

2) Steps provide guidance to take control of AFW system, after AFAS, to limit flow to 150 gpm and prevent overfeeding the SGs.

3) Core and RCS Heat Removal will be maintained by:

a) Ensuring a heat sink is available by maintaining SGs > 40% wide range.

b) Heat removal is taking place by the preferred method of steaming the SGs through the ADVs.

Or

c) Heat removal is taking place by the non-preferred method of steaming the SGs through the MSSVs.

4) Note the contingency action to take local control of ADVs would only apply on Unit 1.

5) Steaming through the MSSVs results in undesired "saw tooth" affect on RCS parameters (temp., press., level, NC flow) and in time may lead to ESDE if any MSSV sticks open.

e. Core Heat Removal

EO-5

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
2. SAMPLE the RCS and Pressurizer surge line to determine boron concentration and dissolved Hydrogen. **INITIAL**______	

CAUTION

After a boron concentration for cold shutdown is attained in the RCS, makeup water added to the RCS during the cooldown should be at least the same boron concentration as in the RCS to prevent any dilution of RCS boron concentration.

INSTRUCTIONS	CONTINGENCY ACTIONS
§1 3. BORATE to maintain adequate SDM throughout the RCS cooldown.	3. If BAM tanks and RWT are NOT available, the SITs may be used for makeup to the RCS per Appendix A.
§1,2,3 4. PERFORM ALL of the following:	4.
A. COMMENCE an RCS cooldown to less than 325°F, within the limits of Figure 1, RCS Pressure Temperature, at a rate NOT to exceed 50°F per hour, using SBCS. REFER TO Figure 2, Recommended Cooldown Guidelines.	A. OPERATE **ANY** of the following to cooldown the RCS to less than 325°F, within the limits of Figure 1, RCS Pressure Temperature, at a rate NOT to exceed 50°F per hour. REFER TO Figure 2, Recommended Cooldown Guidelines. • ADVs • 2C AFW Pump

Question 99

Unit 1 has just tripped from 100% power with a loss of all Containment cooling. As Containment temperature increases, what effect will a rise in Containment temperature have on Steam Generator level?

A. Actual level will be higher than indicated level due to voiding in the variable leg.

B. Actual level will be higher than indicated level due to reference leg temperature increase.

C. Indicated level will be higher than actual level due to voiding in the variable leg.

D. Indicated level will be higher than actual level due to reference leg temperature increase.

A. Incorrect, voiding will not occur in variable leg due to variable leg at S/G pressure.

B. Incorrect, DP will decrease due to the decrease in density of the reference leg. This will cause actual level to be lower than indicated.

C. Incorrect, voiding will not occur in variable leg due to variable leg at S/G pressure.

D. Correct

Question level: 1
Question source: Bank
Exam: RO/SRO
K/A: 022.K3.02.
Importance: 3.3
References: 0711170 Instrument And Controls

{PRIVATE }4.9 Level Error{tc \l 2 "4.9 Level Error"}

Errors in level indication from **detector failure** or electronic failures are not predictable to any amount of usefulness. Predictable failures that are of concern during transient or accident conditions relate to the loss of the reference leg. Two viable conditions for discussion are Rapid Depressurization, associated with Steam Generator level, and Containment Temperature Increases affecting both the Steam Generator and the Pressurizer.

The reference leg when maintained full by condensation in the condensing pot is at some ambient temperature, except in the condensing pot which is near the saturation temperature. During a depressurization the water in the condensing pot could flash to steam and the flow would be out of the condensing pot, this would remove some of the water from the reference leg, thus changing the reference pressure on the detector giving an indicated level higher than actual. This condition will correct itself as the condensing pot refills. Some indications of this transient are bouncing levels or uneven levels.

One incident that increases the Containment Temperature would be a small line break that flashes to steam. The increase in the ambient temperature will affect the level indication by increasing the reference leg ambient temperature therefore decreasing the density in the leg; this again will decrease the reference pressure on the detector giving a higher indicated level than actual.

Other failures that could result in level errors are <u>physical</u> failure of the Δp cell or of the reference or variable legs.

Complete failure of the Δp cell bellows or diaphragm or opening the equalizing valve would cause $\Delta p=0$. This should cause indicated level to fail high.

Failure or draining of the Reference Leg also appears as a high level condition.

Failure of the Variable Leg would appear as a low level condition.

{PRIVATE }5.0 TEMPERATURE MEASUREMENT{tc \l 1 "5.0 TEMPERATURE MEASUREMENT"}

Temperature is one of the most commonly measured variables and is one of the four basic physical parameters of nature for which independent standards and units have been selected.

Length, mass, time and temperature are the four independent parameters to which all other physical parameters are referred.

Assuming that the density of the water is the same in the two columns and P_s (**Figure 1-19**) is equal on both columns then the differential measured by the sensor:

$\rho\Delta h = (h_m - h_1)\,\rho = P$

ρ = Density

Any pressure applied to the tank will be equally applied to both the high and low sides of the sensing bellows. As such, the applied pressure will cancel itself out at the sensing device, leaving only the differential pressure of the applied level to be measured.

Steam vapor will flow into the condensate pot and condense on the outer walls of the pot. The condensate will flow down into the reference leg to maintain the reference leg full at all times. The principle of the wet leg transmitter is the same as that utilized on a pressurized tank in that they both measure a differential. However, the differential pressures sensed at the transmitter is reversed. The transmitter will sense a <u>MAXIMUM D/P at MINIMUM LEVEL</u>, since the reference leg is the high pressure side of the sensor.

However, if there is not compensation for changes in temperature (therefore in water density), errors are introduced. That is, since the reference leg is basically at ambient temperature while the active leg is at or near the temperature of the process it is measuring, then level measurements become erroneous. To prevent this, temperature or pressure compensation is introduced. This, in essence, is regarded as density compensation.

{PRIVATE }4.8 Electronic Pressure Compensation{tc \l 2 "4.8 Electronic Pressure Compensation"}

This type of compensation is sometimes used for greater accuracy in level measurements of saturated systems. In a saturated system, if the pressure is known then the temperature and water density are also known. Therefore, if a system is known to be saturated, the system pressure can be used to derive the density of the water.

Another method of compensation based on the saturated system, is to calibrate the instrument for normal operating conditions. This is done by simply using a constant in the level amplifier, this eliminates the extra instrumentation required in the pressure method.

At PSL on the pressurizer the narrow range level is normally calibrated hot for normal operations (2250 psia) and the wide range is calibrated cold (120°F) for startup and shutdown.

Question 100

Which of the following parameters determines when Containment Spray can be terminated on Unit 2?

Containment Pressure:

A. Containment temperature, Hydrogen concentration

B. Containment temperature, Hydrazine Tank level

C. Containment Spray flow, Hydrazine Tank level

D. Containment Spray flow, Hydrogen concentration

A. Incorrect, hydrogen concentration is only used for determining what type of Hydrogen removal method will be used not Containment Spray termination.

B. Correct

C. Incorrect, spray flow is used to meet the safety function but is not part of the termination criteria.

D. Incorrect, spray flow is used to meet the safety function but is not part of the termination criteria and Hydrogen concentration is only used for determining what type of Hydrogen removal method will be used not Containment Spray termination.

Question Level: 1
Question Source: New
Exam: SRO Only
K/A: 027.G2.4.21
Importance: 4.3
References: 0702207r18-19A ECCS,CNTMT Heat Removal and SDC System,0711824 Loss Of Coolant Accident Event And Procedure, 2-EOP-3 Loss Of Coolant Accident, 10CFR.55.43.b5

Potential sources of leakage which can be rapidly and remotely isolated are checked and isolated, if possible, to minimize RCS inventory losses and to attempt to isolate the break. The PORV's are checked closed. Letdown flow should be isolated (automatic on SIAS). CCW alarms are checked to very no RCS leakage into the CCW system. If the source of the leak can be identified, it should be isolated, if possible.

Once actions to isolate the leak have been taken, directions are given to place the hydrogen analyzers inservice. Also, directions are given to place Hydrogen Recombiners and possibly the Hydrogen Purge System into service if any of the appropriate conditions specified in Appendix-M of EOP-99 exist. Although hydrogen is not flammable until it reaches a concentration of approximately 4% (in dry air), it is prudent to reduce hydrogen to as low a concentration as possible, i.e., less than the minimum detectable concentration of approximately 0.5%. This action minimizes the possibility of reaching the flammability limit and of forming pockets of high concentration hydrogen.

When Containment Sprays (CS) are actuated, hydrogen may be generated by the reaction of boric acid (from spray flow) with aluminum and zinc metals in the containment. The reaction rates will be a function of temperature. Therefore, if the CS system has been spraying boric acid onto zinc and aluminum surfaces in a high temperature environment, conditions may exist for generation of a detectable hydrogen concentration in the containment.

Containment spray should be terminated when Containment pressure has been reduced to an acceptable level since lengthy operation of the system may jeopardize the operation of equipment that would be needed later in the event. This action is necessary since continued operation of the CS System after pressure has been reduced to an acceptable level simply increases the probability of electrical grounds, shorts, and other malfunctions. For Unit 2, the containment spray system cannot be stopped until all of the hydrazine is injected.

4.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
* 39. **Containment Spray Termination** If CS pump(s) are operating and **ALL** of the following conditions are satisfied: • Containment pressure is less than 3.5 psig and stable or lowering • Containment Spray is NOT required for Containment cooling • The Hydrazine Tank has been pumped into the Containment, and Containment Spray is NOT required for iodine removal Then TERMINATE Containment Spray **ONE** train at a time. **REFER TO** Appendix P, Restoration of Components Actuated by ESFAS.	

ATTACHMENT 1
SAFETY FUNCTION STATUS CHECK SHEET
(Page 10 of 11)

8. CONTAINMENT TEMPERATURE AND PRESSURE

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A. Containment Temperature	Less than 230°F	☐☐☐☐☐☐
		AND
Containment Pressure	Less than 5.4 psig	☐☐☐☐☐☐
OR		
B. **TWO** Containment Spray Headers	Flow in **EACH** header is at least 2700 gpm	☐☐☐☐☐☐
		AND
Containment pressure	Less than 42 psig	☐☐☐☐☐☐
OR		
C. **FOUR** Containment Fan Coolers	Running	☐☐☐☐☐☐
		AND
Containment pressure	Less than 42 psig	☐☐☐☐☐☐
OR		
D. **TWO** Containment Fan Coolers	Running	☐☐☐☐☐☐
		AND
ONE Containment Spray Header	Flow in the header is at least 2700 gpm	☐☐☐☐☐☐
		AND
Containment pressure	Less than 42 psig	☐☐☐☐☐☐

END OF SAFETY FUNCTION 8