Bank:	1822	**Rev:**	0	**Rev Date:**	4/3/2012 7:43:00	**QID #:**	1	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	F	**Source:**	NEW		
Search	000007K103	**10CFR55:**	41.7 / 41.8 / 41.10	**Safety Function**	1				
System Title:	Reactor Trip - Stabilization	**System Number**	007	**K/A**	EK1.03				
Tier:	1	**Group:**	1	**RO Imp:**	3.7	**SRO Imp:**	4.0	**L. Plan:**	A2LP-RO-ESPTA
OBJ	11								

Description: Knowledge of the operational implications of the following concepts as they apply to the reactor trip: - Reasons for closing the main turbine governor valve and the main turbine stop valve after a reactor trip

Question:

The reason for verifying the main turbine governor and the main turbine stop valves are closed after a reactor trip is to prevent ____________________

A. motoring of the Main Turbine Generator

B. over pressurization of the Main Condenser

C. overspeeding of the Main Turbine Generator

D. a "Stall-Flutter" condition of the Low Pressure Turbine blading

Answer:

C. Correct

Notes:

A. is incorrect, generator motoring is a result of steam being secured and the generator still connected to the Grid.

B. is incorrect, over pressurization of the main condenser is a concern if steam is left align with a loss of cooling water, however, the EOP user guide states that if the governor/stop valves do not go closed then manually trip the turbine (second attempt to close them) if still not closed then close the MSIVs. Also, close the MSIVs if there is still steam flow to the condenser.

D. is incorrect, Overheating of the LP Turbine blading is a concern if operating the Turbine with a higher than designed backpressure (HI/degraded Vacuum)

References:

OP-2202.001, Standard Post Trip Actions, Rev. 013 (step 4, page 4)
EOP-2202.001, EOP Tech Guide, Rev. 012 (step 4, page 10)
AOP-2203.019, Loss of Vacuum Tech Guide, Rev. 9 (Attachment A Basis, page 20)
STM 2-30, Main Generator Construction and Controls, Rev. 9, section 1.1 [pages 6 and 7]
A2LP-RO-ESPTA, Rev. 11, Obj. 11, Describe the major actions taken during the performance of SPTA and the basis for each.

Historical Comments:

New Question

Because the Stator windings are very large and carry a great deal of current, adequate cooling is a problem. One common method of maintaining a temperature low enough to permit continuous operation is to construct these windings with conducting wire that is hollow. Cooling water is then pumped through the hollow center of the armature conductors. When very high voltages are generated, electrical insulation of these windings and their connections is also very important. Failure of this insulation or generating above the design voltage of the machine could result in serious damage to the Generator.

From the Generator, the armature (stator) windings lead to the Main Transformer on the east side of the Turbine Building. Here the voltage is stepped up from 22KV to 500KV. The higher voltage allows the same amount of power to be transmitted with a lower current and limits the size of conductor required. The voltage is later stepped down again for customer use.

Recall that the amount of voltage that a generator produces depends on:

- The number of coils in the stator (armature) winding
- The strength of the rotor magnetic field

The only practical method of varying the output voltage is by changing the strength of the rotor field.

The purposes of the excitation system are to:

- Produce a magnetic field in the rotor
- Regulate the Main Generator AC output voltage

The excitation system constantly monitors the total AC load demand on the Main Generator and responds immediately to changing demands by raising or lowering the Exciter voltage. This varies the excitation current to the Main Generator field winding, thus maintaining the Main Generator output voltage within prescribed values.

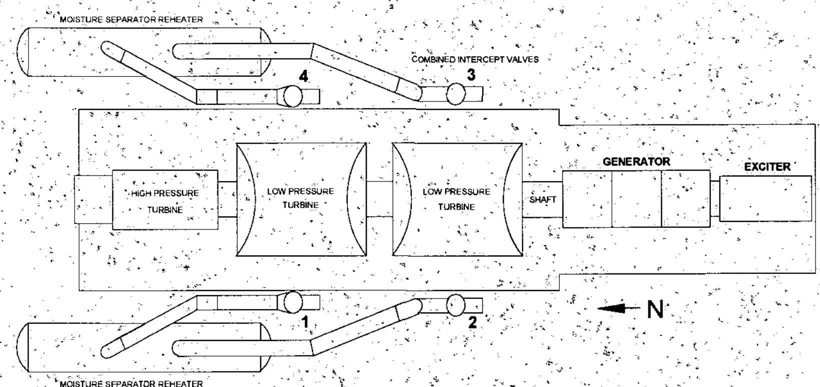
The air space around the Stator windings and the air space between the Stator and the Rotor is filled with pressurized hydrogen gas. The hydrogen is made to flow through these spaces by circulating fans attached to the shaft. Its purpose is to provide cooling to the Rotor field windings and some additional cooling to the Stator windings and insulation. The hydrogen is cooled by a cooling water heat exchanger mounted inside the Generator housing. While the use of hydrogen does improve the Generator efficiency and cooling capability, its presence constitutes a serious explosive hazard should it be allowed to leak from the Generator or otherwise mix with oxygen. Special oil seals are used to prevent any such leakage.

One final point to be made about the Generator is that it is the load for the Main Turbine. This may be difficult to imagine, because there is no direct physical link between the Rotor field windings and Stator windings. They are linked only by a magnetic field. However, that magnetic link is surprisingly strong; so strong, in fact, that improper operation of the Generator electrical systems can cause serious damage to the Turbine. An electrical trip of the

Generator caused by opening of the Generator circuit breakers at the output end of the Stator windings will also cause a Turbine trip, which is a closure of the all of the Turbine steam admission valves. This is done to prevent excessive overspeed of the Turbine. This in turn causes a Reactor trip to prevent an excessive overpressure condition in the Reactor Coolant System. For more details regarding the Main Turbine refer to STM 2-24, Main Turbine Construction. For additional details about the Main Turbine protection system go to STM 2-24-1, Main Turbine Control System. For additional details on Generator Gas systems go to STM 2-30-4.

1.2 Main Generator Overview

As we mentioned in the previous section, the function of the Main Generator is to convert the mechanical energy of the Main Turbine into electrical energy. It is coupled directly to the Main Turbine as shown in the figure below. The Main Generator Rotor is cooled by hydrogen gas while the Stator windings are kept cool by a separate Stator Cooling Water system.



The Rotor field current, referred to as excitation, for the Main Generator is provided by the output of the Alternator-Exciter. The Alternator-Exciter is coupled directly to the Main Generator.

The Generator is connected to the Main and Unit Auxiliary Transformers via a forced fan-cooled Isolated Phase (Iso-phase) Bus system. (refer to STM 2-30-2, IsoPhase Bus Cooling System for more details). The Turbine-driven Generator delivers AC power at 22 kV (22,000 volts) to the Main Transformer bank and the Unit Auxiliary Transformer. This electrical power is stepped up to 500 kV by the Main Transformer for the transmission to the switchyard and stepped down to 6.9 kV and 4.16 kV by the Unit Auxiliary Transformer for the station auxiliaries during normal operating conditions. Refer to STM 2-32-2, High Voltage Electrical Distribution for details regarding these transformers.

The Generator Hydrogen Seal Oil System supplies oil to seal the Generator casing against leakage along the shaft. Two stationary seals, located at each end of the Generator shaft, prevent leakage of air into and hydrogen out of the Main Generator. Refer to STM 2-30-3, Seal Oil System for more details.

The Generator has dual element resistance temperature detectors (RTDs) and thermocouples (TCs). The dual element RTD's (10 ohm) are installed between the top and bottom set of stator bars. The dual element TCs (chromel-constantan) are

INSTRUCTIONS	CONTINGENCY ACTIONS
4. Check Maintenance of Vital Auxiliaries satisfied:	
A. Check Main Turbine tripped by BOTH of the following: • ALL Main Stop Valves closed. • Generator megawatts indicate zero.	A. Perform the following: 1) Manually trip Main Turbine at 2C01. 2) IF Main Turbine does NOT trip, THEN close MSIVs: • 2CV-1010-1 • 2CV-1060-2
B. Generator Output breakers open.	B. Open Generator Output breakers: • 5130 • 5134
C. Exciter Field breaker open.	C. IF Generator Output breakers open, THEN open Exciter Field breaker.
D. Check the following valves closed: • MSR 2E-12A Steam Supply From SG A (2CV-0400) • MSR 2E-12B Steam Supply From SG B (2CV-0460)	D. Close MSIVs: • 2CV-1010-1 • 2CV-1060-2

(Step 4 continued on next page)

EOP STEP:

4. **Check Maintenance of Vital Auxiliaries satisfied:**

EPG STEP:

2.

DEVIATION? Yes

BASIS FOR DEVIATION:

A. The EOP, like the EPG, checks that the main turbine has tripped. The operator checks all Main Stop Valves closed and Generator megawatts indicate zero The contingency action attempts to manually trip the turbine prior to closing the MSIVs. Maintaining the MSIVs open allows the steam flow path to the condenser to be maintained. (1)

B. The EOP, like the EPG, also checks that the generator output breakers have opened to ensure the main generator has disconnected from offsite power. A Contingency Action is provided to direct manually opening the output breakers.

C. The EOP utilizes an additional criterion that the exciter field breaker be checked open to protect the turbine generator. If the breaker remains closed, then the electrical field supplied by the exciter will drastically affect the turbine coast down time. Further, the contingency step to open the exciter field breaker contains a check of Generator Output breaker status. If the Generator Output breaker(s) remain closed, then the exciter field breaker must also remain closed so as not to cause any generator/exciter damage with turbine tripped and generator still coupled to the grid.

D. The MSR Supply Valves from the SGs (2CV-0400 and 2CV-0460) auto close on a turbine trip due to low turbine cross around pressure. If power to these valves is lost prior to the trip, MSIVs will need to be shut to prevent RCS overcooling.

E. Only one 6900v AC bus is required to be energized in the EOP, since each individual bus will support operation of two RCPs and one Circulating Water pump. This provides for forced circulation, and will allow implementation of RTR. The requirement for Non-Vital 480v buses is not used, since the loads supplied by these buses are redundant and loss of one half of the buses will not prevent the safety function from being satisfied.

Attachments:

Attachment A

BASIS:

Attachment A requires a lower back pressure at low loads to prevent the turbine from entering a "Stall-Flutter" condition. "Stall" is a condition where laminar flow on the back side of an airfoil is lost and turbulent flow begins. Since the low pressure turbine blades are similar to aircraft wings when viewed end on, this condition can occur in the low pressure turbine blades. When steam velocity across a blade lowers it can cause a turbulent flow or "stall" condition to occur. Once the blade reaches a "stall" condition it begins to flutter. This can result in a fatigue failure of the turbine blades. Therefore at low turbine loads we attempt to maintain the steam flow velocity across the blades in the acceptable range by reducing the turbine exhaust pressure.

Turbine load is reduced in an attempt to maintain condenser pressure below administrative limits of Figure 1 (TB170X554 Entergy Arkansas Nuclear One – Backpressure Limits – Monoblock Rotors as presented in Turbine Tech Manual SI 2.03 "Allowable Exhaust Pressure Operation and reproduced in AOP as Attachment A). Maintaining condenser pressure below this limit will allow operator time to restore primary and secondary parameters in a controlled fashion. The operator will not exit procedure until condenser pressure established less than 5.3 Inches HG ABS as per ER (2)

Implementation of Power Uprate during 2R15 resulted in a rise in condenser pressure for succeeding cycles. (2) The condenser pressures rose from 3.65/4.81 Inches HG ABS to 3.75/5.10 Inches HG ABS for the LP "B" and HP "A" condenser, respectively. As per ER, HP condenser expected to reach
5.1 Inches HG ABS during peak summertime condition. Therefore, pre-existing administrative limit of 5.0 Inches HG ABS is no longer adequate. The administrative limit was corrected to 5.3 Inches HG ABS which corresponds to the alarm setpoint. Note that vacuum pump autostart setpoint of 4.5 Inches HG ABS is marginally adequate for Power Uprate conditions since average condenser pressure at power uprate is 4.425 Inches HG ABS.

SOURCE DOCUMENTS:

1. TM 080.3290, Technical Manual for Unit 2 Steam Turbine Generator, SI 2.03 "Allowable Exhaust Pressure Operation"
2. ER992190E202, Condenser Vacuum Limit change for Power Uprate.

Bank: 1823 **Rev:** 0 **Rev Date:** 4/3/2012 7:53:51 **QID #:** 2 **Author:** Foster

Lic Level: R **Difficulty:** 3 **Taxonomy:** H **Source:** NEW

Search 000008A106 **10CFR55:** 41.7 **Safety Function** 3

System Title: Pressurizer (PZR) Vapor Space Accident (Relief **System Number** 008 **K/A** AA1.06

Tier: 1 **Group:** 1 **RO Imp:** 3.6 **SRO Imp:** 3.6 **L. Plan:** A2LP-RO-RCS **OBJ** 25

Description: Ability to operate and/or monitor the following as they apply to the Pressurizer Vapor Space Accident: - Control of PZR level

Question:

REFERENCE PROVIDED

Consider the following:

- Unit 2 is operating at 100% power
- Annunciator 2K10 B4 PZR RELIEF TAILPIPE TEMP HI is in alarm
- The ATC reports Quench Tank (2T-42) level is trending up
- Initial Quench Tank level 77.5%
- 10 minutes later Quench Tank level 79%

What is the RCS leakrate, and what action is required to RESEAT the Code Safety valve?

A. 26.4 gpm, Lower RCS pressure

B. 2.64 gpm, Lower RCS pressure

C. 26.4 gpm, Raise RCS pressure

D. 2.64 gpm, Raise RCS pressure

Answer:

B. Correct; the leakrate is correct and the ACA will direct the use OP-2103.005 which wil lower pressure to reseat code safety

Notes:

A. incorrect, leakrate is wrong (did not divide by time frame of data taken)
C. incorrect, leakrate is wrong (did not dived by time frame of data taken) and raising RCS pressure is the wrong action per procedure
D. incorrect, raising RCS pressure is the wrong action per procedure

References:

OP-2305.002, Reactor Coolant System Leak Detection, Rev 023, exhibit 1 (chart for tank levels (in percent) vs. gallons (PROVIDED TO STUDENT) [page 37]
ACA OP-2203.012-J, Rev. 037, 2K10 window B-4, step 2.4 (page 39)
OP-2103.005, Pressurizer Operations, Rev. 033, section 10.0 (page 15)
A2LP-RO-RCS, Rev. 23, Obj. 25, Describe the construction of the Quench Tank to include all flow paths into and out of the tank and the method used for overpressures protection.

Historical Comments:

New Question

2305.002 EXHIBIT 1 REVISED 08/28/06

COMPONENT VOLUME VS LEVEL

PAGE 1 OF 1

PRESSURIZER	53.5 gal/%
VCT	33.8 gal/%
CNTMT SUMP	39.0 gal/%
QUENCH TANK & RDT	17.6 gal/%
CCW SURGE TANK (CCW Loops Split)	9.3 gal/%
CCW SURGE TANK (CCW Loops Cross-Connected)	18.6 gal/%
SIT	120.6 gal/%
RWT	4787.8 gal/%
ABS	9.48 gal/%
2T-20	57.0 gal/%
2T-12	425 gal/%

ANNUNCIATOR 2K10

B-4

PZR RELIEF TAILPIPE TEMP HI

1.0 CAUSES

1.1 Temp > VSP on relief line downstream of 2PSV-4633 (2TIS-4630).

1.2 Temp > VSP on relief line downstream of 2PSV-4634 (2TIS-4631).

2.0 ACTION REQUIRED

NOTE

- Alarm variable setpoint (VSP) adjusted to 160°F if relief not leaking or 240°F if relief leaking (2TIS-4630 or 2TIS-4631 > 160°F).
- 2TIS-4630 and 2TIS-4631 may be at different VSPs.

2.1 Perform RCS LKRT per 2305.002, Reactor Coolant System Leak Detection to determine leakage from 2PSV-4633 and 2PSV-4634.

2.2 <u>IF</u> leakage determined,
<u>THEN</u> perform the following:

2.2.1 Refer to 2203.016, Excess RCS Leakage.

2.2.2 Adjust 2TIS-4630 or 2TIS-4631 VSP to 240°F using upper right adjustment screw to maintain alarm function.

2.2.3 <u>IF</u> wrong adjustment screw turned,
<u>THEN</u> submit WR/WO for calibration.

2.3 Vent and drain Quench tank as necessary using 2103.007, Quench Tank and Reactor Drain Tank Ops.

2.4 <u>IF desired to reduce RCS pressure to attempt to seat valve,</u>
<u>THEN refer to 2103.005, Pressurizer Operations.</u>

2.5 <u>WHEN</u> tailpipe temperature returns to no leakage condition (< 140°F),
<u>THEN</u> restore VSP to 160°F.

3.0 TO CLEAR ALARM

3.1 Reduce tail pipe temperature (2TIS-4630 and 2TIS-4631) to < VSP.

4.0 REFERENCES

4.1 E-2456-3

4.2 DCP-88-2111

4.3 ER010542E201, CR-2-2000-0262, Pressurizer Tailpipe Temperature Alarm

CAUTION

R A P

The following section has been determined to have a Reactivity Addition Potential (RAP) and this activity is classified as a Risk Level R3.

10.0 OPERATION AT REDUCED PRESSURIZER PRESSURE

Normal Pressurizer pressure in Mode 1 is 2200 psia. Tech Spec 3.2.8 allows average pressure to be maintained between 2025 and 2275 psia. The purpose of the broadened band and the ability to operate at lower pressure is to allow flexibility when attempting to reseat simmering Pressurizer Code safeties.

CAUTIONS

- PZR Spray Valves will open in AUTO if online PZR pressure controller is lowered ≥ 25 psia below actual pressure.
- Continuous operation below 2150 psia is limited to < 24 hours to limit the potential for SIAS actuation following an uncomplicated reactor trip.
- At pressures < 2100 psia, a 4% penalty factor is applied to CPC DNBR which could drop DNBR by 0.2. In addition, DNBR will lower due to the pressure reduction, but should stay above the pre-trip setpoint. Up to 5% power reduction may be required to maintain DNBR above the log limit.

10.1 IF desired to reduce Pressurizer pressure, THEN perform the following:

(*) 10.1.1 Monitor DNBR margin on CPCs while lowering pressure. (DNBR pretrip is 1.4)

10.1.2 Lower PZR pressure setpoint for online controller PZR Press Ch 1 (2PIC-4626A) or PZR Press Ch 2 (2PIC-4626B) to desired value.

10.1.3 Lower PZR pressure setpoint for offline controller 2PIC-4626A or 2PIC-4626B to desired value.

10.1.4 IF PZR pressure lowered below 2150 psia, THEN track 24 hour time limit on status board.

Bank:	1824	**Rev:**	0	**Rev Date:**	4/3/2012 9:07:25	**QID #:**	3	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW		
Search	000009A233	**10CFR55:**	41.5 / 41.7 / 41.10 / 43	**Safety Function**	3				
System Title:	Small Break LOCA	**System Number**	009	**K/A**	EA2.33				
Tier:	1	**Group:**	1	**RO Imp:**	3.3	**SRO Imp:**	3.8	**L. Plan:**	A2LP-RO-ALEAK
OBJ	5, 8								

Description: Ability to determine and interpret the following as they apply to a small break LOCA: - RCS water inventory balance and Tech-Spec limits

Question:

REFERENCE PROVIDED

Consider the Following:

- Unit 2 is operating at 100% power

ATC reports:
- Containment Humidity is trending up slowly
- Reactor Coolant System (RCS) Temperature is stable

CRS directs the ATC to perform a RCS Mass Balance

- Initial Data:
  - Pressurizer level 59.75%
  - Volume Control Tank (VCT) level 68%
  - Containment sump level 22%
- Data 15 minutes later:
  - Pressurizer level 59.5%
  - Volume Control Tank (VCT) level 67.6%
  - Containment sump level 22%

The RCS mass loss is __________ and the RCS Leakage limits, per Technical Specification 3.4.6.2, ________________ been exceeded?

A. 0.45 gpm, has not

B. 0.9 gpm, has not

C. 1.8 gpm, has

D. 18 gpm, has

Answer:

C. Correct; Based on Pressurizer level 53.5 gallons per percent, VCT Level 33.8 gallons per percent, containment sump level is constant therefore not used in calculation (sump level is provided to the student due to being inline with normal parameters (Data) gather by RO for RCS mass balance)
T.S. limit of 1 gpm for unidentified leakage is exceeded

Notes:

A, B, and D are incorrect base on reason above

References:

OP-2305.002, Reactor Coolant System Leak Detection, Rev. 023, exhibit 1 (chart for tank levels (in percent) vs. gallons [page 37]
[PROVIDED TO STUDENT] T.S. 3.4.6.2 , Amenment #280
A2LP-RO-ALEAK, Rev. 0, Obj. 5, Given plant conditions, calculate a RCS Leak Rate. And Obj. 8, Discuss the Unit 2 Technical Specifications that are associated with the Excess RCS Leakage AOP.

Historical Comments:

New Question

2305.002 EXHIBIT 1 REVISED 08/28/06

COMPONENT VOLUME VS LEVEL

PRESSURIZER	53.5 gal/%
VCT	33.8 gal/%
CNTMT SUMP	39.0 gal/%
QUENCH TANK & RDT	17.6 gal/%
CCW SURGE TANK (CCW Loops Split)	9.3 gal/%
CCW SURGE TANK (CCW Loops Cross-Connected)	18.6 gal/%
SIT	120.6 gal/%
RWT	4787.8 gal/%
ABS	9.48 gal/%
2T-20	57.0 gal/%
2T-12	425 gal/%

REACTOR COOLANT SYSTEM OPERATIONAL LEAKAGE

LIMITING CONDITION FOR OPERATION

3.4.6.2 Reactor Coolant System operational leakage shall be limited to:

a. No PRESSURE BOUNDARY LEAKAGE,

b. 1 GPM UNIDENTIFIED LEAKAGE,

c. 150 gallons per day primary to secondary leakage through any one steam generator (SG),

d. 10 GPM IDENTIFIED LEAKAGE from the Reactor Coolant System, and

e. Leakage as specified in Table 3.4.6-1 for those Reactor Coolant System Pressure Isolation Valves identified in Table 3.4.6-1.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With any PRESSURE BOUNDARY LEAKAGE or any primary to secondary leakage not within limit, be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With any Reactor Coolant System operational leakage greater than any one of the above limits, excluding PRESSURE BOUNDARY LEAKAGE and primary to secondary leakage, reduce the leakage rate to within limits within 4 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With any Reactor Coolant System Pressure Isolation Valve leakage greater than the above limit, isolate the high pressure portion of the affected system from the low pressure portion within 4 hours by use of at least two valves* in each high pressure line having a non-functional valve and be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

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* These valves may include check valves for which the leakage rate has been verified, manual valves or automatic valves. Manual and automatic valves shall be tagged as closed to preclude inadvertent valve opening.

Bank: 1825	**Rev:** 1	**Rev Date:** 6/27/2012 10:06:5		**QID #:** 4		**Author:** Foster			
Lic Level: R	**Difficulty:** 2	**Taxonomy:** F		**Source:** NEW					
Search 000011K308		**10CFR55:** 41.5 / 41.10 / 45.6 / 45		**Safety Function** 3					
System Title: Large Break LOCA				**System Number** 011		**K/A** EK3.08			
Tier: 1	**Group:** 1	**RO Imp:** 3.9	**SRO Imp:** 4.1	**L. Plan:** A2LP-RO-LOCA		**OBJ** 12			

Description: Knowledge of the reasons for the following responses as they apply to the Large Break LOCA: - Flowpath for sump recirculation

Question:

Consider the following:

- Unit 2 has experienced a large break LOCA
- Refueling Water Tank [RWT] level is 5 %
- All equipment has responded as designed

Considering the above conditions, the Spray Pumps function is to ______________________ and flow through the reactor core is being provided by the __________________ pumps.

A. maintain temperature of the water being used for core cooling; Low Pressure Safety Injection [LPSI]

B. maintain temperature of the water being used for core cooling; High Pressure Safety Injection [HPSI]

C. provide mixing of Boron in the containment sump for pH control; Low Pressure Safety Injection [LPSI]

D. provide mixing of Boron in the containment sump for pH control; High Pressure Safety Injection [HPSI]

Answer:

B. Correct; a Recirulation Actuation Signal will have occurred with the given RWT level. this happens in 25 to 30 minutes post accident. The spray initial response is to prevent the energy release from challenging the design limits of the Containment building. During the Recirculation phase, the spray system will maintain Containment sump temperature by reciring thru the SDC heat exchanger, therefore maintaining the temperature of the water being used for core cooling. The Spray pumps will provide mixing of the TSP in the sump to maintain pH control. The boron that is in the Containment sump will be from the water that was injected from the RWT for shutdown margin. The HPSI pumps will continue to run and inject water into the core for cooling post RAS. The LPSI will recieve a OFF signal on a RAS due to NPSH concerns from the LPSI pump higher flowrates.

Notes:

A, C and D are incorrect for reasons stated above

References:

STM 2-05, Emergency Core Cooling, Rev. 24, section 3.1, HPSI overview (page 14) and section 3.2, HPSI Flowpath (page 15) section 4.0 and 4.1 [page 28]
STM 2-08, Containment spray, Rev. 22, section 1.0, Overview (page 1) and section 2.1, flowpath (page 4)
ALP-RO-LOCA, Rev. 12, Obj. 12, Describe a RAS as it relates to the ECCS including the cause of the RAS; the components actuated by the RAS; HPSI and LPSI pump response to a RAS; and flowpaths available during RAS operation of the ECCS system

Historical Comments:

New Question

Rev. 1; changed wording in 2nd half of stem from what's providing core cooling to what is providing core flow, based on NRC comments

3.0 High Pressure Safety Injection System

3.1 Overview

The HPSI system injects borated water from the refueling water tank (RWT) into the reactor coolant system (RCS) at a high pressure. The system performs this function automatically when initiated by a Safety Injection Actuation Signal (SIAS). It maintains flow to keep the core covered and cooled for a small break loss of coolant accident (LOCA). It provides recirculation of coolant through the reactor core for an extended period following a LOCA. The HPSI system also injects borated water into the RCS to raise shutdown margin following a rapid cooldown of the RCS caused by a steam line rupture incident.

The HPSI system is a subsystem of the emergency core cooling system (ECCS) also called the safety injection system (SIS). Refer to the drawing on page 64. The HPSI system has three electric motor-driven pumps installed in parallel. Two high pressure injection headers and eight motor operated injection valves connect the pumps to the four injection points on the RCS loop cold legs. A manual throttle valve is located upstream of each of the injection valves. The manual valves are throttled to balance flow between injection legs. A handle restraint is welded to the yoke of the manual throttle valves to prevent operation except during flow balancing.

Two more motor-operated valves connect to the "B" hot leg through the shutdown cooling (SDC) suction piping penetration. This connection allows balancing of the hot leg and cold leg injection flow after a LOCA has occurred. An orifice in each injection header prevents pump runout under low pressure conditions (#1 header - 2FO-5101, #2 header - 2FO-5102).

The “C” pump is considered a swing pump and can be aligned to either high pressure header. It is placed in automatic service if one of the other pumps is not operable. The “A” and “B” pumps are powered from 2A-3 and 2A-4 buses respectively. The “C” pump can be powered from either bus depending on its alignment. Normally, both handswitches in the control room are in the PULL-TO-LOCK position with their associated breakers racked up. A kirk key interlock system at the breaker makes the non-aligned train breaker NOT available. Also the operating springs for the non-aligned breaker are normally discharged.

Pressure actuated relief valves in each high pressure header provide over pressure protection. Another relief in header #1 protects against over pressure from the discharge of the charging pumps when the HPSI piping is used as a flowpath for charging into the RCS.

The refueling water tank (RWT) provides storage for the borated water to be injected. This tank is shared with the containment spray system. When the tank level reaches a low level (6%), both systems then take water from the containment sump.

The HPSI pumps are located in the lowest level of the auxiliary building to provide maximum net positive suction head (NPSH). The “A” and “B” pumps each share a room with a low pressure safety injection (LPSI) pump and a SDC heat exchanger. The “C” pump is in a separate room. This design prevents failure of a single component or pipe from affecting the components in the other rooms. The rooms have emergency safeguards feature (ESF) room unit coolers. The coolers are of the fan-coil unit type and each contains a low efficiency filter, a cooling coil and a centrifugal direct-driven fan. The coolers recycle the air within a room.

The rooms also have a purge air system which is normally aligned during normal plant operations. To ensure it is isolated during a SIAS situation, its dampers receive a CLOSE signal. The purge air system can also be used if personnel access is required during emergency conditions.

The HPSI system has the necessary connections, valves and piping to test each active component during normal plant operating conditions. Recirculation lines on each pump allow flow testing. System check valve leakage testing is accomplished during pump operation or by applying pressure from the charging pumps downstream of the check valve.

3.2 HPSI Flowpaths

The HPSI pumps take suction from the refueling water tank (RWT) during initial operation in the automatic mode. As the RWT level lowers, the suction automatically switches to the containment sump for the recirculation mode of operation. This action is caused by a recirculation actuation signal (RAS) generated when 2 of 4 level signals from the RWT reach 6% level. The pumps discharge through check valves and normally open motor-operated valves into high pressure headers #1 and 2. Normal lineup is for pumps “A” and “B” discharging to header #1 and header #2 respectively. Pump “C” is connected to both suction and discharge cross connect pipes. Manual isolations on either side of the “C” pump connections allow the pump to be aligned to either header #1 or header #2. Its alignment is determined by the surveillance last run but its control switches (described in a later section) are normally in PULL-TO-LOCK position. A flow element is installed in each of the headers. The headers then split into four lines, each with a motor-operated injection valve. The injection valves are paired such that the discharge from one header #1 valve and one header #2 valve combine. Flow then passes through another flow element, a containment penetration, and enters a LPSI injection line. This line then connects to one of four RCS loop injection lines. Flow then passes through a check valve and enters the RCS cold legs.

A second flow path begins at the pump discharge. This path is the minimum recirculation flow for protecting the pump from overheating if pumping against a shutoff head. This situation could occur during a incident that initiated automatic injection while RCS pressure is greater than the pump discharge pressure. Flow passes through a restricting orifice, a check valve, a normally open motor-operated isolation valve, and then enters the RWT recirculation line. Pump operation using this flowpath is normally limited to three (3) hours in a 24-hour period to minimize pump overheating.

Another recirculation path exists that returns flow directly to the associated pump suction. This flow path is necessary for pump protection in the event of a RAS signal occurring during injection.

4.0 Low Pressure Safety Injection (LPSI)

The LPSI system serves two functions. First, it injects a large quantity of borated water from the refueling water tank (RWT) into the reactor coolant system (RCS) at a low pressure. The system is automatically initiated by a safety injection actuation signal (SIAS). It keeps the core covered and cooled during a loss of coolant design basis accident (DBA-LOCA). Second, it provides flow through the core and the shutdown cooling heat exchangers for residual heat removal during cold shutdown conditions.

4.1 LPSI System Description

The LPSI system is a subsystem of the emergency core cooling system (ECCS). Refer to the drawing on page 74. The LPSI system has two motor-driven pumps (2P-60A and 2P-60B) installed in parallel. 2P-60A has a 450 horsepower motor while 2P-60B has a 500 horsepower motor. The difference is due to replacement of the "B" pump motor after it burned out. The 500 HP motor was immediately available and was installed. The pumps discharge into a combined low pressure header that has a return connection from the shutdown cooling heat exchangers. Four motor-operated injection valves connect the low pressure header to the four injection points on the RCS loop cold legs.

Each LPSI pump can be manually aligned to discharge to a SDC heat exchanger for decay heat removal operations. A flow detector and flow control valve in the low pressure header are used during SDC operation for temperature control.

The pumps are provided with minimum flow protection to prevent damage during extended periods of low-flow or no-flow conditions. The mini-recirc valves (2CV-5123 and 2CV-5124) are motor operated valves that return LPSI flow to the RWT. They receive a RAS actuation to close to preclude water inventory loss when entering the recirculation phase during a LOCA. RAS is bypassed at the PPS inserts on panel 2C03 during plant cooldown to help ensure against a loss of a shutdown cooling due to an RAS trip of a LPSI pump.

The recirculation lines have flow limiting orifices (.0625" diameter) installed which limit flow to < 100 gpm. This is minimum flow with the pump discharge valves shut. The pumps have a minimum continuous flow requirement (> 3 hours) of 2000 gpm which is controlled administratively. This also requires a manual valve lineup to recirculate flow back to the RWT.

A backpressure compensated pressure relief valve on the low pressure header provides over pressure protection should temperature in the piping rise while isolated.

Another relief valve in the return header from the SDC heat exchangers provides protection from being over pressurized by the higher pressure CVCS system.

The RWT provides storage for the borated water to be injected. This source is shared with the containment spray system and the high pressure injection system. When level in the RWT reaches a low level, a RAS is generated which secures the LPSI pumps to preclude pump damage on loss of net positive suction head.

STM 2-08

Containment Spray System

1.0 Introduction

1.1 Safety Related Functions

The Containment Spray System (CSS) is a subsystem of the Containment Heat Removal System (CHRS). The other subsystem of the CHRS is the Containment Cooling System (CCS). The CHRS is designed to rapidly reduce the Containment pressure and temperature following a postulated loss of coolant accident (LOCA) or a main steam line break (MSLB) accident. It accomplishes this by removing thermal energy from the Containment atmosphere. The CHRS also reduces the probability of an off site release of radioactive material by keeping the differential pressure (ΔP) between the inside of the Containment building and the outside environment low enough to prevent a violation of the Containment integrity. The CHRS is required to reduce containment peak pressure by 50% in 24 hours.

The Containment Spray system is designed to spray borated water into the Containment building in the event of a loss of coolant accident (LOCA) or a main steam line break. This suppresses any resultant increase in Containment pressure and temperature.

The borated water spray reduces fission products (mostly iodine) in the post LOCA containment atmosphere. Borated water spray is mixed with a pH buffer, sodium tetraborate (NaTB), prior to recirculation of the sump fluid to control sump fluid pH. The buffer is contained within three permeable baskets located in the containment basement. The buffer is used to raise the pH of the sump fluid to an equilibrium pH of 7 to 8. This pH range will assure that the iodine removed from the reactor building atmosphere by the spraying action will not re-evolve from the liquid as it is sprayed back into the building. Thus, controlling the pH of the recirculated spray reduces the potential of personnel exposure should a release to the environment occur and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components

The borated water spray also serves as a:

- reactivity control medium, and
- a core heat removal medium when used in conjunction with the Shutdown Cooling Heat Exchangers.

1.2 Regulatory / Safety Significant Functions

Containment Spray system components act as an alternate source of inventory, through the use of Containment Spray pumps or gravity feed, should the Low Pressure Safety Injection (LPSI) pumps become unavailable during shutdown cooling (SDC) operations.

This Containment Spray system provides for hydrogen mixing post accident in the Containment atmosphere. The system provides mixing through displacement of atmosphere as spray droplets fall.

2.0 System Description

The Containment Spray system is comprised of two redundant trains with each train consisting of:

- RWT outlet valve (MOV)
- Containment Spray pump
- Containment Spray pump recirculation isolation valve (MOV)
- shutdown cooling heat exchangers
- Containment Spray isolation valve (MOV)
- Containment Spray header (131 nozzles)
- Containment sump isolation valves (2 MOV's)
- required piping, instrumentation, and controls

Shared components of the Containment Spray system are:

- RWT
- Containment sump

Control and indication for train A is located on panel 2C17. Train B control and indication is located on panel 2C16.

2.1 Normal Flowpaths

Refer to the illustrations on pages 40, 41, and 42. The Containment Spray pumps take a suction from the Refueling Water Tank (RWT) when operating in the "injection" mode or from the Containment sump when in the "recirculation" mode. Motor operated valves automatically shift the suction flow path from the RWT to the sump upon receipt of a Recirculation Actuation Signal (RAS).

Spray flow passes through the shutdown cooling heat exchanger, and then through the motor operated spray valves into the spray headers.

During spray operation in the injection mode, a minimum recirculation flow of approximately 200 gpm is returned to the RWT. This recirc flow prevents pump overheating during low flow conditions. The recirculation flow is routed through the RWT test and recirculation header.

The Containment Spray system is actuated automatically when Containment Building pressure reaches 23.3 psia by the Containment Spray Actuation Signal (CSAS).

While in operation, a (RAS from the Engineered Safety Features Actuation System (ESFAS) will shift the suction source from the RWT to the Containment sump. The minimum recirculation isolation valves will close to prevent pumping water from the sump into the RWT; thereby, minimizing the potential for an unmonitored radioactive release via the RWT vent.

2.2 Alternate Flowpaths

The Containment Spray pumps are tested once a quarter for full flow capacity. Refer to the illustration on page 43. The discharge of the Spray pump is routed through 2SI-5A or 5B and 2SI-18 to the six-inch diameter RWT recirculation and testing header. This header carries the borated water back to the RWT.

Bank: 1825	**Rev:** 0	**Rev Date:** 5/25/2012 9:50:06		**QID #:** 4		**Author:** Foster	
Lic Level: R	**Difficulty:** 3	**Taxonomy:** H		**Source:** NEW			
Search 000011K308		**10CFR55:** 41.5 / 41.10 / 45.6 / 45		**Safety Function** 3			
System Title: Large Break LOCA				**System Number** 011		**K/A** EK3.08	
Tier: 1	**Group:** 1	**RO Imp:** 3.9	**SRO Imp:** 4.1	**L. Plan:** A2LP-RO-LOCA		**OBJ** 12	

Description: Knowledge of the reasons for the following responses as they apply to the Large Break LOCA: - Flowpath for sump recirculation

Question:

Consider the following:

- Unit 2 has experienced a large break LOCA
- Refueling Water Tank [RWT] level is 5 %
- All equipment has responded as designed

Considering the above conditions, the Spray Pumps function is to_________________________ and the reactor core temperature is maintained by the ____________________ pumps.

A. maintain temperature of the water being used for core cooling; Low Pressure Safety Injection [LPSI]

B. maintain temperature of the water being used for core cooling; High Pressure Safety Injection [HPSI]

C. provide mixing of Boron in the containment sump for pH control; Low Pressure Safety Injection [LPSI]

D. provide mixing of Boron in the containment sump for pH control; High Pressure Safety Injection [HPSI]

QID use History

	RO	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☑	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

Answer:

B. Correct; a Recirulation Actuation Signal will have occurred with the given RWT level. this happens in 25 to 30 minutes post accident. The spray initial response is to prevent the energy release from challenging the design limits of the Containment building. During the Recirculation phase, the spray system will maintain Containment sump temperature by reciring thru the SDC heat exchanger, therefore maintaining the temperature of the water being used for core cooling. The Spray pumps will provide mixing of the TSP in the sump to maintain pH control. The boron that is in the Containment sump will be from the water that was injected from the RWT for shutdown margin. The HPSI pumps will continue to run and inject water into the core for cooling post RAS. The LPSI will recieve a OFF signal on a RAS due to NPSH concerns from the LPSI pump higher flowrates.

Notes:

A, C and D are incorrect for reasons stated above

References:

STM 2-05, Emergency Core Cooling, Rev. 24, section 3.1, HPSI overview (page 14) and section 3.2, HPSI Flowpath (page 15) section 4.0 and 4.1 [page 28]
STM 2-08, Containment spray, Rev. 22, section 1.0, Overview (page 1) and section 2.1, flowpath (page 4)
ALP-RO-LOCA, Rev. 12, Obj. 12, Describe a RAS as it relates to the ECCS including the cause of the RAS; the components actuated by the RAS; HPSI and LPSI pump response to a RAS; and flowpaths available during RAS operation of the ECCS system

REVO

Bank:	1825	**Rev:**	0	**Rev Date:**	5/25/2012 9:50:06	**QID #:**	4	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW		
Search	000011K308	**10CFR55:**	41.5 / 41.10 / 45.6 / 45	**Safety Function**	3				
System Title:	Large Break LOCA	**System Number**	011	**K/A**	EK3.08				
Tier:	1	**Group:**	1	**RO Imp:**	3.9	**SRO Imp:**	4.1	**L. Plan:**	A2LP-RO-LOCA
OBJ	12								

Description: Knowledge of the reasons for the following responses as they apply to the Large Break LOCA: - Flowpath for sump recirculation

Question:

Consider the following:

- Unit 2 has experienced a large break LOCA
- Refueling Water Tank [RWT] level is 5 %
- All equipment has responded as designed

Considering the above conditions, the Spray Pumps function is to ____________________ and the reactor core temperature is maintained by the ________________ pumps.

A. maintain temperature of the water being used for core cooling; Low Pressure Safety Injection [LPSI]

B. maintain temperature of the water being used for core cooling; High Pressure Safety Injection [HPSI]

C. provide mixing of Boron in the containment sump for pH control; Low Pressure Safety Injection [LPSI]

D. provide mixing of Boron in the containment sump for pH control; High Pressure Safety Injection [HPSI]

QID use History

	RO	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☑	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

Answer:

B. Correct; a Recirulation Actuation Signal will have occurred with the given RWT level. this happens in 25 to 30 minutes post accident. The spray initial response is to prevent the energy release from challenging the design limits of the Containment building. During the Recirculation phase, the spray system will maintain Containment sump temperature by reciring thru the SDC heat exchanger, therefore maintaining the temperature of the water being used for core cooling. The Spray pumps will provide mixing of the TSP in the sump to maintain pH control. The boron that is in the Containment sump will be from the water that was injected from the RWT for shutdown margin. The HPSI pumps will continue to run and inject water into the core for cooling post RAS. The LPSI will recieve a OFF signal on a RAS due to NPSH concerns from the LPSI pump higher flowrates.

Notes:

A, C and D are incorrect for reasons stated above

References:

STM 2-05, Emergency Core Cooling, Rev. 24, section 3.1, HPSI overview (page 14) and section 3.2, HPSI Flowpath (page 15) section 4.0 and 4.1 [page 28]
STM 2-08, Containment spray, Rev. 22, section 1.0, Overview (page 1) and section 2.1, flowpath (page 4)
ALP-RO-LOCA, Rev. 12, Obj. 12, Describe a RAS as it relates to the ECCS including the cause of the RAS; the components actuated by the RAS; HPSI and LPSI pump response to a RAS; and flowpaths available during RAS operation of the ECCS system

Bank:	1826	**Rev:**	0	**Rev Date:**	4/3/2012 1:24:30	**QID #:**	5	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NRC Exam bank Bank 1194		
Search	000015K101	**10CFR55:**	41.8 / 41.10	**Safety Function**	4				
System Title:	017 Reactor Coolant Pump (RCP) Malfunction	**System Number**	015	**K/A**	AK1.01				
Tier:	1	**Group:**	1	**RO Imp:**	4.4	**SRO Imp:**	4.6	**L. Plan:**	A2LP-RO-ELOOP **OBJ** 5

Description: Knowledge of the operational implications of the following concepts as they apply to Reactor Coolant Pump Malfunctions: - Natural circulation in a nuclear reactor power plant

Question:

Consider the following:

- Loss of Offsite Power has occurred
- OP-2202.007, Loss of Offsite Power EOP, has been entered

15 minutes, post trip, plant conditions are:

- Pressurizer level is 45% and trending up
- Pressurizer pressure is 2150 psia and trending up
- T-hot is 581°F and trending up
- Average CET temperature is 585°F and trending up
- T-cold is 550°F and trending up
- Steam Generator levels are 18% NR and trending up
- 2P7A and 2P7B are feeding each Steam Generator at 300 gpm

Which ONE (1) of the following diagnosis should be made concerning Natural Circulation heat removal?

A. Natural Circulation heat removal is inadequate due to rising RCS temperatures

B. Natural Circulation heat removal is adequate because loop Delta-T is adequate

C. Natural Circulation heat removal is inadequate due to inadequate feed water flow

D. Natural Circulation is in the process of being established, all indications are normal

Answer:

A. Correct; with all temperatures indications trending up would indicate there is no flow in the loops/core.

Notes:

B. Incorrect, loop Delta-T is not the only parameter monitored for natural circ conditions.
C. Incorrect, feed flow is not a required parameter IAW OP-2202.007 step 25.
D. Incorrect, RCS temperatures are expected to either be steady or lowering as natural circ is being established.

References:

OP-2202.007, Loss of Offsite Power, Rev. 012, step 25 (page 19)
Student will be provided with a current copy of Steam Tables
A2LP-RO-ELOOP, Rev. 8, Obj. 5, Given a set of plant conditions determine if the conditions for Natural Circulation are being met during the Loss of Offsite Power optimal recovery EOP.

Historical Comments:

NRC bank question 1194, changed the wording of the question but does not met the requirements of a modified question

NOTE
Plant response will be delayed during natural circulation due to longer loop cycle times.

■25. Check natural circulation conditions established in at least ONE loop by ALL of the following:

- Loop ΔT less than 50°F.
- T_H and T_C constant or lowering.
- RCS MTS 30°F or greater.
- ΔT between T_H and average CETs less than 10°F.

■25. <u>IF</u> natural circulation can <u>NOT</u> be confirmed, <u>THEN</u> verify the following:

A. RCS heat removal with SDBCS or SG Safety valves.

B. SG levels being maintained 10% to 90%.

C. RCS pressure within limits of 2202.010 Attachment 1, P-T Limits.

D. PZR level being maintained 29% to 80%.

26. Align 4160v Non-vital buses as follows:

A. Check 4160v Non-vital bus 2A1 supplied by AACG.

A. <u>IF</u> 2A1 de-energized, <u>THEN</u> perform the following:

1) Perform the following for the below listed Load Center Supply breakers:

a) Place handswitch in PTL.

b) Verify breaker open:

BREAKER	DESCRIPTION
2A102	2A1 to 2B1
2A104	2A1 to 2B7
2A202	2A2 to 2B2

2) **GO TO** Step 27.

B. **GO TO** Note before Step 28.

QID: 1194 **Rev:** 0 **Rev Date:** **RO Select:** **SRO Select:** **Points:** 1.00

Lic Level: R **Difficulty:** 3 **Taxonomy:** An **Source:** **Originator:** Coble

10CFR55_41: **10CFR55_43:** **Section:** **Type:** OLD

System Title: 017 Reactor Coolant Pump (RCP) Malfunctio **System Number** 015 **K/A:** AK1.01

RO Tier: 1 **RO Group:** 1 **RO Imp:** 4.4 **SRO Tier:** **SRO Group:** 1 **SRO Imp:** 4.6

Description: Knowledge of the operational implications of the following concepts as they apply to Reactor Coolant Pump Malfunctions: - Natural circulation in a nuclear reactor power plant

Question:

Given the following:

* The plant tripped 20 minutes ago due to a Loss of Offsite Power.
* Pressurizer level is 40% and trending up.
* Pressurizer pressure is 2150 psia and trending up.
* T-hot is 580°F and trending up.
* Average CET temperature is 585°F and trending up.
* T-cold is 550°F and trending up.
* Steam Generator levels are 15% NR and trending up.
* 2P7A and 2P7B are feeding each Steam Generator at 300 gpm.

Which ONE (1) of the following diagnosis should be made concerning Natural Circulation heat removal?

a. Natural Circulation is in the process of being established, all indications are normal.

b. Natural Circulation heat removal is inadequate due to rising RCS temperatures.

c. Natural Circulation heat removal is inadequate due to inadequate feed water flow.

d. Natural Circulation heat removal is adequate because loop Delta-T is adequate.

Answer:

b. Natural Circulation heat removal is inadequate due to rising RCS temperatures.

Notes:

References:

OP 2202.007, Loss of Offsite Power EOP Step 23

Historical Comments:

Bank:	1827	**Rev:**	0	**Rev Date:**	4/3/2012 1:48:57	**QID #:**	6	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	000022A106	**10CFR55:**	41.7	**Safety Function**	2						
System Title:	Loss of Reactor Coolant Makeup	**System Number**	022	**K/A**	AA1.06						
Tier:	1	**Group:**	1	**RO Imp:**	2.9	**SRO Imp:**	2.7	**L. Plan:**	A2LP-RO-ACCP	**OBJ**	2

Description: Ability to operate and/or monitor the following as they apply to the Loss of Reactor Coolant Pump Makeup: - CVCS charging pump ammeters and running indicators

Question:

Consider the following:

- Unit 2 is operating at 100% power
- "A" Coolant Charging Pump [2P-36A] is running
- Charging Header Flow (2FI-4863) is reading 36 gpm and fluctuating
- Charging Header Pressure (2FI-4870) is reading 2150 psig and fluctuating
- Letdown flow (2FI-4801) is lowering
- ATC notes amperage on 2B5 fluctuating more than normal
- OP-2203.036, The Loss of Charging AOP, has been entered

What actions are required per OP-2203.036, Loss of Charging AOP?

A. Take Manual Control of the Letdown Flow Controller and restore Letdown flow

B. Manually start the Backup Charging Pump and restore Charging Header Pressure

C. Secure all Charging Pumps, Isolate Letdown, and close the charging header isolation valve

D. Trip the Reactor, actuate SIAS and CCAS and GO TO OP-2202.001 Standard Post Trip Actions

Answer:

C. Correct, actions are directed by the Loss of Charging AOP

Notes:

A. Incorrect, Taking Manual Control of the Letdown Flow Controller and restore Letdown flow is directed for restoration of charging after venting (step 17, page 14)

B. Incorrect, Manually starting the Backup Charging Pump and restoring Charging Header Pressure is directed if the running CCP tripped (i.e. electrical fault, step 2 in the AOP)

D. Incorrect, Tripping the Reactor is directed if pressurizer level can not be maintained (charging header rupture, step 17 cnotingnecy cloumn 17.E.5) page 16), actuation of SIAS and CCAS is not directed by this AOP

References:

OP-2203.036, Loss of Charging AOP, Rev. 010, Step 3 (page 3) step 17 [page 14] and step [page
AOP-2203.036, Loss of Charging AOP Tech Guide, Rev. 009 (page 7)
A2LP-RO-ACCP, Rev. 0, Obj. 2, Describe the mitigation strategy and instructions for actions directed in the Loss of Charging AOP, OP-2203.036.

Historical Comments:

New Question

INSTRUCTIONS	CONTINGENCY ACTIONS
2. **IF lead Charging pump stopped AND green indicating light OFF, THEN start backup Charging pump.**	

NOTE

Erratic Charging Pump Discharge pressure and flow may indicate gas binding.

3. **Check for adequate Charging pump operation as follows:**	3. **IF Charging pump operation NOT adequate, THEN perform the following:**
• Charging header flow 28 to 45 gpm.	A. Close at least ONE Letdown Isolation valve by placing valve handswitch in CLOSE position: • 2CV-4820-2 • 2CV-4821-1 • 2CV-4823-2 (least preferred)
• Charging Pump Discharge header pressure greater than RCS pressure.	B. Place ALL Charging pump handswitches in stop.
• Charging Pump Discharge pressure stable.	C. Close Charging Header Isolation valve (2CV-4840-2).
• Charging Pump flow stable	D. Verify VCT Outlet valve (2CV-4873-1) closed by placing valve handswitch in CLOSE position.
• IF Charging flow less than 40 gpm, THEN Refer to : - TRM 3.1.1 Flowpaths - TRM 3.1.2 Flowpaths - TRM 3.1.3 Charging pump - TRM 3.1.4 Charging pump	E. Verify Emergency Borate valve (2CV-4916-2) closed.
	F. Verify Gravity Feed Isolation valves closed: • 2CV-4920-1 • 2CV-4921-1
	G. Verify RWT to Charging pump Suction valve (2CV-4950-2) closed by placing valve handswitch in CLOSE position.

(Step 3 continued on next page)

INSTRUCTIONS	CONTINGENCY ACTIONS
***16. Verify VCT level 60% to 78%, refer to 2104.003, Chemical Addition.**	
17. Restore Charging and Letdown as follows:	
A. Verify Charging Pump Header Isolation valve (2CV-4840-2) open.	
B. Verify VCT Outlet valve (2CV-4873-1) open.	B. IF VCT outlet valve can NOT be opened, THEN perform the following: 1) Align Charging pump suction to EITHER of the following: • RWT • BAMT 2) Maintain PZR level within 5% of setpoint as follows: a) Cycle Charging pumps as needed: • 2P-36A • 2P-36B • 2P-36C b) Record charging header data using 2201.010 Attachment 44, Charging Header Data. c) Adjust Turbine load to maintain T_{REF} within 2°F of T_{AVE}. 3) **GO TO** Step 18.

(Step 17 continued on next page)

INSTRUCTIONS

17. (Continued)

E. Check for adequate Charging pump operation as follows:

- Charging header flow 28 to 45 gpm.
- Charging Pump Discharge header pressure greater than RCS pressure.
- Charging Pump Discharge pressure stable.
- Charging Pump flow stable.

- IF Charging flow less than 40 gpm, THEN Refer to:
  - TRM 3.1.1 Flowpaths
  - TRM 3.1.2 Flowpaths
  - TRM 3.1.3 Charging pump
  - TRM 3.1.4 Charging pump

(Step 17 continued on next page)

CONTINGENCY ACTIONS

E. IF abnormal Charging pump operation indicated, THEN perform the following:

1) Place ALL Charging pump handswitches in stop:
   - 2P-36A
   - 2P-36B
   - 2P-36C

2) Locally vent Charging pumps using Attachment B, Charging Pump Venting.

3) Refer to the following Technical Requirements:
   - 3.1.1 Flowpaths
   - 3.1.2 Flowpaths
   - 3.1.3 Charging pump
   - 3.1.4 Charging pump

4) IF gas binding indicated, THEN **RETURN TO** Step 11.

5) IF in Modes 1 or 2 AND PZR level can NOT be maintained within 10% of setpoint, THEN perform the following:

   a) Trip Reactor.

   b) **GO TO** 2202.001, Standard Post Trip Actions.

6) IF in Modes 3 or 4, THEN **GO TO** 2203.032, Emergency Boration and initiate RCS makeup using HPSI pumps.

AOP STEP:

3. **Check for adequate Charging pump operation as follows:**

BASIS:

Charging pump, flow and discharge pressure are checked. Inadequate charging pump operation is an indication that an undetermined problem exists with a specific pump or the CVCS, such as a piping rupture or gas binding. The contingency will isolate letdown, stop the charging pumps, and isolate the suction and discharge flow paths. Previously, the letdown isolation valve outside containment was used to allow for local operation or inspection in the event of valve malfunction. However, a failure of the backpressure regulator control and subsequent failure of outside isolation valve to fully isolate Letdown led to CR-ANO-2-1999-0743 (5). This CR determined that 2CV-4823-2 is not designed to isolate full RCS letdown at normal letdown pressure/flow. In fact, the valve is designed to isolate a broken pipe against Containment design pressure (about 58 psid) i.e. 2CV-4823-2 is a containment isolation valve vice an RCS isolation valve. Consequently the step has been restructured to allow the operator to isolate Letdown by verifying at least one letdown isolation valve closed, and listing all three isolation valves as options with 2CV-4823-2 being least preferred. Verify means that the operator will use any and all valves to ensure that Letdown is isolated. A loss of charging event will result in entering several technical specifications action statements.

SOURCE DOCUMENTS:

1. 2104.002, Chemical and Volume Control.
2. M-2231, Chemical And Volume control System.
3. ANO-2 Technical Requirements: TRM 3.1.2.1, TRM 3.1.2.2, TRM 3.1.2.3, and TRM 3.1.2.4.
4. INPO SOER 97-01, Potential Loss of High Pressure Injection and Charging Capability from Gas Intrusion.
5. CR-ANO-2-1999-0743
6. LIC-01-017, ANO2 TS Am. 229, Relocation of Boric Acid Makeup Systems from TSs to TRM

Bank:	1828	**Rev:**	0	**Rev Date:**	4/3/2012 2:30:54	**QID #:**	7	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	F	**Source:**	NEW		
Search	0000262244	**10CFR55:**	41.10	**Safety Function**	8				
System Title:	Loss of Component Cooling Water (CCW)	**System Number**	026	**K/A**	2.2.44				
Tier:	1	**Group:**	1	**RO Imp:**	4.2	**SRO Imp:**	4.4	**L. Plan:**	A2LP-RO-ARCP
OBJ	5								

Description: Equipment Control - Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.

Question:

Consider the following:

- Unit 2 is operating at 100% power
- "C" CCW pump Tripped on Thermal overload
- "A" CCW pump was MANUALLY started as directed by OP-2203.025, RCP Emergencies AOP
- "A" CCW surge tank level is 12% and trending down
- Annunciator 2K12 C-6, SURGE TK 2T37A LEVEL HI/LO, is in alarm

The required Action(s) per OP-2203.025, RCP Emergencies AOP, is(are):

A. Direct NLO to manually makeup to the "A" CCW surge tank using 2CT-16

B. Verify CCW surge tank makeup valve (2CV-5210) is open and restoring level

C. Trip the Reactor, Secure the Reactor Coolant Pumps, isolate Controlled Bleedoff

D. Verify Loop II cross over valves are open and start "B" CCW pump to supply Loop II

Answer:

C. Correct, Actions are directed by OP-2203.025, step 3

Notes:

A. incorrect, action is logical but not directed by ACA or AOP (ACA does verify makeup aligned)
B. incorrect, action is directed by ACA but the AOP [step 3] give specific direction for a low surge tank level after restoration of CCW
D. incorrect, not directed by AOP, if "B" CCW pump did not auto start, the "A" CCW pump is preferred. Also, AOP step 3 very specific about required action with a low surge tank level after restoration of CCW

References:

OP-2203.025, RCP Emergencies AOP, Rev. 013, step 3 (page 8)
AOP2203.025, RCP Emergencies AOP Tech Guide, Rev. 013, step 3(page 8)
OP-2203.012-L, 2K12 ACA, Rev. 040, window C-6, step 2.3.1 and 2.3.4 (page 62)
A2LP-RO-ARCP, Rev. 0, Obj. 5, Describe the basis / strategy as stated in 2203.025 Technical Guidelines, for actions directed by the AOP.

Historical Comments:

New Question

INSTRUCTIONS

CONTINGENCY ACTIONS

*3. **IF in–service CCW Surge Tank (2T-37A/B) level lowers to less than 13% following restoration of CCW to RCPs, THEN perform the following:**

A. IF in Mode 1 OR 2, THEN trip Reactor.

B. Stop ALL RCPs.

C. Verify BOTH PZR Spray valves in MANUAL AND closed:

- 2CV-4651
- 2CV-4652

CAUTION
Failure to isolate Controlled Bleedoff may result in failure of RCP seals.

D. Isolate Controlled Bleedoff as follows:

1) Close RCP Bleedoff to VCT valve (2CV-4847-2).

2) Close RCP Bleedoff Isolation to VCT valve (2CV-4846-1).

3) Close RCP Bleedoff Relief to Quench Tank valve (2CV-4856).

E. IF Reactor manually tripped, THEN **GO TO** 2202.001, Standard Post Trip Actions.

AOP STEP:

*3. **<u>IF</u> in-service CCW Surge Tank (2T-37A/B) level lowers to less than 13% following restoration of CCW to RCPs, <u>THEN</u> perform the following:**

BASIS:

Greater than 13% level in the CCW surge tank is needed to ensure adequate NPSH is available for the CCW pumps. If level lowers uncontrollably following restoration of CCW flow to the RCPs, this is indicative of a large CCW leak. Direction is given to trip the reactor and secure all RCPs. The reactor is manually tripped first if the Plant is in Mode 1 or 2 to prevent an automatic reactor trip when the first RCP is secured.

SOURCE DOCUMENTS:

1 - 2202.001, Standard Post Trip Actions.
2 - B580.003, RCP Technical Manual.
3 - ANO-2 SAR Section 5.5.1, Reactor Coolant Pumps.

AOP STEP:

*4. **Check ALL RCP Vapor Seal pressures less than 1500 psia:**

BASIS:

A vapor seal pressure of greater than 1500 psia is an indication of severe degradation of the lower three seals. Contingency actions attempt to minimize the impact on the plant should the vapor seal fail by tripping the reactor, securing affected RCPs, and transitioning the operator to the EOP.

The vapor seal is designed to hold full pressure of 2500 psia in a static condition and during coastdown following failure of the other 3 seals. It is not desired to operate in this abnormal condition due to the raised risk of vapor seal failure.

SOURCE DOCUMENTS:

1 - 2202.001, Standard Post Trip Actions.
2 - B580.003, RCP Technical Manual.
3 - ANO-2 SAR Section 5.5.1, Reactor Coolant Pumps.

ANNUNCIATOR 2K12

C-6

SURGE TK 2T37A LEVEL HI/LO
(Continued)

2.2.6 IF air present in Pump or Heat Exchanger,
THEN perform the following:

- Vent components supplied by CCW.
- Determine location of air ingress into CCW System.

2.3 IF LOW Level,
THEN perform the following:

2.3.1 Verify 2T-37A Makeup valve (2CV-5210) open.

2.3.2 Verify either Condensate Transfer pump running:

- 2P-9A on 2B12-B2
- 2P-9B on 2B21-G3

2.3.3 Walk down system and check for leaks.

2.3.4 IF level NOT restored
AND CCW loops are Cross-Connected,
THEN GO TO RCP Emergencies (2203.025).

3.0 TO CLEAR ALARM

3.1 Restore level to between 13 and 75%.

4.0 REFERENCES

4.1 E-2457-4

Bank:	1829	**Rev:**	1	**Rev Date:**	6/27/2012 10:07:4	**QID #:**	8	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	H	**Source:**	NEW		
Search	000029K105	**10CFR55:**	41.8	**Safety Function**	1				
System Title:	Anticipated Transient Without Scram (ATWS)	**System Number**	029	**K/A**	EK1.05				
Tier:	1	**Group:**	1	**RO Imp:**	2.8	**SRO Imp:**	3.2	**L. Plan:**	ASLP-RO-RXT10 **OBJ** 4.c

Description: Knowledge of the operational implications of the following concepts as they apply to the ATWS: - definition of negative temperature coefficient as applied to large PWR coolant systems

Question:

Consider the following:

- Unit 2 is operating at 80% power
- The Main Turbine has tripped off line
- Reactor Protection System [RPS] has failed to automaticlly actuate
- The Reactor did trip at the Diverse Scram System [DSS] setpoint

With these conditions, the time to reach the DSS setpoint will be longer at _______ of core life based on Moderator Temperature Coefficient [MTC] being _______________.

A. end; more significant

B. end; less significant

C. begining; more significant

D. begining; less significant

Answer:

A. Correct; as the core ages, the MTC will become more significant. with a turbine trip RCS temperature / pressure will go up due to the loss of heat removal. As RCS temperature goes up, the more significant MTC at a EOL core will cause power to go down therefore lenghtening the response time [time before the DSS trip setpoint will be reached]

Notes:

B, C, and D are incorrect due to reasons stated above.

References:

T.S. 3.1.1.4, Rev. 48, MTC coefficient [page 71] and bases [pages 253 and 254]
ASLP-RO-RXT10, Rev. 4, Obj. 4.c; Describe the effect on the moderator temperature coefficient of reactivity from changes in: [c] core age

Historical Comments:

New Question;
Rev. 1, changed the wording in answers from negative to significant

REACTIVITY CONTROL SYSTEMS

MODERATOR TEMPERATURE COEFFICIENT

LIMITING CONDITION FOR OPERATION

3.1.1.4 The moderator temperature coefficient (MTC) shall be within the limits specified in the CORE OPERATING LIMITS REPORT. The maximum upper design limit shall be:

a. Less positive than $+0.5\times10^{-4}$ $\Delta k/k/°F$ whenever THERMAL POWER is ≤ 70% of RATED THERMAL POWER, and

b. Less positive than 0.0 $\Delta k/k/°F$ whenever THERMAL POWER is > 70% of RATED THERMAL POWER.

APPLICABILITY: MODES 1 and 2*#

ACTION:

With the moderator temperature coefficient outside any one of the above limits, be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.1.1.4.1 The MTC shall be determined to be within its limits by confirmatory measurements. MTC measured values shall be extrapolated and/or compensated to permit direct comparison with the above limits. (Note 1)

4.1.1.4.2 The MTC shall be determined at the following frequencies and THERMAL POWER conditions during each fuel cycle:

a. Prior to initial operation above 5% of RATED THERMAL POWER, after each fuel loading. (Note 1)

b. At greater than 5% of RATED THERMAL POWER, within 7 effective full power days (EFPD) of reaching 40 EFPD core burnup.

c. At greater than 5% of RATED THERMAL POWER, within 7 EFPD of reaching two-thirds of expected core burnup. (Note 2)

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* With $K_{eff} \geq 1.0$.

See Special Test Exception 3.10.2.

Note 1: For fuel cycles that meet the applicability requirements given in WCAP-16011-P-A, the verification prior to entering MODE 1 may be made using the predicted MTC as adjusted for the measured boron concentration.

Note 2: The MTC determination of surveillance 4.1.1.4.2.c is not required if the results of the tests required in surveillances 4.1.1.4.2.a and 4.1.1.4.2.b are within a tolerance of $\pm 0.16 \times 10^{-4}$ $\Delta k/k/°F$ from the corresponding design values. For cycles that meet the applicability requirements given in WCAP-16011-P-A, the MTC determination of surveillance 4.1.1.4.2.c is not required if the result of the test required in surveillance 4.1.1.4.2.b is within a tolerance of $\pm 0.16 \times 10^{-4}$ $\Delta k/k/°F$ from the corresponding design value.

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN

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

SHUTDOWN MARGIN requirements vary throughout core life as a function of fuel depletion, RCS boron concentration, and RCS Tavg. The most restrictive condition occurs at EOL, with Tavg at no load operating temperature, and is associated with a postulated steam line break accident, and resulting uncontrolled RCS cooldown. In the analysis of this accident, a minimum SHUTDOWN MARGIN is required to control the reactivity transient. Accordingly, the SHUTDOWN MARGIN requirement is based upon this limiting condition and is consistent with FSAR safety analysis assumptions. With Tavg ≤ 200°F, the reactivity transients resulting from any postulated accident are minimal and the shutdown margin provides adequate protection.

SDM verification performed as a result of an immovable CEA that is fully inserted in the core need only account for the most reactive CEA assumed to fail to insert upon a reactor trip, with no additional penalty for the immovable CEA since it has no "withdrawn worth." Likewise, SDM verification when a single CEA is found immovable at 50" withdrawn need only account for the reactivity worth of the most reactive CEA and the reactivity worth of the 50" of the immovable CEA that is assumed to fail to insert upon a reactor trip.

3/4.1.1.3 BORON DILUTION

A minimum flow rate of at least 2000 GPM provides adequate mixing, prevents stratification and ensures that reactivity changes will be gradual during boron concentration reductions in the Reactor Coolant System. A flow rate of at least 2000 GPM will circulate an equivalent Reactor Coolant System volume of 6,650 cubic feet in approximately 25 minutes. The reactivity change rate associated with boron concentration reductions will therefore be within the capability of operator recognition and control.

3/4.1.1.4 MODERATOR TEMPERATURE COEFFICIENT (MTC)

The limitations on MTC are provided to ensure that the assumptions used in the accident and transient analysis remain valid through each fuel cycle. The Surveillance Requirements consisting of beginning of cycle measurements and end of cycle MTC predictions ensure that the MTC remains within acceptable values. The confirmation that the measured values are within a tolerance of $\pm 0.16 \times 10^{-4}$ Δk/k/°F from the corresponding design values (MTC predicted values based on core data) prior to 5% power and near 40 EFPD provides assurances that the MTC will be maintained within acceptable values throughout each fuel cycle. CE NPSD 911-A and CE NPSD 911 Amendment 1-A, "Analysis of Moderator Temperature Coefficients in Support of a Change in the Technical Specifications End of Cycle Negative MTC Limits", provide the analysis that established the design margin of $\pm 0.16 \times 10^{-4}$ Δk/k/°F. The option to eliminate the EOC MTC measurement requires that the reload analysis and predicted design value be performed using the CE methodology.

3/4.1.1.4 MODERATOR TEMPERATURE COEFFICIENT (MTC) (continued)

For fuel cycles that meet the applicability requirements of WCAP-16011-P-A, Revision 0, "Startup Test Activity Reduction Program," SR 4.1.1.4.2.a may be met prior to exceeding 5% of RATED THERMAL POWER after each fuel loading by confirmation that the predicted MTC, when adjusted for the measured RCS boron concentration, is within the MTC limits. WCAP-16011-P-A also provides the basis for using only the near 40 EFPD surveillance test result to justify elimination of the near two-thirds of expected core burnup surveillance when applicability requirements are met. Performance of only one measurement at power is justified based on the WCAP-16011-P-A conclusion that ITC startup test data between different operating conditions is poolable. For the purposes of this specification, "within 7 days" ensures the required tests will be performed within 7 days prior to, or within 7 days following the point in core life specified for the test.

The applicability requirements in WCAP-16011-P-A ensure core designs are not significantly different than those used to benchmark predictions and require that the measured RCS boron concentration meets specific test criteria. This provides assurance that the MTC obtained from the adjusted predicted MTC is accurate.

For fuel cycles that do not meet the applicability requirements in WCAP-16011-P-A, the verification of MTC required prior to entering MODE 1 after each fuel loading is performed by measurement of the isothermal temperature coefficient.

3/4.1.1.5 MINIMUM TEMPERATURE FOR CRITICALITY

This specification ensures that the reactor will not be made critical with the Reactor Coolant System average temperature less than 540 °F. This limitation is required to ensure 1) the moderator temperature coefficient is within its analyzed temperature range, 2) the protective instrumentation is within its normal operating range, 3) the pressurizer is capable of being in an OPERABLE status with a steam bubble, and 4) the reactor pressure vessel is above its minimum RT_{NDT} temperature.

Bank:	1829	**Rev:**	0	**Rev Date:**	6/6/2012 12:44:30	**QID #:**	8	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	H	**Source:**	NEW		
Search	000029K105	**10CFR55:**	41.8	**Safety Function**	1				
System Title:	Anticipated Transient Without Scram (ATWS)	**System Number**	029	**K/A**	EK1.05				
Tier:	1	**Group:**	1	**RO Imp:**	2.8	**SRO Imp:**	3.2	**L. Plan:**	ASLP-RO-RXT10
OBJ	4.c								

Description: Knowledge of the operational implications of the following concepts as they apply to the ATWS: - definition of negative temperature coefficient as applied to large PWR coolant systems

Question:

Consider the following:

- Unit 2 is operating at 80% power
- The Main Turbine has tripped off line
- Reactor Protection System [RPS] has failed to automaticlly actuate
- The Reactor did trip at the Diverse Scram System [DSS] setpoint

With these conditions, the time to reach the DSS setpoint will be longer at _______ of core life based on Moderator Temperature Coefficient [MTC] being _______________ .

A. end; more negative

B. end; less negative

C. begining; more negative

D. begining; less negative

QID use History

	RO	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☑	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

Answer:

A. Correct; as the core ages, the MTC will become more negative. with a turbine trip RCS temperature / pressure will go up due to the loss of heat removal. As RCS temperature goes up, the more negative MTC at a EOL core will cause power to go down therefore lenghtening the resonse time [time before the DSS trip setpoint will be reached]

Notes:

B, C, and D are incorrect due to reasons stated above

References:

T.S. 3.1.1.4, Rev. 48, MTC coefficient [page 71] and bases [pages 253 and 254]
ASLP-RO-RXT10, Rev. 4, Obj. 4.c; Describe the effect on the moderator temperature coefficient of reactivity from changes in: [c] core age

Historical Comments:

New Question

Bank:	1830	**Rev:**	0	**Rev Date:**	4/3/2012 5:24:29	**QID #:**	9	**Author:**	Foster	
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW			
Search	000038K306	**10CFR55:**	41.5 / 41.10	**Safety Function**	3					
System Title:	Steam Generator Tube Rupture (SGTR)	**System Number**	038	**K/A**	EK3.06					
Tier:	1	**Group:**	1	**RO Imp:**	4.2	**SRO Imp:**	4.5	**L. Plan:**	A2LP-RO-ESGTR	**OBJ** 3

Description: Knowledge of the reasons for the following responses as they apply to the SGTR: - Actions contained in EOP for RCS water inventory balance, S/G tube rupture, and plant shutdown procedures (Criteria for securing RCP)

Question:

Consider the following:

- Unit 2 has experienced a Steam Generator Tube Rupture (SGTR) on "A" SG
- A 500 gpm leak rate has been determined
- The unit has been tripped and OP-2202.004, Steam Generator Tube Rupture EOP, has been entered
- RCS pressure is 1260 psia
- RCS temperature is 570°F
- All 4 Reactor Coolant Pumps (RCP) are running

OP-2202.004, Steam Generator Tube Rupture EOP, should direct what action(s) to be taken (if any) concerning the RCPs?

A. NO action is required, leave all 4 RCPs running, forced circulation is desired

B. Secure Two RCPs, energize Pressurizer Heaters to raise RCS margin to saturation (MTS)

C. Leave all 4 RCPs running, energize Pressurizer Heaters to raise RCS Pressure >1400 psia

D. Secure All RCPs due to low margin to saturation (MTS)

Answer:

D. Correct, Student should determine a Low margin to Saturation conditions based on the given RCS pressure and temperature. Securing All RCP's, due to low margin to saturation (MTS) is directed by the EOP, step 10, contingency column 10.B.1)

Notes:

A. Incorrect, forced circulation is desired but procedure directs securing 2 RCPs to RCS pressure <1400 psia but the low MTS dictates securing all RCPs
B. Incorrect, securing All RCP's directed due to low MTS is directed but adding heat to the RCS (energizing PZR heaters) does not align with the major recovery strategies of the SGTR EOP
C. Incorrect, procedure directs securing 2 RCPs to RCS pressure <1400 psia, and adding heat to the RCS (energizing PZR heaters) does not align with the major recovery strategies of the SGTR EOP

References:

OP-2202.004, Stem Generator Tube Rupture EOP, Rev.012, step 10 contingency column 10.b.1) (page 8) and the Major Recovery Strategies for SGTR listed on top of the Safety Function Status Checks (page 41)
EOP-2202.004, Stem Generator Tube Rupture EOP Tech Guide, Rev. 012, step 10 (pages 7, 22)
Current copy of Steam Tables (Will be provided to Student)
A2LP-RO-ESGTR, Rev. 7, Obj. 3, Describe the propose for leaving 2 Reactor Coolant Pumps (RCPs) running during a SGTR.

Historical Comments:

New Question

INSTRUCTIONS	CONTINGENCY ACTIONS
■ 10. Check RCS pressure greater than 1400 psia.	**■ 10. Perform the following:** A. IF RCS pressure less than 1400 psia, THEN perform the following: 1) Verify maximum of ONE RCP running in EACH loop. 2) IF RCP 2P32Aor 2P32B stopped, THEN verify associated PZR Spray valve in MANUAL and closed. B. IF NPSH requirements violated OR RCS MTS less than 30°F, THEN perform the following: 1) Stop ALL RCPs. 2) Verify BOTH PZR Spray valves in MANUAL and closed.

SAFETY FUNCTION STATUS CHECK

SAFETY FUNCTION **ACCEPTANCE CRITERIA**

Major Recovery Strategies for SGTR

- Detect ruptured SG.
- Perform RCS cooldown to less than 535°F TH.
- Isolate ruptured SG (Goal is within 30 minutes of procedure entry to limit off-site release).
- Reduce RCS pressure less than MSSV setpoint.
- Perform RCS cooldown to SDC.

TIME: ____ ____ ____ ____

1. Reactivity Control

1. A. 1) Reactor power lowering.

OR

2) Reactor power less than 10^{-1}% AND stable or lowering.

B. 1) Maximum of ONE CEA NOT fully inserted.

OR

2) Emergency Boration in progress or completed.

STEAM GENERATOR TUBE RUPTURE

2202.004

EPG INTRODUCTION:

PURPOSE

This guideline provides operator actions, which must be accomplished in the event of a Steam Generator Tube Rupture (SGTR). The actions in this guideline are necessary to ensure that the plant is placed in a stable, safe condition. The goal of the guideline is to safely establish Shutdown Cooling System entry conditions while minimizing radiological releases to the environment and maintaining adequate core cooling. This guideline provides technical information to be used by utilities in developing a plant specific procedure.

ENTRY CONDITIONS

1. The Standard Post Trip Actions have been performed.
   or
   BOTH of the following conditions exist:
   - Event initiated from [Mode 3 or Mode 4]
   - [SIAS has NOT been blocked]

   and
2. Plant conditions indicate that a steam generator tube rupture has occurred. ANY or all of the following may be present:
   - Rise in condenser off-gas activity or high activity alarm.
   - Rise in steam generator blowdown activity or high activity alarm.
   - Rise in steam generator liquid sample activity.
   - Rise in steam generator level.
   - Feed flow, steam flow mismatch.

EXIT CONDITIONS

1. The diagnosis of a Steam Generator Tube Rupture event is NOT confirmed.
   or
2. ANY of the Steam Generator Tube Rupture Safety Function Status Check acceptance criteria are NOT satisfied.
   or
3. The Steam Generator Tube Rupture EPG has accomplished its purpose by satisfying ALL of the following:
   - All Safety Function Status Check acceptance criteria are being satisfied.
   - Shutdown Cooling System entry conditions have been established.
   - An appropriate, approved procedure to implement exists or has been approved by the [Plant Technical Support Center or the Plant Operations Review Committee].

DEVIATION? Yes

EOP STEP:

■10. **Check RCS pressure greater than 1400 psia.**

EPG STEP:

*6.

DEVIATION? Yes

BASIS FOR DEVIATION:

The EOP does not specify "and SIAS is actuated" as does the EPG. If RCS pressure has lowered to less than 1400 psia (1), SIAS will or should be actuated, since the SIAS actuation setpoint is set at 1650 psia (2). Additionally, this step is placed such that it appears after the operator has checked that a SIAS has occurred, and initiated SIAS manually, if automatic actuation had not occurred. The actions to trip RCPs (based on NPSH (1) or MTS (4) should be taken whether or not SIAS has automatically initiated.

A contingency action has been added to place the PZR spray valve controllers in manual and verify the spray valves closed. An open normal spray valve without a RCP running would result in pressurizer spray flow going into the idle T_C loop rather than into the PZR (3).

SOURCE DOCUMENTS:

1. ANO-2 EOP Setpoint Document, setpoint A.6.
2. ANO-2 EOP Setpoint Document, setpoint A.1.
3. M-2230, sheets 1& 2 of 2, P&ID, Reactor Coolant System.
4. ANO-2 EOP Setpoint Document, Setpoint M.1.
5. ER980547N207, ANO2 PUR PPS/CPC Setpoint Mods.

Bank:	1831	**Rev:**	0	**Rev Date:**	4/4/2012 10:32:24	**QID #:**	10	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	4	**Taxonomy:**	H	**Source:**	NEW				
Search	000040K202	**10CFR55:**	41.7	**Safety Function**	4						
System Title:	Steam Line Rupture	**System Number**	040	**K/A**	AK2.02						
Tier:	1	**Group:**	1	**RO Imp:**	2.6	**SRO Imp:**	2.6	**L. Plan:**	A2LP-RO-EESD	**OBJ**	4

Description: Knowledge of the interrelations between the Steam Line Rupture and the following: Sensors and detectors

Question:

Consider the following:

- Unit 2 is operating at 100% power

The ATC reports:
- Reactor power is rising
- RCS temperature is lowering
- Containment pressure, temperature and dew point are rising
- "A" Steam Generator pressure is 750 psia and lowering
- All plant systems responsed as designed

With NO operator action, what feed water source and flowpath should be available due to the above conditions?

A. "A" MFP Pump (2P-1A), through the main feed header

B. Condensate Pump (2P-2A), through the main feed header

C. AFW Pump (2P-75), through the emergency feed header

D. "B" EFW Pump (2P-7B), through the emergency feed header

Answer:

D. Correct, "B" EFW Pump (2P-7B), through the emergency feed header

Notes:

The above conditions are indications of a Steam Line Break inside the Containment Building. As SG pressures lower, a reactor trip will occur and a Main Steam Isolation Signal (MSIS, caused by SG pressure <751 psia) will occur. A MSIS will cause the main feed block valves and the MSIVs to go close. A secondary signal is produced from the MSIS in the feed water system (MFWIS) whish will secure the AFW pump, MFW pumps, Condensate pumps, and heater drain pumps. Therefore, Without Operator action, the main feed header is not an option for feeding SGs (making answer A and B incorrect) the AFW and Condensate pumps have a trip signal locked in (making answer B and C incorrect)
A. Incorrect, the main feed block valves receive a MSIS signal closed
B. Incorrect due to the AFW pump being secured from a MFWIS signal
C. Incorrect due to the condensate pump being secured from a MFWIS signal and the main feed block valves receive a MSIS signal closed

References:

STM 2-70, Engineered Safety Features Actuation System, Rev. 18, section 2.2.4.1, main feedwater isolation signal, (page 5 and 6) section 2.2.5, main steam isolation signal, (page 5 and 6) and tables on page 51and page 55
OP-2202.005, Excess Steam Demand EOP, Rev. 013, step 5, verify MSIS actuated (page 3) and step 19.B, establish EFW flow, [page 10]
EOP-2202.005, Excess Steam Demand EOP Tech Guide, Rev. 013, step 5, verify MSIS actuated (page15) and step 19.B,

establish EFW flow [page 30)
OP-2202.010, Standard Attachments, Rev. 019, Attachment 46, Establishing EFW Flow [pages 134 and 140]
A2LP-RO-EESD, Rev. 7, Obj. 4, Given a set of plant conditions during an ESD, determine the actions necessary to maintain post-cooldown RCS temperature and pressure.

Historical Comments:

New Question

2.2.1 Safety Injection Actuation Signal (SIAS)

The Safety Injection Actuation Signal, referred to as SIAS, provides for Safety Injection during design basis Loss of Coolant Accidents (LOCA), Main Steam Line Break (MSLB) events, or Steam Generator Tube Ruptures (SGTR). This actuation provides cooling to limit core damage and assure adequate shutdown margin, regardless of temperature.

The SIAS, along with the Containment Cooling Actuation Signal (CCAS), is actuated by a Low Pressurizer Pressure trip and/or High Containment Pressure. CCAS will be discussed shortly.

All components actuated by a SIAS are listed in the ESFAS Actuated Components table starting on page 60.

2.2.2 Containment Isolation Actuation Signal (CIAS)

The Containment Isolation Actuation Signal (CIAS) provides for Containment Isolation during a design LOCA or MSLB event to prevent the release of radioactive material.

The CIAS is actuated by a High Containment pressure. Certain CIAS valves are automatically actuated (closed) by a SIAS. This provides diverse signals for these valves for containment isolation.

All components actuated by a CIAS are listed in the ESFAS Actuated Components table starting on page 46.

2.2.3 Containment Cooling Actuation Signal (CCAS)

A Containment Cooling Actuation Signal (CCAS) provides for Containment Cooling during a design basis LOCA or MSLB event. This actuation limits post-accident containment pressure to design values during and following these events.

The CCAS is actuated by a Low Pressurizer Pressure signal, which actuates SIAS at the same time, and/or a High Containment Pressure.

All components actuated by a CCAS are listed in the ESFAS Actuated Components table starting on page 45.

2.2.4 Containment Spray Actuation Signal (CSAS)

A Containment Spray Actuation Signal (CSAS) provides for Containment Spray during a design basis LOCA or MSLB accident in order to remove heat and iodine from the containment area, and to hold containment temperature and pressure below design values.

The CSAS is initiated by a High-High Containment Pressure, in conjunction with a SIAS.

The operating mode of the CSAS is automatically changed by receipt of a Recirculation Actuation Signal (RAS). The RAS actuation is discussed in the following paragraphs. The operating mode of the CSAS will be discussed later.

All components actuated by a CSAS are listed in the ESFAS Actuated Components table starting on page 49.

2.2.4.1 Main Feedwater Isolation Signal (MFWIS)

Safety analysis performed for the steam generator replacement project, and subsequent power uprate, indicated that Containment Building (CB) pressure with Main Feedwater (MFW) and Main

Steam (MS) line breaks in containment could exceed the pressure limits. (Exceeding the pressure limit could result from the higher power level, increased Steam Generator inventory, and addition of MS blowdown orifices.) Use of the Low Steam Generator pressure signal to initiate MSIS mitigation of the pressure rise would not be sufficient, per the safety analysis.

During 2R-14, a design change was installed to provide modifications to actuate equipment necessary to prevent exceeding the CB pressure limits. This was accomplished by using the Hi-Hi Containment Pressure (CSAS) signal to terminate forced MFW flow, isolate MFW, and terminate MS flow. This termination and isolation is accomplished through generation of a Main Feedwater Isolation Signal (MFWIS).

CSAS and MSIS actuation relay contact combination were applied to actuate the components that isolate MFW and MS. This arrangement will terminate forced flow, such that the MFW isolation and/or backup valves can close, stop the Condensate Pumps, Heater Drain Pumps, and MFW pumps.

Once a MFWIS is actuated, regardless of which train, both condensate and feedwater trains will be secured.

All components actuated by a MFWIS are listed in the ESFAS Actuated Components table starting on page 55.

2.2.5 Main Steam Isolation Signal (MSIS)

The Main Steam Isolation Signal (MSIS) provides for Main Steam Isolation during design basis Steam Generator line breaks or Steam Generator tube ruptures.

The MSIS is actuated by a Low SG Pressure signal.

All components actuated by an MSIS are listed in the ESFAS Actuated Components table starting on page 51.

2.2.5.1 2R-14 MSIS Changes

As documented by CR-2-99-0282, Tech Spec LCO Table 3.3.3 implies MFW and MS isolation by MSIS are redundant. Contrary to the implication, the existing design required both trains of MSIS to isolate MFW. That is, the actuation of MSIS would only secure its respective train of feedwater and condensate. Therefore, both actuations would have to occur in order to completely secure MFW.

In addition, single failures existed that could result in MSIS relay de-energization. And under that design, a single MSIS relay failure could result in the tripping of a MFP. Although the MSIS relays fail safe (tripped), a "Loss of MFW Event" would result.

It was determined that the Condensate, Heater Drain, and MFW pumps must be coasting down before the safety related redundant isolation and backup MFW valves could completely close. The valves were not designed to close against normal forced feedwater flow. (They are only considered redundant for upstream water retention after forced flow differential decrease.)

MSIS – MAIN STEAM ISOLATION SIGNAL				
Component	**Designation**	**Actuated Position**	**Time Delay**	**Relay Number**
2C39 Aux Relay Cabinet – Red				
SW Pump	2P-4A	Running	4.5 seconds	K-105A
SW Pump	2P-4B	Running	6 seconds	
Intake Structure Exhaust	2VEF-25A	Running	70 seconds	
ACW Isolation	2CV-1425-1	Closed		
CCW Hx Inlet Valve	2CV-1530-1	Closed		
CCW Hx Outlet Valve	2CV-1543-1	Closed		
SW to SFP Cooler	2CV-1525-1	Closed		
SG Blowdown Isolation	2CV-1016-1	Closed		
SG Blowdown Isolation	2CV-1066-1	Closed		
MSIS Override Enable for 2CV-1425-1	2CR1425M-1	Energized with manual HS operation		K-106A
Cntmt Cooling Coils A/B Low SW Flow enable relay	62/1521-1	Energized with low flow	60 seconds	
"B" MFP Mech Reset Enable	2K2B	Latch reset solenoid deenergized		K-204A
MFW Block CSAS Override Enable Relay	2CR-1024CS	Energized		
	2CR-1074CS	Energized		
MFW Block Valve	2CV-1024-1	Closed		K-204A & K-305A
MFW Block Valve	2CV-1074-1	Closed		
MSIV	2CV-1060-2	Closed		
MSIV	2CV-1010-1	Closed		
"A" MFP Electrical Trip	2K2A	Tripped		
"B" MFP Mechanical Trip	2K2B	Tripped		
Main Feedwater Isolation Actuation Relay	MFWIS1	Energized		

MFWIS - MAIN FEEDWATER ISOLATION SIGNAL				
Component	**Designation**	**Actuated Position**	**Time Delay**	**Relay Number**
Condensate Pumps	2P-2A	Off		MFWIS1 or MFWIS2
	2P-2B	Off		
	2P-2C	Off		
	2P-2D	Off		
Heater Drain pumps	2P-8A	Off		
	2P-8B	Off		
AFW pump	2P-75	Off		

MFWIS1 relay is located in 2P-2C Condensate Pump breaker cubicle 2A-106.

MFWIS2 relay is located in 2P-2B Condensate Pump breaker cubicle 2A-205.

INSTRUCTIONS	CONTINGENCY ACTIONS
2. Notify SM to refer to Technical Specifications and 1903.010, Emergency Action Level Classification.	
3. Open Placekeeping page.	
4 Notify Control Board Operators to monitor floating steps.	
5. Verify MSIS actuated on PPS inserts.	
*6. IF SIAS setpoints exceeded by EITHER of the following: • RCS pressure 1650 psia or less. • CNTMT pressure 18.3 psia or greater. THEN verify SIAS and CCAS actuated on PPS inserts.	*6. IF SIAS setpoints NOT exceeded, THEN GO TO Step 7.
*7. Verify actuated ESFAS components using 2202.010, Exhibit 9, ESFAS Actuation.	

INSTRUCTIONS | **CONTINGENCY ACTIONS**

NOTE

If possible during the cooldown, maintain SG to RCS Δp less than 1600 psid.

■ **19. Maintain RCS post-cooldown conditions as follows:**

A. Maintain RCS temperature by steaming intact SG using EITHER of the following:

- Upstream ADV.
- Upstream ADV Isolation MOV.

B. Control feedwater flow to intact SG using 2202.010 Attachment 46, Establishing EFW Flow.

C. Maintain RCS pressure within P-T limits using 2202.010 Attachment 48, RCS Pressure Control.

EOP STEP:

5. **Verify MSIS actuated on PPS inserts.**

EPG STEP: 9

DEVIATION? Yes

BASIS FOR DEVIATION:

The EOP is structured such that the SPTA (1) contains several actions for mitigating an overcooling event to ensure implementation in a timely manner. If those actions have not stopped the cooldown event, then an MSIS should have already occurred or should be manually actuated. Since a MSIS may either reduce the break's total energy flow (by isolating the SG with the break from the intact SG) or isolate the break entirely, verification of MSIS actuation is performed early in the ESD EOP.

The main condenser is protected against overpressure by design. Upon LOOP, Circ Water is lost to the condenser. Vacuum will degrade which will ensure the turbine paths are isolated (MTG and MFWP Vacuum trips). The path for main steam to the condenser via 2CV-0400/0460 is isolated in SPTA. If LOOP were to occur subsequent to Rx Trip, then 2CV-0400/0460 will already be closed. SDBCS will cease functioning upon LOOP (Loss of 2Y1 and 2Y2) and will restore with all controls in manual and closed signals upon 2Y1/2 restoration, so no steaming via this path (13). SG Blowdown isolates on Loss of Instrument Air, which occurs because of LOOP (14). However, as the operator has a floating step to restore IA from U1, the operator, when a LOOP is diagnosed (no power to 2A1 or 2A2) is directed to isolate SG blowdown. Once restored via operator action, SDBCS will protect the condenser by modulating all of its control function from the bypass valves to the atmospheric dumps as condenser degrades. A Condenser Interlock blocks all signals to the bypass valves.

In the case of ESD this step actuates MSIS, which closes the MSIVs and SGBD isolation valves.

SOURCE DOCUMENTS:

1. 2202.001, Standard Post Trip Actions;
   2202.010, Standard Attachments, Exhibit 8, Diagnostic Actions;
   ANO-2 EOP Setpoint Document, setpoint G.24;
   ANO-2 EOP Setpoint Document, setpoint G.20.

EOP STEP:

■19. Maintain RCS post-cooldown conditions as follows:

EPG STEP:

*13.

DEVIATION? Yes

BASIS FOR DEVIATION:

In order to maintain post cooldown pressure and temperature, the cooldown must be stopped. If the cooldown has not stopped a verification of MSIS actuated components (1) should reveal the reason for the continued cooldown.

A. Step provide direction for using the Upstream ADV or Upstream ADV Isolation MOV which is AC powered (3 & 4).

B. Step directs use of an attachment (6) to control feedwater flow to the intact SG to avoid excessive cooldown to assist in maintaining post cooldown conditions.

C. Once the cooldown has stopped, the operator will maintain post cooldown pressure and temperature for PTS concerns using an attachment (5).

The EOP expands the direction provided in the EPG, which only states to stabilize RCS temperature, to specify to maintain RCS conditions within the P-T limits. This ensures that a pressurized thermal shock condition is avoided by ensuring that pressure is below the 200°F MTS curve (2).

SOURCE DOCUMENTS:

1. E-2024, sheets 19-23 of 33, ESF Relays Contact Information.
2. ANO-2 EOP Setpoint Document, setpoint M.2.
3. DCP 86-2017, Upstream ADV Isolation Valves.
4. M-2206, sheet 1 of 2, P&ID Steam Generator Secondary System.
5. ANO-2 EOP Setpoint Document, setpoints P.1 & P.2;
   2202.010, Standard Attachments, Attachment 48, RCS Pressure Control.
6. 2202.010, Standard Attachments, Attachment 46, Establishing EFW Flow.

ATTACHMENT 46
ESTABLISHING EFW FLOW

NOTE

Tech Spec requirements for Q CST (T-41B) are as follows:

- **107,000 gallons (10.9 feet) when aligned to Unit 1 ONLY.**
- **160,000 gallons (16.0 feet) when aligned to Unit 2 ONLY.**
- **267,000 gallons (26.3 feet) when aligned to both units.**

* 1. IF EFW pump running OR will be started
AND pump suction aligned to "Q" CST,
THEN monitor level to ensure Tech Spec requirements satisfied.

2. IF EFAS or MSIS is actuated
THEN **GO TO** step 6.

3. IF desired to manually control EFW flow using 2P7B,
THEN perform the following:

   A. Verify 2P7B running.

   B. IF desired to feed 'A' S/G
   THEN perform the following:

      1) Verify 2CV-1038-2 (2P7B Discharge to 'A' S/G) open.

      2) Throttle 2CV-1025-1 (2P7B Flow Control Valve to 'A' S/G) to control 'A' S/G level.

   C. IF desired to feed 'B' S/G,
   THEN perform the following:

      1) Verify 2CV-1036-2 (2P7B Discharge to 'B' S/G) open.

      2) Throttle 2CV-1075-1 (2P7B Flow Control Valve to 'B' S/G) to control 'B' S/G level.

   D. IF 2P7A is running AND will not be used to feed the SGs,
   THEN secure 2P7A by overriding and closing Steam to EFW Pump Turbine Valve (2CV-0340-2).

6. <u>IF</u> desired to manually control EFW using 2P7B and EFAS or MSIS actuated, <u>THEN</u> perform the following:

   A. Verify 2P7B running.

   B. <u>IF</u> desired to feed 'A' S/G, <u>THEN</u> perform the following:

      1) Override 2CV-1038-2 (2P7B Discharge to 'A' S/G) by placing handswitch to MSIS override AND then to EFAS override.

      2) Override 2CV-1025-1 (2P7B Feed to 'A' S/G) by placing 2HS-1025B-1 to MSIS override AND then to EFAS override.

      3) Throttle 2CV-1025-1 to control 'A' S/G level.

   C. <u>IF</u> desired to feed 'B' S/G, <u>THEN</u> perform the following:

      1) Override 2CV-1036-2, (2P7B Discharge to 'B' S/G) by placing handswitch to MSIS override AND then to EFAS override.

      2) Override 2CV-1075-1 (2P7B Feed to 'B' S/G) by placing 2HS-1075B-1 to MSIS override AND then to EFAS override.

      3) Throttle 2CV-1075-1 to control 'B' S/G level.

   D. <u>IF</u> 2P7A is running <u>AND</u> will not be used to feed the SGs, <u>THEN</u> secure 2P7A by overriding and closing Steam to EFW Pump Turbine Valve (2CV-0340-2).

Bank:	1832	**Rev:**	0	**Rev Date:**	5/5/2012 2:08:05	**QID #:**	11	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	H	**Source:**	NEW		
Search	000055A201	**10CFR55:**	41.7 / 41.10	**Safety Function**	6				
System Title:	Loss of Offsite and Onsite Power (Station Black	**System Number**	055	**K/A**	EA2.01				
Tier:	1	**Group:**	1	**RO Imp:**	3.4	**SRO Imp:**	3.7	**L. Plan:**	A2LP-RO-ESBO
OBJ	2								

Description: Ability to determine and interpret the following as they apply to a Station Blackout: - Existing valve positioning on a loss of instrument air system

Question:

Consider the following:

- Unit 2 has tripped due to a Grid disturbance
- OP-2202.001, Standard Post Trip Actions (SPTAs), have been completed
- OP-2202.008, Station Blackout EOP, has been entered

Reactor Coolant System (RCS) Heat Removal should be initially accomplished by manually OPENING the______________________________.

A. UPSTREAM atmospheric dump valve

B. UPSTREAM atmospheric dump valve isolation valve

C. DOWNSTREAM atmospheric dump valve

D. DOWNSTREAM atmospheric dump valve isolation valve

Answer:

B. Correct, opening the UPSTREAM atmosphere dump valve isolation valve (2CV-1001-1) due to the ADV failing open. Post Trip in SPTAs the MSIVs will be closed (isolating the downstream Atmospheric dump valves)

Notes:

A. Incorrect, the upstream ADV fails open therefore actions are required to manually close the UPSTREAM atmospheric dump valve (2CV-1001) to control SG pressure.
C. Incorrect, the MSIVs fail close on loss of IA which isolates the DOWNSTREAM atmospheric dump valve (2CV-0305)
D. Incorrect, the MSIVs fail close on loss of IA which isolates the DOWNSTREAM atmospheric dump valve (2CV-0305)

References:

OP-2202.008, Station Blackout EOP, Rev. 011, step 7.B [page 3]
EOP-2202.008, Station Blackout EOP Tech Guide, Rev. 009, step 7 [page 13]
OP-2205.008,Rev. 024, Exhibits 2 and 3 [pages 29 thru 35]
A2LP-RO-ESBO, Rev. 8, Obj. 2, Given a set of plant conditions, describe the strategy for the Station Blackout optimal recovery EOP.

Historical Comments:

New Question

INSTRUCTIONS	CONTINGENCY ACTIONS
6. Verify the following valve handswitches in CLOSE:	
A. Regen HX Outlet valve (2CV-4823-2).	
B. Controlled Bleedoff valve (2CV-4847-2).	
C. RCS Sample valves: • 2SV-5833-1 • 2SV-5843-2	
D. MSIVs: • 2SV-1010-1A • 2SV-1010-2A • 2SV-1060-1A • 2SV-1060-2A	
E. SG Blowdown valves: • 2CV-1016-1 • 2CV-1066-1	
***7. Maintain adequate RCS Heat Removal by the following:**	
A. At least ONE SG level 10% to 90%.	
B. At least ONE SG pressure 950 psia to 1050 psia by performing necessary steps of "Manual Operation of Upstream Atmospheric Dump Valves" Exhibit 3 of 2105.008, Steam Dump and Bypass Control System Operations.	B. Perform the following: • <u>IF</u> SG pressure less than 950 psia due to overcooling, <u>THEN</u> adjust EFW pump 2P7A speed to minimize overcooling. • <u>IF</u> SG pressure greater than 1050 psia, <u>THEN</u> check MSSVs maintaining SG pressure 1050 psia to 1100 psia.

EOP STEP - Section 1 – DG Operations:

*7. **Maintain adequate RCS Heat Removal by the following:**

EPG STEP:
*6.
*7.

DEVIATION? Yes

BASIS FOR DEVIATION:

The EOP directs that SG levels be maintained in the normal post trip range (1). This range is wider than the normal operating range to allow raised flexibility during an accident.

Maintaining SG secondary pressure 950 to 1050 psia will allow operation below the SG safety lifting setpoint, while at the same time minimizing the amount of RCS cooldown. SG pressure is maintained within the normal band (2) by locally operating the SDBCS ADVs or the Upstream ADV Isolation MOVs using an exhibit (4).

If 2P7A speed is causing an overcooling effect, then direction is given to adjust speed to minimize the effect.

If SG pressure is greater than 1050 psia, then proper MSSV operation is checked (3).

SOURCE DOCUMENTS:

1. ANO-2 EOP Setpoint Document, setpoint G.5 & G.6.
2. ANO-2 EOP Setpoint Document, setpoint G.21 & G.22.
3. ANO-2 EOP Setpoint Document, setpoint G.23.
4. 2105.008, Steam Dump and Bypass Control System Operations, Exhibit 2, Manual Operation of Upstream Atmospheric Dump Valves

MANUAL OPERATION OF UPSTREAM ATMOSPHERIC DUMP VALVES

NOTE
- ADVs fails open on loss of air with selector switch in OPER.
- Valves are reverse seating.

*1.0 IF desired to locally monitor A S/G pressure on 2PI-1007, THEN perform the following:

1.1 Verify pipe cap installed downstream of 2MS-3005.

1.2 Verify instrument tap capped downstream of 2MS-3005.

1.3 Open 2PI-1007 and 2CV-1001 Header Drain Isolation (2MS-3005).

1.4 Slowly open 2PI-1007 and 2CV-1001 Header Drain Isolation (2MS-3006).

1.5 Verify 2PI-1007 local tubing isolation valve open.

*2.0 IF desired to locally monitor B S/G pressure on 2PI-1051, THEN perform the following:

2.1 Verify instrument tap capped downstream of 2MS-3008.

2.2 Open 2PI-1051 and 2CV-1051 Header Vent Isolation (2MS-3007).

2.3 Slowly open 2PI-1051 and 2CV-1051 Header Vent Isolation (2MS-3008).

2.4 Verify 2PI-1051 local tubing isolation valve open.

3.0 IF desired to **FAIL OPEN** Upstream Atmospheric Dump valve, THEN perform the following:

3.1 Verify Handle Position Selector to OPER.

3.2 Isolate air to diaphragm by closing appropriate valve:

- For 2CV-1001: IA to 2CV-1001 (2IA-287).
- For 2CV-1051: IA to 2CV-1051 (2IA-94).

3.3 Remove cap from local air bleed off valve.

3.4 Open air bleed off valve.

3.5 Manually open ADV Isolation MOV as directed:

- For 2CV-1001: 2CV-1002
- For 2CV-1051: 2CV-1052

2105.008 EXHIBIT 2 Revised 01/18/2012

MANUAL OPERATION OF UPSTREAM ATMOSPHERIC DUMP VALVES

4.0 IF desired to **THROTTLE** Upstream Atmospheric Dump valve, THEN perform the following:

4.1 Place Handle Position Selector to MAN.

4.2 Rotate handwheel clockwise until resistance felt.

4.3 Verify ADV fully closed.

4.4 Place Handle Position Selector to LOCK.

4.5 Isolate air to diaphragm by closing appropriate valve:

- For 2CV-1001: IA to 2CV-1001 (2IA-287)
- For 2CV-1051: IA to 2CV-1051 (2IA-94)

4.6 Remove cap from local air bleed off valve.

4.7 Open air bleed off valve.

4.8 Manually open ADV Isolation MOV as directed:

- For 2CV-1001: 2CV-1002
- For 2CV-1051: 2CV-1052

CAUTION

ADV will fail open rapidly when handle position selector placed in OPER.

4.9 To open ADV, place Handle Position Selector to OPER.

4.10 WHEN desired valve position obtained, THEN place Handle Position Selector to LOCK.

4.11 To close ADV, perform the following:

4.11.1 Place handle position selector to MAN.

4.11.2 Rotate handwheel clockwise until desired position obtained.

4.11.3 Place handle position selector to LOCK.

2105.008 EXHIBIT 2 Revised 01/18/2012

MANUAL OPERATION OF UPSTREAM ATMOSPHERIC DUMP VALVES

5.0 To restore valve to normal lineup, perform the following:

5.1 Close local air bleed off valve.

5.2 Replace cap on air bleed off valve.

5.3 Re-align air by opening appropriate valve:

- For 2CV-1001: IA to 2CV-1001 (2IA-287)
- For 2CV-1051: IA to 2CV-1051 (2IA-94)

5.4 Verify handle position selector in OPER.

5.5 Verify ADV fully closed.

5.6 Verify ADV Isolation MOV closed:

- For 2CV-1001: 2CV-1002
- For 2CV-1051: 2CV-1052

5.7 Verify the following valves closed to isolate pressure gauges:

- 2MS-3005
- 2MS-3006
- 2MS-3007
- 2MS-3008

- **All applicable steps are complete.**
- **Expected system response obtained.**

SDBCS EMERGENCY OPERATION

1.0 IF BOTH MSIV's closed,
THEN GO TO step 5.0.

2.0 Perform the following to determine availability of SDBCS valves:

2.1 IF the following conditions satisfied,
THEN SDBCS Master controller (2PIC-0300) available:

- SDBCS controlling S/G pressure at setpoint in automatic
- Emergency OFF (2K02-A14) clear
- Instrument air available
- IF using Turbine Bypass valves,
THEN Condenser Interlock (2K02-B14) clear

2.2 IF the following conditions satisfied,
THEN SDBCS Downstream ADV/Turbine Bypass valves available:

- Instrument air available
- Emergency OFF (2K02-A14) clear
- Power available to selected controllers/valves
- IF using Turbine Bypass valves,
THEN Condenser Interlock (2K02-B14) clear

NOTE

- The SDBCS Master controller can not be set less than 650 psi.
- Computer points FR1030 and FR1130 can be useful to monitor steam flow.

3.0 IF SDBCS Master controller (2PIC-0300) available per step 2.0 and use desired,
THEN perform the following:

3.1 Place permissive handswitch for desired SDBCS Downstream ADV/Turbine Bypass valves in MANUAL:

- 2CV-0301 Downstream Atmospheric Dump valve (2HS-0301)
- 2CV-0305 Downstream Atmospheric Dump valve (2HS-0305)
- 2CV-0302 Turbine Bypass valve (2HS-0302)
- 2CV-0303 Turbine Bypass valve (2HS-0303)
- 2CV-0306 Turbine Bypass valve (2HS-0306)

3.2 Verify SDBCS Master controller (2PIC-0300) in LOCAL using R/L button.

* 3.3 Adjust SDBCS Master controller (2PIC-0300) to desired setpoint

SDBCS EMERGENCY OPERATION

4.0 IF SDBCS Downstream ADV/Turbine Bypass valves operation in manual desired, THEN perform the following:

4.1 Place selected HIC(s) in MANUAL:

- 2HIC-0301 Downstream Atmospheric Dump valve
- 2HIC-0305 Downstream Atmospheric Dump valve
- 2HIC-0302 Turbine Bypass valve
- 2HIC-0303 Turbine Bypass valve
- 2HIC-0306 Turbine Bypass valve

4.2 Adjust output on selected HIC(s) as desired.

4.3 Place the selected permissive(s) handswitch to MANUAL:

- 2CV-0301 Downstream Atmospheric Dump valve (2HS-0301)
- 2CV-0305 Downstream Atmospheric Dump valve (2HS-0305)
- 2CV-0302 Turbine Bypass valve (2HS-0302)
- 2CV-0303 Turbine Bypass valve (2HS-0303)
- 2CV-0306 Turbine Bypass valve (2HS-0306)

* 4.4 Adjust output on selected HIC as desired.

4.5 IF valve opening NOT desired,
THEN place permissive handswitch to OFF:

- 2CV-0301 Downstream Atmospheric Dump valve (2HS-0301)
- 2CV-0305 Downstream Atmospheric Dump valve (2HS-0305)
- 2CV-0302 Turbine Bypass valve (2HS-0302)
- 2CV-0303 Turbine Bypass valve (2HS-0303)
- 2CV-0306 Turbine Bypass valve (2HS-0306)

5.0 Perform the following to determine availability of SDBCS valves:

5.1 IF the following conditions satisfied,
THEN Upstream ADV are available:

- Instrument air available
- Emergency OFF (2K02-A14) clear
- Power available to selected controllers/valves

5.2 IF the following conditions satisfied,
THEN ADV Upstream Isolation valve are available:

- Emergency OFF (2K02-A14) clear or Upstream ADV locally failed open
- Power available

6.0 IF operation of Upstream Atmospheric Dump valve from the Control Room desired,
THEN perform the following:

6.1 Verify selected HIC in MANUAL with ZERO output demand:

- 2HIC-1001 Upstream Atmospheric Dump valve
- 2HIC-1051 Upstream Atmospheric Dump valve

6.2 Place selected valve(s) permissive handswitch in MANUAL:

- 2CV-1001 Upstream Atmospheric Dump valve (2HS-1001)
- 2CV-1051 Upstream Atmospheric Dump valve (2HS-1051)

6.3 IF MSIS actuated,
THEN override actuation for selected MOV isolation:

- 2CV-1002 ADV Upstream Isolation valve
- 2CV-1052 ADV Upstream Isolation valve

* 6.4 Throttle open selected MOV as desired:

- 2CV-1002 ADV Upstream Isolation valve
- 2CV-1052 ADV Upstream Isolation valve

* 6.5 Place selected HIC to desired demand:

- 2HIC-1001 Upstream Atmospheric Dump valve
- 2HIC-1051 Upstream Atmospheric Dump valve

SDBCS EMERGENCY OPERATION

7.0 IF using ADV Upstream Isolation valve to control S/G pressure, THEN perform the following:

7.1 Verify selected HIC in MANUAL with output of 100%:

- 2HIC-1001 Upstream Atmospheric Dump valve
- 2HIC-1051 Upstream Atmospheric Dump valve

7.2 Place selected valve permissive handswitch in MANUAL:

- 2CV-1001 Upstream Atmospheric Dump valve
- 2CV-1051 Upstream Atmospheric Dump valve

7.3 IF MSIS actuated, THEN override actuation for selected MOV isolation:

- 2CV-1002 ADV Upstream Isolation valve
- 2CV-1052 ADV Upstream Isolation valve

* 7.4 Throttle open selected MOV as desired:

- 2CV-1002 ADV Upstream Isolation valve
- 2CV-1052 ADV Upstream Isolation valve

- **All applicable steps are complete.**
- **Expected system response obtained.**

Bank: 1833	**Rev:** 0	**Rev Date:** 4/4/2012 3:08:15		**QID #:** 12		**Author:** Foster			
Lic Level: R	**Difficulty:** 2	**Taxonomy:** F		**Source:** NEW					
Search 0000562403		**10CFR55:** 41.6		**Safety Function** 6					
System Title: Loss of Offsite Power				**System Number** 056		**K/A** 2.4.3			
Tier: 1	**Group:** 1	**RO Imp:** 3.7	**SRO Imp:** 3.9	**L. Plan:** A2LP-RO-EAOP		**OBJ** 3			

Description: Emergency Procedures/Plan - Ability to identify post-accident instrumentation.

Question:

Reg Guide 1.97 post-accident Instrumentation is identified on the control panels by a ____________ on the instrument face plate and __________ be available during a Loss of Offsite Power condition.

A. "Green Dot" sticker, would

B. "Green Dot" sticker, would not

C. 2C-80 plaque, would

D. 2C-80 plaque, would not

Answer:

A. Correct, "Green Dot" stickers are required by OP-2305.026, instruments would be available during a LOOP (2Y1 and 2Y2 are non vital instrument buses but are supplied from EDG backed vital buses)

Notes:

B. Incorrect, instruments would be available during a LOOP (2Y1 and 2Y2 are non vital instrument buses but are supplied from EDG backed vital buses)
C. Incorrect, 2C-80 is remote shutdown instrumentation
D. Incorrect, 2C-80 is remote shutdown instrumentation

References:

A2QC-RO-QUAL, Rev. 18, Reactor Coolant System, advanced knowledge section 3.2.1.2 (page 17)
OP-2305.026, Reg. Guide Instrumentation Verification, Rev. 020, section 3.0 (description, page 2)
OP-1015.021, Rev. 011, section 8.0, Instrumentation Usage [page 41]
A2LP-RO-EAOP, Rev. 17, Obj. 3, Discuss the usage of the Abnormal Operating Procedure as defined in OP-1015.021, ANO-2 EOP/AOP User's Guide.

Historical Comments:

New Question

Reactor Coolant System

3.2 Advanced Knowledge Topics

3.2.1 Specifications and Operability

3.2.1.1 Discuss the Limiting Conditions for Operation (LCO), Action Statements, and Technical Specification Bases associated with the Reactor Coolant System and components.

3.2.1.2 Locate all indications associated with Reg. guide 1.97 qualified instrumentation. Discuss the purpose and significance of each instrument using procedure listing.

_____ / _____
Date

3.2.1.3 Discuss precautions and specifications of RCS gas content.

3.2.1.4 Identify and discuss all Remote Shutdown Instrumentation, both within and outside the Control Room.

3.2.1.5 Identify and discuss all Post Accident Monitoring Instrumentation.

3.2.1.6 Discuss the LCO and Action Statements associated with Seismic Instrumentation and Meteorological Instrumentation.

3.2.1.7 Discuss the Action Statements should containment sump level indication become inoperable during MODE 1 operations.

3.2.1.8 Discuss the LCO and Action Statements associated with Reactor Coolant System Leakage.

3.2.1.9 Discuss the LCO and Action Statements associated with Reactor Coolant System Chemistry and Specific Activity.

3.2.1.10 Discuss the information given in and Action Statements associated with the RCS Pressure/Temperature Limits curves.

_____ / _____
Date

3.2.2 System Operations

3.2.2.1 Discuss indications and required actions should any one of the following occur:

- Pressurizer safety valve failure
- Pressurizer level Channel #1 or #2 fails
- Low range Channel #1 or #2 pressure failure
- Wide range Channel #1 or #2 pressure failure
- Narrow range Channel #1 or #2 pressure failure
- Quench tank rupture disk failure
- Quench tank drain valve failure
- Reactor vessel O-ring fails

3.2.2.2 Discuss indications of RCS voiding and where voiding may occur.

3.2.2.3 Describe how a bubble is formed in the reactor vessel head and how such a bubble is collapsed.

3.2.2.4 Discuss criteria for securing RCP's (normal and emergency).

3.2.2.5 Discuss RCP restart criteria.

_____ / _____
Date

1.0 PURPOSE

This procedure satisfies in part an NRC commitment to control and maintain operability and identification of Reg Guide 1.97 post accident monitoring instrument indicators.

2.0 SCOPE

Supplement 1 checks those indications that are required to be marked as Reg Guide 1.97 post accident monitoring instruments in the Unit 2 Control Room. Supplement 2 checks Reg Guide 1.97 components, recorders and indications that are not routinely checked by other surveillances. Attachment A provides a cross reference of Reg Guide 1.97 instruments and the procedures other than this procedure where checks on these instruments are performed.

3.0 DESCRIPTION

Reg Guide 1.97 states that "The instruments designated as Type A, B and C, and Categories 1 and 2 should be specifically identified on the control panels so that the operator can easily discern that they are intended for use under accident conditions."

For Unit 2, instrument indicators designed to be relied upon in post accident conditions are to be conspicuously labeled with a green dot. These indicators consist of Reg Guide 1.97 Category 1 and 2 indicators and some additional environmentally qualified (EQ) instruments.

4.0 REFERENCES

4.1 References Used in Procedure Preparation

- CR-C-90-028, Reg Guide 1.97 Indicators Not Identified
- ANO-92-01380, Downgrade of Reg Guide 1.97 Level Transmitters 2LT-5010, 5030, 5050, 5070
- CR-ANO-2-2000-0242-002, Post Accident CNTMT Pressure Requirements Not Satisfied by Narrow Range CNTMT Pressure Instruments
- ER-ANO-2002-0149-000, A/C/D excores upgraded to RG 1.97
- ER-ANO-2002-0528-004, I&C Support for Increased HPSI Flow
- CR-ANO-2-2004-0328, Remove 2JE-9003-2 from Reg Guide 1.97
- CR-ANO-2-2011-2309, Failed instrument 2TE-4735-3A
- EC-30016, Modify Hot Leg Input to C CPC due to failed 2TE-4735-3A

4.2 References Used in Conjunction with this Procedure

None

8.0 INSTRUMENTATION USAGE

Operators should consider all instrumentation to be operating properly unless proven otherwise. Channel cross checks and/or use of alternate instrumentation should be used to validate instrument readings. Alternate instrumentation, for example, would require using an EFW pump discharge flow and SG level response to validate an incorrect discharge pressure reading. All instrumentation marked with green dots is Reg Guide 1.97 certified. These instruments are a higher quality and are expected to be available during accident conditions.

9.0 EOP/AOP USAGE PHILOSOPHIES

9.1 This Section will be used to address questions and concerns related to EOP/AOP usage philosophies that may arise during the use of these procedures during actual or simulated plant emergencies.

These items have been reviewed by Operations Management and the responses are to be considered standing philosophies for EOP/AOP usage.

9.1.1 **QUESTION 1**

Can an operating crew take actions that are not specified in the particular procedure (EOP or AOP) being implemented? Is it required that any operator action taken must be procedurally directed?

ANSWER:

Operators must always have flexibility to take actions necessary to mitigate an event. Operators must use their training in system design and control to take "supplemental" actions necessary to restore any system or equipment to a usable condition. These action should be on an "As Needed" basis to supplement the EOP/AOP procedure in use. The overall recovery strategy of the procedure must be maintained and NOT hindered by any "supplemental" operator actions. This is not a procedure deviation but is a prudent action (a.k.a. manual action/anticipatory action/action to mitigate the consequences of an accident/skill of the craft). This can be justified as per ANS 3.2 1976 step 5.2.2(3).

EXAMPLE:

EFAS actuates, but 2P7B does not automatically start. Can the operator manually close the breaker from 2C17 even though the procedure does not direct this action? Yes, this is well within the realm of expected operator response.

Bank:	1834	**Rev:**	0	**Rev Date:**	4/4/2012 3:39:21	**QID #:**	13	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	Modified NRC Exam Bank 1503		
Search	000057A220	**10CFR55:**	41.7 / 41.10	**Safety Function**	6				
System Title:	Loss of Vital AC Electrical Instrument Bus	**System Number**	057	**K/A**	AA2.20				
Tier:	1	**Group:**	1	**RO Imp:**	3.6	**SRO Imp:**	3.9	**L. Plan:**	A2LP-RO-ED120
OBJ	3								

Description: Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: - Interlocks in effect on loss of ac vital electrical instrument bus that must be bypassed to restore normal equipment operation

Question:

Consider the following:

- Unit 2 tripped due to a Loss of Offsite Power
- Annunciator 2K08 B-3, 2A3 LO RELAY TRIP, comes into alarm on the Reactor trip
- #1 EDG is secured due to lack of cooling
- The CRS directs the IAO to perform a dead bus crosstie of 2Y1 with 2Y2 supplying using OP-2107.003, 120 VAC Distribution Operations, exhibit 13

Per OP-2107.003, 120 VAC Distribution Operations exhibit 13, which action below is the correct sequence for performing a dead bus crosstie of 2Y1and 2Y2 with 2Y2 supplying?

A. The 2Y1 Main Feeder Breaker MANUAL TRIP button must be pushed in to remove the Kirk Key from the 2Y1 Feeder Breaker to allow obtaining the crosstie breaker Kirk Keys

B. The 2Y2 Main Feeder Breaker MANUAL TRIP button must be pushed in to remove the Kirk Key from the 2Y2 Feeder Breaker to allow obtaining the crosstie breaker Kirk Keys

C. The 2Y1 Main Feeder Breaker MANUAL CLOSE button must be pushed in to remove the Kirk Key from the 2Y1 Feeder Breaker to allow obtaining the crosstie breaker Kirk Keys

D. The 2Y2 Main Feeder Breaker MANUAL CLOSE button must be pushed in to remove the Kirk Key from the 2Y2 Feeder Breaker to allow obtaining the crosstie breaker Kirk Keys

Answer:

A. Correct, actions are directed by OP-2107.003, 120 VAC Distribution Operations, exhibit 13

Notes:

The Kirk Keys are normally captured in the feeder breakers when the breakers are closed. The feeder breaker Kirk keys are needed to obtain the crosstie breaker Kirk keys to allow closing the crosstie breakers to restore the control room instrumentation and control. To obtain the feeder breaker Kirk keys and ensure the supplying bus is not cross tied to the other safety bus, the feeder breaker Kirk key can only be removed when the feeder breaker trip pushbutton is depressed. Since the condition requires powering 2Y1 from 2Y2, the feeder breaker we need to open is the normal feeder breaker for 2Y1. This makes Answer A Correct. Distracter B would be used only if 2Y2 was to be supplied from 2Y1. Distracters C and D would not meet the interlock and thus are incorrect.

References:

STM 2-32-4, 120 VAC Distribution System, Rev. 17, section 2.1 (page 3)
OP-2107.003, 120 VAC Distribution Operations, Rev. 030, Exhibit 13 Step 2.0 (page 118)
OP-2203.012-H, ACA, Rev. 034, window B-3 (page 23)
OP-2202.001, Standard Post Trip Actions (SPTAs), Rev. 013, step 4. contingency column 4.H. (page 5)
A2LP-RO-ED120, Rev. 2, Obj. 3, Explain the following wit respect to the 120VAC Instrumentation System:

a. the purpose of 2Y1 and 2Y2, b. source of power to 2Y1 and 2Y2, c. Cross-connecting 2Y1 and 2Y2

Historical Comments:

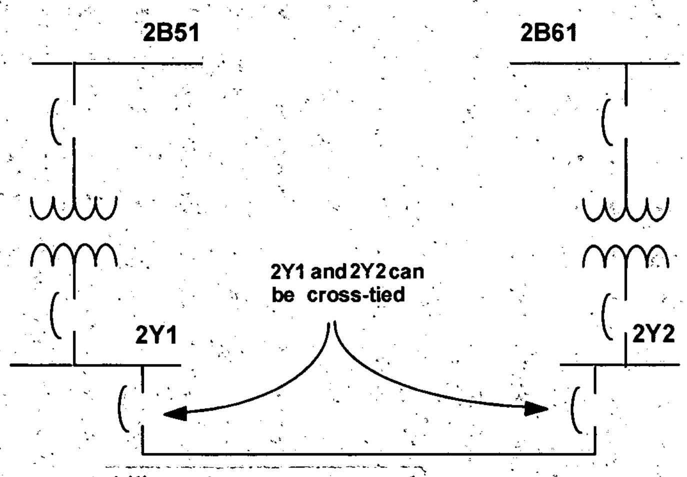
Modified NRC bank question used on the 2008 RO and SRO exam.

2.0 Detailed System Description

2.1 120V Instrumentation System

This system is procedurally addressed in 2107.003, Inverter and 120 VAC Electrical System Operation, and consists of the following distribution panels.

- 2Y1
- 2Y2
- 2Y3
- 2Y4
- 2Y5



2Y1 and 2Y2 are part of the original plant design and supply most of the non-ESF instrumentation and control systems. They are supplied from a Motor Control Center via a transformer. 2Y1 and 2Y2 have the ability to be cross-connected.

These buses have a Kirk key interlock similar to that for 2B5 and 2B6. Normally the key block contains the keys for the cross-connect breakers and each feeder breaker is closed with the key captured in the respective breaker. When the feeder breaker is opened, it can be locked in the open position and the key can be removed. This key (from either feeder breaker) can then be inserted into the key block located in 2Y1. When the feeder breaker key is rotated the cross-connect breaker keys will rotate and can then be removed. The cross-connect breakers can then be unlocked and closed.

The purpose of the interlock is to prevent closing the cross-connect breakers unless one of the buses has its supply breaker locked in the open position. With the use of keys that are located at the panels, the two buses cannot be cross-connected unless one of the supply breakers is open; however spare Kirk keys, that are controlled by the Shift Supervisor, will allow an energized cross-connect of these two buses. Both of these techniques are covered in the operating procedure.

The procedure does not allow cross-connecting these buses unless the plant is in mode 5 or 6 or in the case of an emergency as directed by the Emergency Operating Procedure. This is because of loading concerns with the Emergency Diesel Generators.

DEAD BUS CROSS-CONNECT OF 2Y1 AND 2Y2

2.0 FEEDING 2Y1 FROM 2Y2

CAUTION

Cross tying 2Y1 and 2Y2 is NOT permitted in Mode 1, 2, 3 or 4 EXCEPT in an emergency. Cross tying in Mode 1 through 4 will render DG inoperable.

NOTE

- Required PPE per 2107.001, Exhibit 9 is 100% cotton or other non-melting or flame resistant clothing and leather gloves.
- Dead bus cross connect does NOT make Safety Related buses OR 2Y1 and 2Y2 inoperable.

2.1 Open 2Y1 Main Breaker.

2.2 While pushing in MANUAL TRIP button, turn Kirk key to lock open 2Y1 Main Breaker.

2.3 Remove Kirk key from 2Y1.

2.4 Perform the following to obtain X-tie Kirk keys:

2.4.1 Open 2Y1 top panel.

2.4.2 Insert key (removed from 2Y1 Main breaker) into key block.

2.4.3 Rotate key to unlock X-tie keys.

2.4.4 Remove both X-tie keys.

2.4.5 Close 2Y1 top panel.

2.5 On 2Y1, insert one Kirk key into 2Y1 to 2Y2 Tie Breaker.

2.6 Rotate key to unlock breaker.

2.7 Close 2Y1 To 2Y2 Tie Breaker with closing lever.

2.8 On 2Y2, insert other Kirk key into 2Y2 To 2Y1 Tie Breaker.

2.9 Rotate key to unlock breaker.

2.10 Inform the control room that 2Y1 will be energized.

2.11 Close 2Y2 To 2Y1 Tie Breaker with closing lever.

ANNUNCIATOR 2K08

B-3

2A3 L.O. RELAY TRIP

1.0 CAUSES

1.1 Phase Overcurrent on bus 2A3

2.0 ACTION REQUIRED

CAUTION

Do NOT reset lockout relay until cause of trip repaired or isolated.

2.1 Verify 2A3 Feeder breakers tripped:

- 2A-308
- 2A-309
- 2A-310

2.2 Refer to Tech Specs 3.8.2.1 and 3.8.2.2.

2.3 Contact Electrical Maintenance to determine cause of bus lockout.

3.0 TO CLEAR ALARM

NOTE

2A3 may automatically re-energize when lockout reset.

3.1 WHEN cause of trip has been determined and corrected, THEN reset 2A3 lockout relay.

4.0 REFERENCES

4.1 E-2456-1

INSTRUCTIONS	CONTINGENCY ACTIONS
4. (continued)	
____E. At least ONE 6900v AC bus energized.	
____F. At least ONE 4160v Non-vital AC bus energized.	
____G. BOTH 4160v Vital AC buses energized.	G. Perform the following: 1) IF de-energized 4160v Vital AC bus available AND associated EDG available, THEN verify associated EDG supplying bus. 2) IF NEITHER DG available, THEN start AACG AND align to associated 4160v Vital bus using 2104.037, Alternate AC Diesel Generator Operations, Attachment E. ____3) Check at least ONE 4160v and 480v Vital AC bus energized.
H. BOTH DGs secured.	H. IF ANY DG running AND SW NOT aligned, THEN locally stop DG by unlocking and placing "ENGINE CONTROL" handswitch in LOCKOUT: • 2E11 • 2E21
____I. At least ONE 125v Vital DC bus energized: • 2D01 - SPDS point E2D01 • 2D02 - SPDS point E2D02	

QID: 1503 **Rev:** 0 **Rev Date:** 10/29/2007 **RO Select:** **SRO Select:** **Points:** 1.00

Lic Level: R **Difficulty:** 3 **Taxonomy:** H **Source:** NEW **Originator:** Coble

10CFR55_41: **10CFR55_43:** **Section:** **Type:**

System Title: Loss of Vital AC Electrical Instrument Bus **System Number** 057 **K/A:** AA2.20

RO Tier: 1 **RO Group:** 1 **RO Imp:** 3.6 **SRO Tier:** **SRO Group:** 1 **SRO Imp:** 3.9

Description: Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: - Interlocks in effect on loss of ac vital electrical instrument bus that must be bypassed to restore normal equipment operation.

Question:

Given the following:

* The plant has been tripped due to indication of an Excess Steam Demand.
* A loss of offsite power occurs on the trip.
* Both EDGs start and load their respective safety buses.
* During the subsequent SIAS, Alarm "2A4 LO RELAY TRIP" comes in.
* #2 EDG is then secured due to lack of cooling.
* The CRS and Shift Manger determine that Instrument and Control Bus 2Y2 will be needed in this emergency to mitigate the Steam Line Rupture event.

Which of the following actions will need to be taken locally to allow crosstie of 2Y2 from 2Y1 to restore Control Room instrumentation and control and prevent re-energizing the buses from two sources?

A. The 2Y1 Main Feeder Breaker MANUAL TRIP button must be pushed in to remove the Kirk Key from the 2Y1 Feeder Breaker to allow obtaining the crosstie breaker Kirk Keys.

B. The 2Y2 Main Feeder Breaker MANUAL TRIP button must be pushed in to remove the Kirk Key from the 2Y2 Feeder Breaker to allow obtaining the crosstie breaker Kirk Keys.

C. The 2Y1 Main Feeder Breaker MANUAL CLOSE button must be pushed in to remove the Kirk Key from the 2Y1 Feeder Breaker to allow obtaining the crosstie breaker Kirk Keys.

D. The 2Y2 Main Feeder Breaker MANUAL CLOSE button must be pushed in to remove the Kirk Key from the 2Y2 Feeder Breaker to allow obtaining the crosstie breaker Kirk Keys.

Answer:

B. The 2Y2 Main Feeder Breaker MANUAL TRIP button must be pushed in to remove the Kirk Key from the 2Y2 Feeder Breaker to allow obtaining the crosstie breaker Kirk Keys.

Notes:

The Kirk Keys are normally captured in the feeder breakers when the breakers are closed. The feeder breaker Kirk keys are needed to obtain the crosstie breaker Kirk keys to allow closing the crosstie breakers to restore the control room instrumentation and control. To obtain the feeder breaker Kirk keys and ensure the supplying bus is not cross tied to the other safety bus, the feeder breaker Kirk key can only be removed when the feeder breaker trip pushbutton is depressed. Since the condition requires powering 2Y2 from 2Y1, the feeder breaker we need to open is the normal feeder breaker for 2Y2. This makes Answer B Correct. Distracter A would be used only if 2Y1

PARENT

was to be supplied from 2Y2. Distracters C and D would not meet the interlock and thus are incorrect.

References:

STM 2-34-4, 120 VAC Distribution System, Section 2.1
OP 2107.003, 120 VAC Distribution Operations, Exhibit 13 Step 1.0

Historical Comments:

Bank:	1835	**Rev:**	0	**Rev Date:**	4/4/2012 4:35:56	**QID #:**	14	**Author:**	Foster
Lic Level:	R	**Difficulty:**	4	**Taxonomy:**	H	**Source:**	NEW		
Search	0000582402	**10CFR55:**	41.7	**Safety Function**	6				
System Title:	Loss of DC Power	**System Number**	058	**K/A**	2.4.2				
Tier:	1	**Group:**	1	**RO Imp:**	4.5	**SRO Imp:**	4.6	**L. Plan:**	A2LP-RO-ED125
OBJ	11								

Description: Emergency Procedures/Plan - Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.

Question:

Consider the following:

- Unit 2 is operating at 40% power
- Battery charger (2D32A) that was supplying 2D02 has failed
- The IAO is in the process of placing the swing charger (2D32B) in service
- Annunciator 2K01 D-11, BATTERY 2D12 NOT AVAIL, comes into alarm

With the above conditions the Unit should be at __________ % power and __________________ should be entered.

A. 0; OP-2203.037, Loss of 125 V DC AOP

B. 40; OP-2203.037,Loss of 125V DC AOP

C. 0; OP-2202.001, Standard Post Trip Actions EOP

D. 40; OP-2203.024, Loss of Turbine Load AOP

Answer:

B. Correct, with a loss of Red DC the plant will stay at power and entry into the AOP is required

Notes:

A. Incorrect, loss of Red train DC will not cause a Reactor trip, entry conditions have been met for the loss of 125V DC AOP and the AOP will direct actions to stabilize the plant and align power to the RED DC bus.
C. Incorrect, the unit does not trip due to the loss of Green DC and there has not been any condition to jeopardize offsite power. If the unit did trip in this condition, there would be a partial loss of electrical power to vital and non vital buses due to the loss of control power to offsite feeder breakers and #2 EDG, but entry conditions for LOOP are not met.
D. Incorrect; A loss of Green DC will not trip the Turbine therefore, Loss of Turbine load entry conditions are not met.

References:

STM 2-32-5, 125 Vdc Electrical Distribution, Rev. 17, section 2.7.2 [page 15]
A2LP-RO-ED125, Rev. 7, Obj. 9; Evaluate a set of plant conditions that is causing an alarm on the 125VDC Distribution system and determine the cause of the alarm and any action required to be taken.

Historical Comments:

New Question

2.7.2 Complete Loss Of A Vital DC Train With The Plant At Power

If there was a total loss of Red DC at power there would be no immediate effect with respect to the loss of the Main Turbine or a Feed Pump Turbine. The Loss of DC Abnormal Operating Procedure would be entered and the following conditions would be dealt with.

- All trip functions for channel 1 or channel 3 PPS would be placed in Trip Channel Bypass to prevent an inadvertent actuation if the unit was to trip or there was a loss of off-site power.
- Loss of Main Chilled Water to Containment Building Coolers and CEDM Coolers.
- Loss of SG blowdown.

The strategy then becomes to restore the DC bus.

If there was a loss of Vital Green DC Bus the Main Turbine would not trip because of the automatic transfer switch (2S23) that has an alternate feed from 2D25 which is supplied form 2D03, the non-vital DC bus. This modification was completed during 2R13 and will prevent a Main Turbine Trip coincident with a loss of Green DC.

If there is a complete loss of either DC train and the Main Turbine trips before operators can place the appropriate channel of the PPS in Trip Channel Bypass, the following would occur.

The following are the results of such a scenario.

- A complete loss of AC power for the respective train except for the H bus that feeds the reactor coolant pumps and Main Circulating Water Pumps. This is caused by the loss of control power for the feeder breakers to the respective vital and non-vital 4160V buses.
- The respective Emergency Diesel cannot automatically start since it will have no DC control power.
- The loss of two vital 120 VAC buses causes actuations as noted above in 2.7.
- The procedure deals with the ESFAS actuations and attempts to restore the vital and non-vital AC buses.
- The procedure then restores the DC bus.

2.7.3 Station Blackout

A Station Blackout is a complete loss of all AC power. During a loss of all AC power, the batteries are depleting due to the battery chargers not having any AC power. If there is a Station Blackout, priority in the Station Blackout EOP is to protect the station batteries by shedding unnecessary loads while the operators try and restore AC power. Load shedding unnecessary loads will allow the batteries to last longer. The batteries will initially stay at a fairly constant voltage and current output (assuming loads stay the same) until the battery amp-hour limit is exceeded. After the battery amp-hour limit is exceeded, battery voltage and current will go down until the battery is depleted. When the batteries are depleted, vital indictors

Bank:	1836	**Rev:**	0	**Rev Date:**	5/26/2012 10:57:5	**QID #:**	15	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	H	**Source:**	NEW				
Search	000062K304	**10CFR55:**	41.5 / 41.10	**Safety Function**	4						
System Title:	Loss of Nuclear Service Water	**System Number**	062	**K/A**	AK3.04						
Tier:	1	**Group:**	1	**RO Imp:**	3.5	**SRO Imp:**	3.7	**L. Plan:**	A2LP-RO-SWACW	**OBJ**	11

Description: Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: - Effect on the nuclear service water discharge flow header of a loss of CCW

Question:

Consider the following:

- Unit 2 has tripped from 100% power
- The Steam supply to "A" EFW pump has ruptured upstream of 2CV-1000-1
- "A" Steam Generator pressure 740 psia and trending down
- No Operator actions have been taken

Due to the conditions above, the Service Water (SW) to Component Cooling Water (CCW) System supply header isolation valves (2CV-1530-1 and 2CV-1531-2) should be ____________ to ____________.

A. open; provide cooling to CCW components

B. closed; prevent over pressurizing of CCW components

C. open; provide cooling to ESF components

D. closed; isolate seismic boundaries

Answer:

D. Correct; the CCW supply valves have an auto closure due to the MSIS, and they do isolate to separate seismic cat 1 from seismic cat 2 piping systems. the valves can be overridden open to provide cooling to CCW components [manual action].

Notes:

A. Incorrect; valves receive a closed signal, not an open
B. Incorrect; over pressurization is not a concern, when manually realigning Sw to CCW there is a precaution to maintain >85# SW header pressure to provide adequate cooling to ESF components
C. Incorrect; Valves go closed to provide the required SW pressure for ESF components

References:

STM 2-42, Service Water and Auxiliary Cooling Water Systems, Rev. 35, section 3.5.12, [pages 36 and 37]
A2LP-RO-SWACW, Rev. 14, Obj. 11, Given a set of plant conditions, describe the response of the Service Water/Auxiliary Cooling Water systems to ANY ESFAS actuation.

Historical Comments:

New Question

These valves are interlocked to automatically open when their respective cooler starts. Also, the valves are interlocked such that when the cooler is running, the valve cannot be closed.

These valves are equipped with a seal-in circuit that allows the valve to travel fully open or closed by taking the handswitch to the appropriate position and releasing it.

The Switchgear Room Coolers can be started manually from the Control Room and they will automatically start on an SIAS actuation. The Service Water isolation valves should be open under these conditions.

These loads are supplied with Automatic Vent and Vacuum valves for water hammer mitigation.

3.5.10 Post Accident Hydrogen Analyzers

Service water is continuously aligned to the Post Accident Hydrogen Analyzer Sample Coolers, 2E-86 and 2E-87. Loop 1 supplies 2E-86 via manual isolation valve 2SW-5044. Loop 2 supplies 2E-87 via manual isolation valve 2SW-58.

3.5.11 Control Room Emergency Condensing Unit Coolers

Service Water is supplied to the Control Room Emergency Condensing Unit Coolers 2VE-1A and 2VE-1B. These coolers will automatically start whenever the Emergency Ventilation Units, 2VUC-27A/B are started. Loop 1 Service Water supplies 2VE-1A. Loop 2 Service Water supplies 2VE-1B.

The heat exchangers are shell and tube type with Service Water supplied to the tube side. Flow through the condensers is controlled by pressure indicating controller 2PIC-1506-2 and 2PIC-1509-1 that control the position of 2CV-1506-2 and 2CV-1509-1 respectively. These PICs are located on the local gageboard at the chiller units.

Both units, 2VE-1A and 2VE-1B can also be supplied from Unit 1 Service Water system through normally locked closed valves. This lineup is not normally performed except during outage.

3.5.12 Component Cooling Water Heat Exchangers

Service Water is supplied to the tube side of the Component Cooling Water Heat Exchangers. These heat exchangers are designated 2E-28A, -28B, and -28C. Either Service Water header may supply the heat exchangers.

These isolation valves are controlled with a two position (OPEN-CLOSE) spring return to center handswitch from the Control Room. The valves equipment ID, power supply and handswitch location are listed in the following table.

SW Isolation Valve	Power Supply	HS Location
2CV-1530-1	2B53-G3	2C-17
2CV-1531-2	2B64-F1	2C-16

These valves are interlocked to close automatically under the following conditions:

1. Main Steam Isolation Signal (MSIS)
2. Safety Injection Actuation Signal (SIAS)

This automatic isolation serves to isolate the Seismic Category 2 CCW/Main Chiller system from the Seismic Category 1 Service Water system.

The valves (2CV-1530-1 & 2CV-1531-2) have override capability that will allow the operator to re-open them following an MSIS or SIAS actuation. Taking the handswitch to CLOSE energizes the override relay for the specific actuation and allows the valve to be opened as desired. The Emergency operating procedure requires that both Service Water headers be maintained at greater than 85 psig when any automatic ESFAS actuations have been overridden.

If the valves are overridden open following a MSIS or SIAS, a Recirculation Actuation Signal (RAS) will cause them to close again by removing the override signal. A RAS signal alone will not cause the valves to close. The valves also have override capability that will allow the operator to re-open the valves following a RAS actuation. Again, taking the handswitch to CLOSE and then to OPEN does this.

These valves are not equipped with a seal in circuit. This allows the valve to be fully opened, fully closed or throttled to some intermediate position.

3.5.13 Main Chillers

SW is supplied to the Main Chiller to remove heat from the refrigerant in the Condenser of the cooling loop.

The Main Chiller condenser inlet valves (2CV-3806 and 2CV-3808) will auto close if Service water flow to the chillers is low (<1500 gpm) and both chiller starters (2C121A & 2C122A) are tripped or open.

The Main Chiller condenser inlet valves 2CV-3806 and 2CV-3808 also have an override capability that will allow the operator to re-open the valves following an auto closure. The handswitch must be taken to the actuated position (closed), then to the open position to open the valves.

SW flow through the condenser is controlled by flow control valve that receives its position signal based on condenser pressure.

The SW return header from the condensers is supplied with an Automatic Vent and Vacuum valve for water hammer mitigation.

3.5.13.1 SW Booster Pumps

The SW Booster Pumps, are:

1. horizontal, single stage, centrifugal pumps
2. powered from 480V LCs
   - 2P-147A from 480V LC 2B7 breaker 34
   - 2P-147B from 480V LC 2B8 breaker 34

Bank:	1837	**Rev:**	0	**Rev Date:**	4/5/2012 7:41:36	**QID #:**	16	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	F	**Source:**	NEW				
Search	000065A103	**10CFR55:**	41.5 / 41.7	**Safety Function**	8						
System Title:	Loss of Instrument Air	**System Number**	065	**K/A**	AA1.03						
Tier:	1	**Group:**	1	**RO Imp:**	2.9	**SRO Imp:**	3.1	**L. Plan:**	A2LP-RO-ALIA	**OBJ**	3

Description: Ability to operate and/or monitor the following as they apply to the Loss of Instrument Air: - Restoration of systems served by instrument air when pressure is regained

Question:

Consider the following:

- Unit 2 is operating at 100% power and has experienced a Total Loss of Instrument Air
- OP-2202.021, Loss of Instrument Air AOP, has been entered
- Actions have been taken and the rupture air line has been isolated
- System pressure has been restored

With the restoration of Instrument Air, what action(s) is(are) required to restore plant system(s) back to a normal 100% power lineup?

A. Realign Component Cooling Water flow to the Reactor Coolant Pumps

B. Restore Letdown using OP-2104.002 Chemical and Volume Control

C. Verify the UPSTREAM Atmospheric dump valves are open

D. Restore purge on the Holdup Tanks (2T-12s)

Answer:

B. letdown will isolate on a loss of IA due to 2CV-4823-2 failing closed. EOP OP-2202.021 step 17 has the operator manually control CCPs due to no letdown flow therefore restoring Letdown to a normal lineup post restoration of IA is required.

Notes:

A. Incorrect, the containment supply and return header valves for CCW to the Reactor Coolant Pumps are MOVs, therefore no action is required due to the loss of IA

C. Incorrect, the upstream atmosphere dump is air operated, it does fail open on a loss of IA, but, it is normally isolated from the main steam header with a MOV with its controller in manual and closed signal applied and the permissive HS in OFF. The AOV will reclose when IA is restored without operator action. It would be prudent for the operator to check that it has returned to its normal position but no action is required.

D. Incorrect, Restoration of the air purge on the holdup tanks is not required. IA will stay aligned [no auto features with this system] therefore, no action required when IA is restored.

References:

OP-2203.021, Loss of Instrument Air AOP, Rev. 015, step 17 ,contingency column 17. [page 9] has you taking manual control of systems

STM 2-04, Chemical and Volume Control System, Rev. 28, section 2.1.5 [page 6], and simplified drawing [page 62]

A2LP-RO-ALIA, Rev. 0, Obj. 3, Describe the mitigation strategy and instructions for actions directed in OP-2203.021, Loss of Instrument Air.

Historical Comments:

New Question

INSTRUCTIONS

*17. **Check air-operated control systems for proper operation:**

- SDBCS
- CVCS
- Condensate and Feedwater
- Chilled Water
- SG Blowdown
- SU and BD DI
- Shutdown Cooling
- Controlled Bleedoff
- Main Steam

(Step 17 continued on next page)

CONTINGENCY ACTIONS

*17. **IF control systems NOT operating properly,**
THEN manually control plant systems as follows:

A. IF Reactor tripped,
THEN control SG pressure 950 psia to 1050 psia using "SDBCS Emergency Operation" Exhibit 3 of 2105.008, Steam Dump and Bypass Control System Operations.

NOTE
Air Accumulator provides reserve capacity for five full strokes of each valve.

B. Maintain Condensate pressure 650 psig to 700 psig by performing the following:

1) Place MFW Pump Recirc valves in MANUAL:
   - 2FIC-0735
   - 2FIC-0742

2) Throttle MFW Pump Recirc valves:
   - 2CV-0741
   - 2CV-0749

The expected pressure drop across the letdown side (tube side) of the regenerative heat exchanger is 70 psi with letdown flow at 132 gpm.

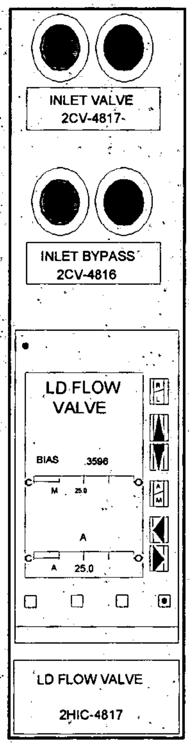
2.1.5 Letdown Containment Isolation Valve 2CV-4823-2

The valve 2CV-4823-2 provides outside containment isolation capability on the letdown header. This valve is an air operated valve and is physically located in the upper south piping penetration room.

2CV-4823-2 is controlled from a handswitch on control room panel 2C09 with open and closed position indication also provided. It will automatically close and cannot be re-opened if a CIAS #2 signal is present.

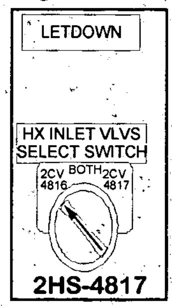
The valve will fail closed on a loss of instrument air or on a loss of DC power from 2D24-3.

2.1.6 Letdown Flow Control Valves 2CV-4816 / 2CV-4817



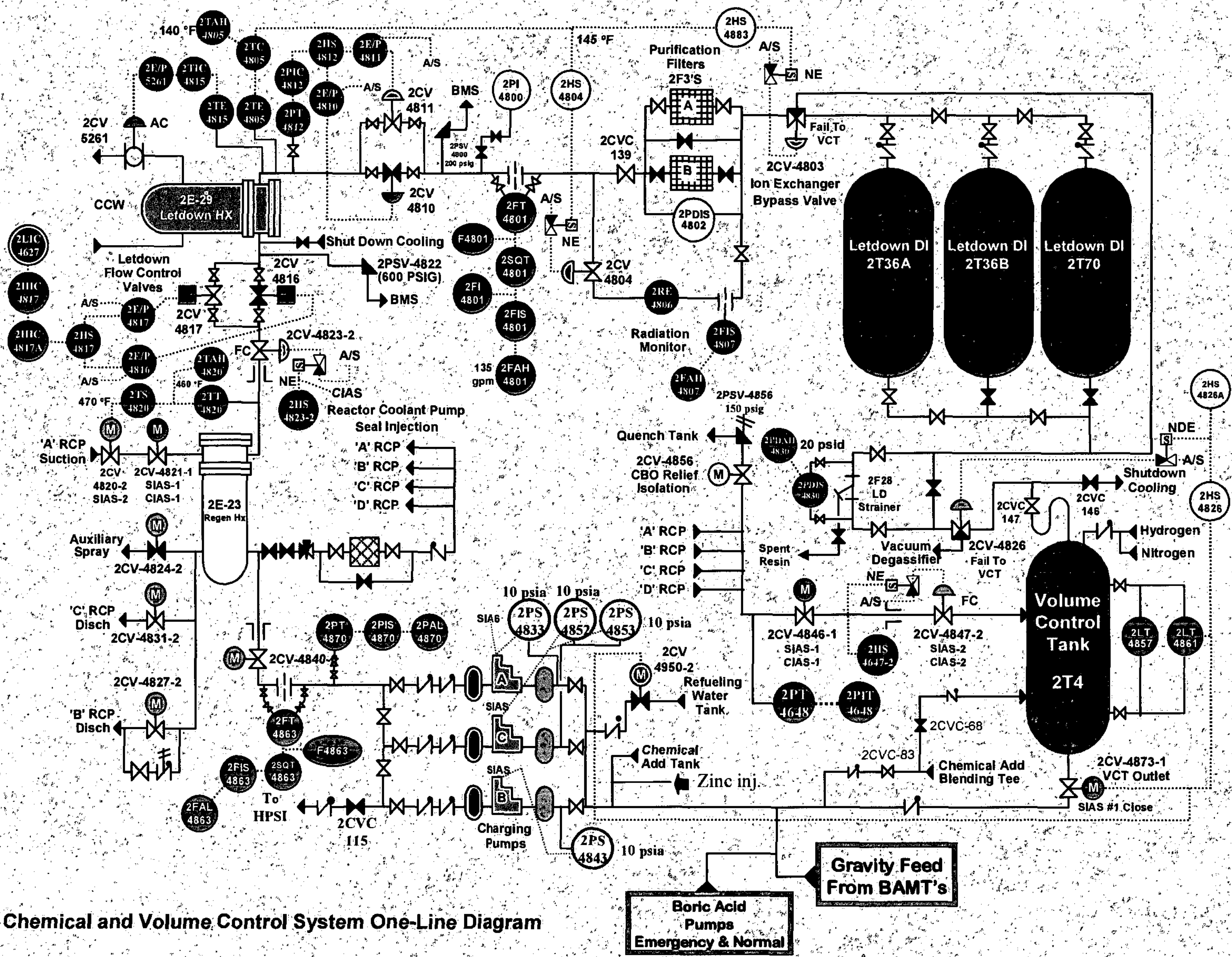
The letdown flow control valves are provided to control the letdown flow from the RCS in order to maintain RCS pressurizer level at the desired value. These valves are physically located in the upper south piping penetration room.

During system operation the control room operator has the capability for selecting one or both of these valves to control flow using 2HS-4817 on panel 2C09. Normally only one of these valves is in service and is controlled automatically by the letdown flow valve controller 2HIC-4817, located on panel 2C09.



This Fisher Porter Controller is powered from 2Y1. If power is lost to the Fisher Porter Controller its output goes to zero. When power is restored to the Fisher Porter it will return in manual with the output that existed prior to the loss of power.

The controller will control the position of the selected valve(s) based on input from the pressurizer level control system. Automatic control of these valves is possible as long as the remote shutdown panel 2C80 controller 2HIC-4817A and 2HIC-4817 on control room panel 2C09 are *both* in automatic.



Chemical and Volume Control System One-Line Diagram

Bank: 1838	**Rev:** 0	**Rev Date:** 4/5/2012 8:09:49		**QID #:** 17		**Author:** Foster	
Lic Level: R	**Difficulty:** 4	**Taxonomy:** H		**Source:** Modified ANO-OpsUnit2-11274			
Search 000077K202	**10CFR55:** 41.5 / 41.7 / 41.10			**Safety Function** 6			
System Title: Generator Voltage and Electric Grid Disturbanc				**System Number** 077		**K/A** AK2.02	
Tier: 1	**Group:** 1	**RO Imp:** 3.1	**SRO Imp:** 3.3	**L. Plan:** A2LP-RO-MGEN		**OBJ** 8	

Description: Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following: - Breakers, relays

Question:

Consider the following:

- Unit 2 is operating at 100% power
- OP-2203.008, Natural Emergencies AOP, has been entered due to severe weather in the area
- CBOT reports grid voltage is lowering
- Dispatcher has been contacted and reports he has lost generation capacity due to the weather
- MVARs are reported at 300 MVARs and trending up
- Annunciator 2K02 H-2, GEN FIELD OVERTEMP, is in alarm
- 1 minute later Annunciator 2K02 C-3 NEG SEQ HIGH, comes into alarm

Based on the above conditions what action(s) is(are) required?

A. Commence a rapid power reduction using OP-2102.004, Power Operation Att. H

B. Trip the Main Turbine Generator, enter OP-2203.024, Loss of Turbine Load AOP

C. Trip the Reactor, enter OP-2202.001 Standard Post Trip Actions EOP

D. Start the AACDG and place on the grid to stabilize/raise grid voltage

Answer:

C. Correct, action is directed by ACAs

Notes:

A. Incorrect, not directed by either ACA for alarms present
B. Incorrect, action is directed in the ACAs IF reactor power is within the capacity of the available Steam Dumps. The unit is at 100% power which is greater than Steam Dump capacity and just tripping the turbine would cause a reactor trip on high pressure
D. Incorrect, placing the AACDG on the grid is not directed by ACA

References:

OP-2203.012-B ACA, Rev. 035, windows H-2, step 2.5 (page 20) and C-3, step 2.5 (page 24)
A2LP-RO-MGEN, Rev. 6, Obj. 8, describe the alarms and Annunciators Corrective Actions for all Main Generator alarms on 2K02. Include in the discussion with the class if a manual trip to Turbine trip is required.

Historical Comments:

Modified question from ANO Unit2 exam bank, last used on RO/SRO Exam (A2WEX-RO-EXAM11-7B and A2WEX-SRO-EXAM11-7B) 11/12/2012 (not given to current class as of 5/3/2012)

ANNUNCIATOR 2K02

H-2

GEN FIELD OVERTEMP

1.0 CAUSES

1.1 Generator Field temperature high (measured by field resistance).

2.0 ACTION REQUIRED

2.1 Verify proper Exciter cooling using 2106.009, Turbine Generator Operations.

2.2 Notify Dispatcher that generator excitation must be reduced.

2.3 Reduce generator excitation as necessary until alarm clears using 2106.009, Turbine Generator Operations.

2.4 Contact Electrical Maintenance for assistance.

2.5 IF Negative Sequence High (2K02-C3) alarms, THEN perform the following:

2.5.1 IF Reactor power greater than SDBCS capacity, THEN trip Reactor.

2.5.2 Trip Main Turbine.

2.5.3 IF Reactor tripped, THEN GO TO 2202.001, Standard Post Trip Actions.

2.5.4 IF Reactor did NOT trip, THEN GO TO 2203.024, Loss Of Turbine Load.

3.0 TO CLEAR ALARM

3.1 Lower Field temperature below alarm setpoint.

4.0 REFERENCES

4.1 E-2451-3

ANNUNCIATOR 2K02

C-3

NEGATIVE SEQUENCE HI

1.0 CAUSES

1.1 Negative Sequence alarm contact actuated @ 3% (246/AL).

2.0 ACTION REQUIRED

NOTE

- Negative Sequence relay (246) protects generator from external unbalanced faults that cause rotor overheating.
- Alarm setpoint of 3% and action setpoint of 6% are % of I_2 (maximum continuous negative sequence current).

2.1 Check Generator Negative Sequence Meter on 2C01.

2.2 Reduce load as necessary to maintain Negative Sequence less than 6%. Refer to 2106.009, Turbine Generator Operations.

2.3 Notify System Dispatcher.

2.4 Notify System Engineer to investigate and review for Technical Information Letter (TIL) 1292 recommendations.

2.5 IF SWC Trouble 2K02-E4 is due to Machine Gas Temp High 2K23-3 OR Gen Field Overtemp (2K02-H2) alarms, THEN perform the following:

2.5.1 IF Reactor power greater than SDBCS capacity, THEN trip Reactor.

2.5.2 Trip Main Turbine.

2.5.3 IF Reactor tripped, THEN GO TO 2202.001, Standard Post Trip Actions.

2.5.4 IF Reactor did NOT trip, THEN GO TO 2203.024, Loss Of Turbine Load.

3.0 TO CLEAR ALARM

3.1 Clear unbalanced fault.

4.0 REFERENCES

4.1 E-2451-3

4.2 Technical Information Letter (TIL) 1292 (CR-ANO-2-2006-0405)

4.3 CALC-87-D-2101-07 1 VERIFICATION OF NEGATIVE SEQUENCE RELAY SETTING

Consider the following:

- Plant is at 85% power, escalating to 100% when the following occurs.
- 2K02-C3, Negative Sequence High alarm comes in.
- While investigating the problem, 2K02-H2, Generator Field Overtemperature alarm comes in.

Which of the following would be the correct course of action?

A. Trip the Reactor, enter SPTAs.
B. Trip the Turbine, enter Loss of Turbine Load.
C. Lower turbine load until Negative Sequence Alarm clears.
D. Lower turbine exitation until Negative Sequence Alarm clears.

Answer: A

Question Comments:

Image Reference: None

QuestionID: ANO-OpsUnit2-11274

Objectives:

1. CourseID: A2LP-RO-MGEN Objective: 8

KA References:

References:

1. 2203.12B

Training Programs:

1. Reactor Operator
2. Senior Reactor Operator

Categories:

Systems:

Task References:

Cognitive Level: 2: Comprehension or Analysis

Point Value: 1.0

Exam Bank: OpsUnit2

Review Status: Reviewed

Comments:

Parent

Bank:	1839	**Rev:**	0	**Rev Date:**	4/5/2012 8:39:59	**QID #:**	18	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	4	**Taxonomy:**	H	**Source:**	NEW				
Search	00CE06K202	**10CFR55:**	41.7	**Safety Function**	4						
System Title:	Loss of Feedwater	**System Number**	E06	**K/A**	EK2.2						
Tier:	1	**Group:**	1	**RO Imp:**	3.5	**SRO Imp:**	4.0	**L. Plan:**	A2LP-RO-ELOSF	**OBJ**	3

Description: Knowledge of the interrelations between the (Loss of Feedwater) and the following: - Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems

Question:

Consider the following:

- Unit 2 is operation at 100% power
- "A" EFW pump is OOS for repairs
- Both Main Feed Pumps trip due to a failure of the MFP lube oil system
- CRS directs a Reactor trip
- Upon the trip, annunciator 2K08 B-3, 2A3 L.O. RELAY TRIP, comes into alarm
- OP-2202.001, Standard Post Trip Actions (SPTAs) EOP, have been completed
- OP-2202.006, Loss of Feedwater EOP, has been entered

Considering the above conditions, RCS Core Heat is being removed by ______________ Circulation and feedwater to the Steam Generators will be provided by ______________ pump.

A. natural; AFW (2P-75)

B. natural; "B" EFW (2P7B)

C. forced,; AFW (2P-75)

D. forced; "B" EFW (2P7B)

Answer:

A. Correct, The Loss of Feedwater EOP entry conditions have been met due to the loss of both Main feed pumps, "A" EFW being OOS and no power for "B" EFW pump therefore; the EOP will secure the RCPs to minimize heat input to the RCS placing the core in natural circ conditions, the LOOP will prevent using a MFP or Condensate pump to feed SGs, the 2A3 bus lockout will prevent using the "B" EFW pump, the EOP will direct starting the AACDG, aligning it to 2A1 (nonvital bus) and feeding with the AFW pump.

Notes:

B. Incorrect, natural circ is correct condition as directed by the EOP but the "B" EFW (2P-7B) does not have a power source (2A3 bus lockout)
C. Incorrect, forced circulation is directed to be secured (step 5 of the EOP)
D. Incorrect, forced circulation is directed to be secured (step 5 of the EOP), "B" EFW (2P7B) does not have a power source (2A3 bus lockout)

References:

OP-2203.012-H ACA, Rev. 034, window B-3 step 1.1[page 23]
OP-2202.006 ; Loss of Feedwater EOP, Rev. 010, step 5.A [page 2] and step 13 [page.9]

EOP-2202.008, Loss of Feedwater EOP Tech Guide, rev. 009, step 13 [page 21]
A2LP-RO-ELOSF, Rev. 5, Obj. 3, Analyze a set of plant conditions, during a loss of feedwater event, and determine if adequate RCS heat removal exists and the actions required to restore heat removal if it is inadequate.

Historical Comments:

New Question

ANNUNCIATOR 2K08

B-3

2A3 L.O. RELAY TRIP

1.0 CAUSES

1.1 Phase Overcurrent on bus 2A3

2.0 ACTION REQUIRED

CAUTION

Do NOT reset lockout relay until cause of trip repaired or isolated.

2.1 Verify 2A3 Feeder breakers tripped:

- 2A-308
- 2A-309
- 2A-310

2.2 Refer to Tech Specs 3.8.2.1 and 3.8.2.2.

2.3 Contact Electrical Maintenance to determine cause of bus lockout.

3.0 TO CLEAR ALARM

NOTE

2A3 may automatically re-energize when lockout reset.

3.1 WHEN cause of trip has been determined and corrected,
THEN reset 2A3 lockout relay.

4.0 REFERENCES

4.1 E-2456-1

INSTRUCTIONS	CONTINGENCY ACTIONS

CAUTION

Failure to use average CETs to monitor MTS with ALL RCPs stopped may result in misleading evaluation of core conditions.

INSTRUCTIONS	CONTINGENCY ACTIONS
***1. Confirm diagnosis of Loss Of Feedwater by checking SFSC acceptance criteria satisfied every 15 minutes.**	***1. Rediagnose event using 2202.010 Exhibit 8, Diagnostic Actions.**
***2. Notify SM to refer to Technical Specifications and 1903.010, Emergency Action Level Classification.**	
3. Open Placekeeping page.	
4. Notify Control Board Operators to monitor floating steps.	
5. Reduce RCS heat input as follows:	
A. Stop ALL RCPs.	
B. Verify BOTH PZR Spray valves in MANUAL and closed.	
6. Conserve SG inventory as follows:	
A. Verify SG Blowdown Isolation valves closed: • 2CV-1016-1 • 2CV-1066-1	
B. Verify SG Sample valves closed. • 2CV-5850 • 2CV-5858 • 2CV-5852-2 • 2CV-5859-2	

INSTRUCTIONS	CONTINGENCY ACTIONS
13. **IF AFW Pump 2P75 available, THEN establish AFW flow to SGs from 2P75 as follows:**	13. **IF AFW Pump 2P75 unavailable, THEN perform EITHER of the following:** • **GO TO** Step 13.A if unavailability is due to electrical power supply. OR • **GO TO** Step 14.

(Step 13 continued on next page)

EOP STEP:

13. **IF AFW Pump 2P75 available,**
THEN establish AFW flow to SGs from 2P75 as follows:

EPG STEP:

*6.
*10.

DEVIATION? Yes

BASIS FOR DEVIATION:

The EPG step contains multiple decisions and actions that the EOP addresses with a series of steps.

Since the EPG step is lacking any specific guidance on restoring feedwater, these EOP steps were written in order of priority with specific restoration guidance given for each individual feedwater source. Additionally, the EOP steps which address EFW and AFW actions address EPG step 10 to minimize the possibility of SG feed ring damage.

Anytime it is determined that a method cannot be implemented to restore feedwater, the operator is instructed to attempt to establish feedwater using the next appropriate method.

A. This step determines which SU XFMR is supplying power to 2A1. If operator unable to power 2A1 from SU XFMR #3, then either the AACG or SU XFMR #2 may be used to power 2A1. If SU XFMR #2 (1 & 2) is supplying 2A1 then load shedding must be bypassed in order to start 2P75. If SU XFMR #2 is available the 2A1 may be energized.

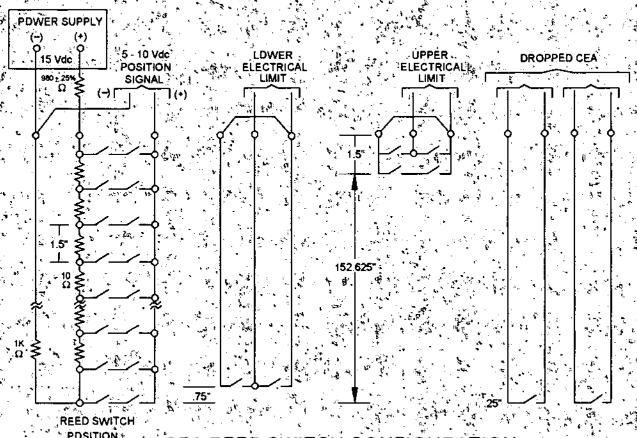
   This approach to bypass SU XFMR #2 load shedding on 2A1 approved by Design Engineering (John Hotz) 06/03/03. "Design Engineering doesn't have any problem with the ST#2 load shed bypass for AFW start since the green train is in pull-to-lock and Unit 1 is not on ST#2. The load transferring to ST#2 is much less than the load assumed in existing controlling Calculations and is therefore acceptable. The start of the 1000 Hp AFW will be acceptable."

B. This step is provided in the event that SU XFMR #2 is supplying 2A1.
   With this configuration, operator must strip non-essential loads and bypass 4160v AC load shed circuit for SU XFMR #2. If loading precludes bypassing load shed, operator is directed to bypass 2P-75 alignment and proceed with procedure.

C. MSIS or CSAS signals trip 2P75 (8) and operator checks both of these signals are clear. Contingency step provides instructions for overriding these trip signals.

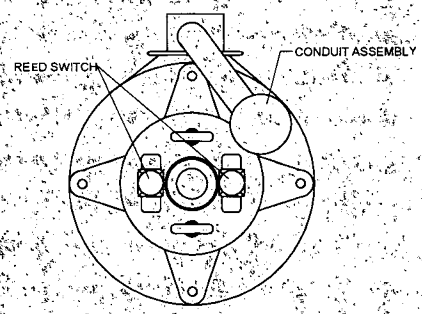
3.7 Reed Switch Assemblies

The Reed Switch Position Transmitter (RSPT) consists of a group of reed switches and a voltage divider network mounted within a stainless steel tube. Two reed switches are wired in series and located every 1-1/2 inches. In addition to the position reed switches, one pair of reed switches is positioned at the .25 inch ("0" step) position for indication of a Dropped Rod. Another one is positioned at the .75 inch ("1st step) position for the Lower Electrical Limit LEL) and another one at the 152.625 inch (200 step) position for the Upper Electrical Limit (UEL). The Dropped Rod Contact reed switches are wired independent of each other while the contact pairs at the Lower Electrical Limit and the Upper Electrical Limit are wired to two pins of the connector. An additional pair of switches are located at 154.125 inch (202 steps) position to serve as a backup to the UEL contacts. A pin connector at the top is provided for cable attachment.



CEA REED SWITCH CONFIGURATION

Two reed switch stacks are mounted outside the RCS pressure boundary, along the upper pressure housing. The individual reed switches are actuated by the permanent magnet attached to the top of the extension shaft. There is no mechanical or electrical connection between the permanent magnet and the reed switches, only magnetic lines of flux penetrate the RCS pressure boundary to actuate the switches.



REED SWITCH STACK LOCATIONS (TOP VIEW)

3.8 Motor Assembly Operation

Withdrawal or insertion of CEAs is accomplished by applying programmed voltage levels, in the proper sequence, to the five CEDM coils. There are three possible states for each coil:

- High voltage (~ 140 ± 5 VDC) — to quickly energize coil
- Low voltage (~ 40 ± 5 VDC) — to maintain coil energized, or
- Off.

sequence in this manner. After a particular Group reaches its UGS, the Operator is required to select individual CEAs in that particular group using the Manual Individual (MI) mode, and withdraw them to their UEL positions. After "dressing up" the individual CEAs, the MG mode would be used to continue the startup evolution. Group 6 is withdrawn next and dressed up in the same manner as the previous groups were. Criticality is achieved by withdrawing Group P with 90 inches withdrawn as a target critical position.

When inserting the Regulating Groups such as during a Plant shutdown, the CEA Groups are moved in reverse order. If a normal shutdown is in progress, Group P and/or 6 will be inserted for Axial Shape Index (ASI) control using Manual Group (MG). The rods in these groups shall be inserted in accordance with the Transient Insertion Limits of Technical Specifications and the ASI guidance found in Attachment A of 2102.004, Power Operations. Normally during a plant shutdown, power is reduced to approximately 20% and then the rest of the CEAs are inserted by opening the Reactor trip circuit breakers.

4.2.1.5 Auto Sequential Mode

Operation of the CEDMCS in the Auto Sequential (AS) mode is administratively prohibited at ANO Unit 2. Because of this the automatic withdrawal capability in both high and low rate has been defeated by removing the auto raise (AR) input.

4.2.1.6 CEA Position Permissives

There are several permissives (interlocks) associated with CEA position. Some of these permissives are based on pulse counting, while others are caused by reed switch actuation. The figure and the table on the following page summarize the CEA position permissives and their sources.

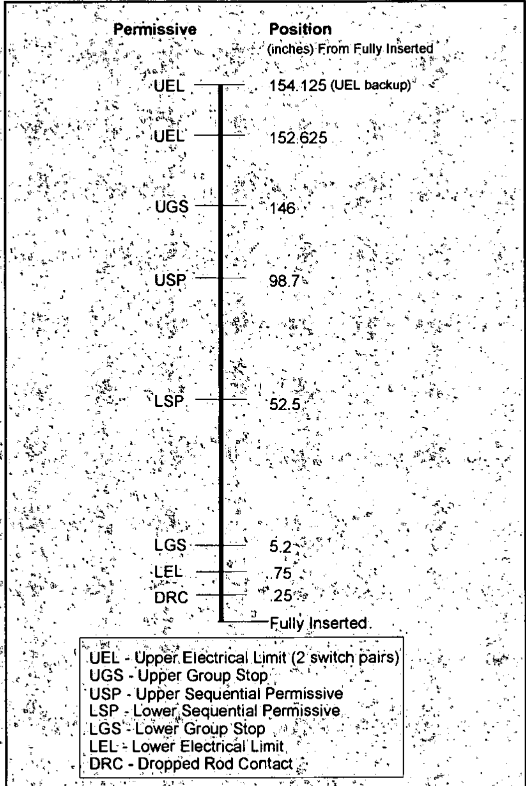
Pulse counting position indication is obtained from the Plant Monitoring System (PMS) computer. Power switch gating pulses which are sent to the CEA coil stacks to cause CEA motion, are also sent to the computer. Refer again to the diagram on page 23. The pulse counting position information can be either read from the computer CRT or printed out. Permissives developed as a result of pulse counting are subject to error. Pulse counting does not recognize a slipping or stuck CEA.

Each CEA has 2 Reed Switch Position Transmitters designated RSPT #1 and RSPT #2. Each RSPT has a safety related section and a non-safety related section.

The safety related section is a stack of 100 reed switch pairs, mounted vertically at 1½ inch intervals. When a reed switch actuates a voltage output is produced that is proportional to actual CEA position.

There are two CEA calculators referred to as CEACs. CEAC #1 receives inputs from all 81 CEA RSPT #1s. CEAC #2 receives inputs from all 81 CEA RSPT #2s. These inputs are used to determine CEA position, Group position, and to detect CEA deviations. There are also four Core Protection Calculators referred to as CPC's. Each CPC channel receives inputs from designated "target" CEAs which represent one quarter of the total CEAs. These target CEA inputs are used in equations for calculating DNBR (departure from nucleate boiling ration) and LPD (linear power density) Reactor trip conditions.

The non-safety related section of the RSPTs are the Upper Electrical Limit (UEL), Lower Electrical Limit (LEL), and the Dropped Rod Contacts (DRC). These three permissives are produced by RSPT #2. RSPT #1 is identical; however, its UEL, LEL and DRC outputs are not used.



Summary of CEA Position Permissives

PERMISSIVE	SOURCE	FUNCTION
UEL (All CEAs)	Reed Switches	In MI, prevents further outward motion of CEA when it reaches 152.625 inches. In MS and MG prevents subgroup motion when highest CEA reaches it. Also lights red lamp on control panel.
LEL (All CEAs)	Reed Switches	In MI, prevents further inward motion when the CEA reaches .75 inches. In MS and MG prevents subgroup motion when lowest CEA reaches it. Also lights green lamp on control panel.
DRC (All CEAs)	Reed Switches	Resets plant computer pulse counter (PC) to "0" for that CEA. Set at .25 inches. (full insertion).
USP Reg. Group CEAs only	Pulse Counting	In MS only, permits next sequential group to move out when first CEA in the group reaches 98.7 inches.

Bank: 1840	**Rev:** 0	**Rev Date:** 5/21/2012 4:34:15		**QID #:** 19		**Author:** Foster			
Lic Level: R	**Difficulty:** 3	**Taxonomy:** H		**Source:** NEW					
Search 000003A202	**10CFR55:** 41.7 / 41.10			**Safety Function** 1					
System Title: Dropped Control Rod				**System Number** 003		**K/A** AA2.02			
Tier: 1	**Group:** 2	**RO Imp:** 2.7	**SRO Imp:** 2.8	**L. Plan:** A2LP-RO-CEDM		**OBJ** 3			

Description: Ability to determine and interpret the following as they apply to the Dropped Control Rod: - Signal inputs to rod control system

Question:

Consider the following:

- Unit 2 is operating at 100% power
- All CEA's at the UEL (Upper Electrical Limit)
- Control Element Assemble (CEA) exercise is in progress
- The ATC has selected CEA #22
- When rod motion is initiated, CEA #22 dropped partially into the core

At this point, the Reed Switch Position Transmitters [RSPT's] for CEA #22 should indicate __________ rod position and the pulse counting computer indication for CEA #22 should indicate __________ rod position.

A. actual; actual

B. 150" withdrawn; actual

C. 150" withdrawn; 150" withdrawn

D. actual; 150" withdrawn

Answer:

D. Correct, the RSPTs are mechanical position device that will detect and display the actual CEA position. the Pulse counters are driven from the signal that is being supplied by the control system to indicate CEA position associated with where the control system "thinks" the CEA is located based on the "pulses" that have been sent to move the CEA. when the CEA partially inserted into the core, the Reed Switches will display the actual rod position and the Pulse Counters would still show the CEA at [or close to] the full out [or beginning position] if the CEA dropped fully into the core the RSPTs will automatically reset the pulse counters to both would indicate the CEA on bottom or 0"

Notes:

A, B, and C are Incorrect for reasons stated above

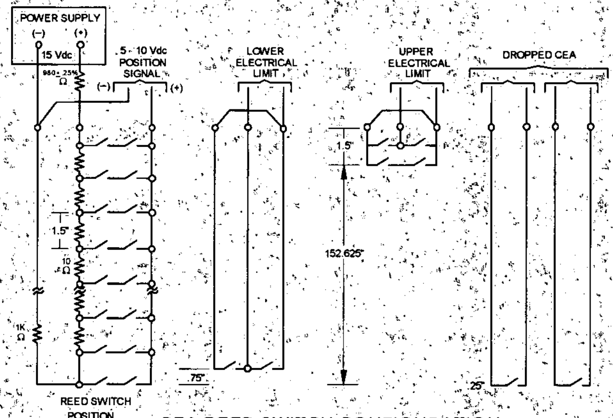
References:

STM 2-02, Control Element Drive Mechanism Control System, Rev. 20, section 3.7 for RSRTs [page 14] section 4.2.1.6 for pulse counter [pages 28 and 29]
A2LP-RO-CEDM, Rev. 13, Obj. 3, Explain CEA position indication. Include in the description how the signal is sensed and its controlling functions.

Historical Comments:

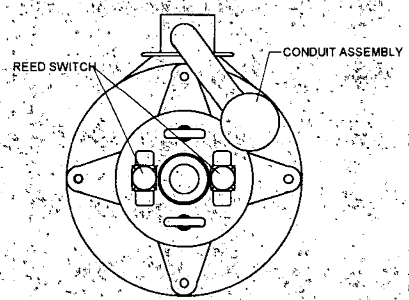
New Question

The Reed Switch Position Transmitter (RSPT) consists of a group of reed switches and a voltage divider network mounted within a stainless steel tube. Two reed switches are wired in series and located every 1-1/2 inches. In addition to the position reed switches, one pair of reed switches is positioned at the .25 inch ("0" step) position for indication of a Dropped Rod. Another one is positioned at the .75 inch ("1st step) position for the Lower Electrical Limit LEL) and another one at the 152.625 inch (200 step) position for the Upper Electrical Limit (UEL). The Dropped Rod Contact reed switches are wired independent of each other while the contact pairs at the Lower Electrical Limit and the Upper Electrical Limit are wired to two pins of the connector. An additional pair of switches are located at 154.125 inch (202 steps) position to serve as a backup to the UEL contacts. A pin connector at the top is provided for cable attachment.



CEA REED SWITCH CONFIGURATION

Two reed switch stacks are mounted outside the RCS pressure boundary, along the upper pressure housing. The individual reed switches are actuated by the permanent magnet attached to the top of the extension shaft. There is no mechanical or electrical connection between the permanent magnet and the reed switches, only magnetic lines of flux penetrate the RCS pressure boundary to actuate the switches.



REED SWITCH STACK LOCATIONS (TOP VIEW)

3.8 Motor Assembly Operation

Withdrawal or insertion of CEAs is accomplished by applying programmed voltage levels, in the proper sequence, to the five CEDM coils. There are three possible states for each coil:

- High voltage (~ 140 $\pm$ 5 VDC) — to quickly energize coil
- Low voltage (~ 40 $\pm$ 5 VDC) — to maintain coil energized, or
- Off

required to select individual CEAs in that particular group using the Manual Individual (MI) mode, and withdraw them to their UEL positions. After "dressing up" the individual CEAs, the MG mode would be used to continue the startup evolution. Group 6 is withdrawn next and dressed up in the same manner as the previous groups were. Criticality is achieved by withdrawing Group P with 90 inches withdrawn as a target critical position.

When inserting the Regulating Groups such as during a Plant shutdown, the CEA Groups are moved in reverse order. If a normal shutdown is in progress, Group P and/or 6 will be inserted for Axial Shape Index (ASI) control using Manual Group (MG). The rods in these groups shall be inserted in accordance with the Transient Insertion Limits of Technical Specifications and the ASI guidance found in Attachment A of 2102.004, Power Operations. Normally during a plant shutdown, power is reduced to approximately 20% and then the rest of the CEAs are inserted by opening the Reactor trip circuit breakers.

4.2.1.5 Auto Sequential Mode

Operation of the CEDMCS in the Auto Sequential (AS) mode is administratively prohibited at ANO Unit 2. Because of this the automatic withdrawal capability in both high and low rate has been defeated by removing the auto raise (AR) input.

4.2.1.6 CEA Position Permissives

There are several permissives (interlocks) associated with CEA position. Some of these permissives are based on pulse counting, while others are caused by reed switch actuation. The figure and the table on the following page summarize the CEA position permissives and their sources.

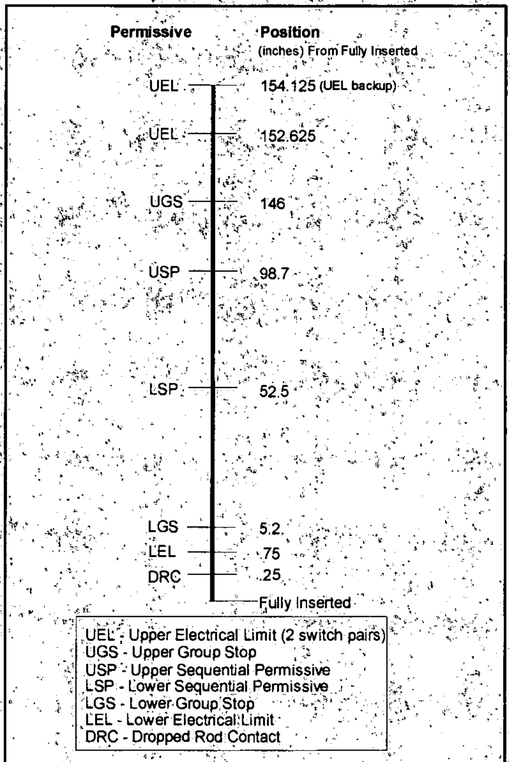
Pulse counting position indication is obtained from the Plant Monitoring System (PMS) computer. Power switch gating pulses which are sent to the CEA coil stacks to cause CEA motion, are also sent to the computer. Refer again to the diagram on page 23. The pulse counting position information can be either read from the computer CRT or printed out. Permissives developed as a result of pulse counting are subject to error. Pulse counting does not recognize a slipping or stuck CEA.

Each CEA has 2 Reed Switch Position Transmitters designated RSPT #1 and RSPT #2. Each RSPT has a safety related section and a non-safety related section.

The safety related section is a stack of 100 reed switch pairs, mounted vertically at 1½ inch intervals. When a reed switch actuates a voltage output is produced that is proportional to actual CEA position.

There are two CEA calculators referred to as CEACs. CEAC #1 receives inputs from all 81 CEA RSPT #1s. CEAC #2 receives inputs from all 81 CEA RSPT #2s. These inputs are used to determine CEA position, Group position, and to detect CEA deviations. There are also four Core Protection Calculators referred to as CPC's. Each CPC channel receives inputs from designated "target" CEAs which represent one quarter of the total CEAs. These target CEA inputs are used in equations for calculating DNBR (departure from nucleate boiling ration) and LPD (linear power density) Reactor trip conditions.

The non-safety related section of the RSPTs are the Upper Electrical Limit (UEL), Lower Electrical Limit (LEL), and the Dropped Rod Contacts (DRC). These three permissives are produced by RSPT #2. RSPT #1 is identical; however, its UEL, LEL and DRC outputs are not used.



Summary of CEA Position Permissives

PERMISSIVE	SOURCE	FUNCTION
UEL (All CEAs)	Reed Switches	In MI, prevents further outward motion of CEA when it reaches 152.625 inches. In MS and MG prevents subgroup motion when highest CEA reaches it. Also lights red lamp on control panel.
LEL (All CEAs)	Reed Switches	In MI, prevents further inward motion when the CEA reaches .75 inches. In MS and MG prevents subgroup motion when lowest CEA reaches it. Also lights green lamp on control panel.
DRC (All CEAs)	Reed Switches	Resets plant computer pulse counter (PC) to "0" for that CEA. Set at .25 inches. (full insertion).
USP Reg. Group CEAs only	Pulse Counting	In MS only, permits next sequential group to move out when first CEA in the group reaches 98.7 inches.

Bank:	1841	**Rev:**	0	**Rev Date:**	4/5/2012 10:52:21	**QID #:**	20	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NEW		
Search	0000052420	**10CFR55:**	41.10	**Safety Function**	1				
System Title:	Inoperable/Stuck Control Rod	**System Number**	005	**K/A**	2.4.20				
Tier:	1	**Group:**	2	**RO Imp:**	3.8	**SRO Imp:**	4.3	**L. Plan:**	A2LP-RO-EAOP **OBJ** 4

Description: Emergency Procedures/Plan - Knowledge of operational implications of EOP warnings, cautions, and notes.

Question:

OP-2203.003, CEA Malfunction AOP, has a NOTE concerning CEA operability. Fill in the statement below.

A CEA is considered UNTRIPPABLE with CEDMCS ______________ AND CEA ______________.

A. operable, movable

B. inoperable, movable

C. inoperable, immovable

D. operable, immovable

Answer:

D. Correct; (from the NOTE in the AOP)

Notes:

References:

OP-2203.003 CEA malfunction AOP, Rev. 020, step 16 contingency column, NOTE after 16. D [page 8]
A2LP-RO-EAOP, rev. 17, Obj. 4, Discuss the Migration strategy, Entry Conditions, applicable industry events, Instructions and Exit Conditions (as per AOP and Tech Guide) of OP-2203.003, CEA Malfunctions.

Historical Comments:

New Question

INSTRUCTIONS	CONTINGENCY ACTIONS
16. (continued)	D. Notify I&C to commence CEA troubleshooting. Refer to TS 3.1.3.1.c, CEA Position. **NOTE** **A CEA is considered untrippable with CEDMCS operable AND CEA immovable.** E. <u>IF</u> ANY CEAs determined to be untrippable, <u>THEN</u> **GO TO** Step 37. F. **GO TO** Step 36.
■17. **Adjust Turbine load to match T_{AVE} within 2°F of T_{REF}.**	
*18. **Check RCS T_C 542 to 554.7°F using CPC PID 5, 6, 160, or 161.**	*18. **Refer to TS 3.2.6, Reactor Coolant Cold Leg Temperature.**
*19. **Check RCS pressure 2025 to 2275 psia.**	*19. **Perform the following:** A. Verify PZR Pressure Control system restoring RCS pressure to setpoint. B. Refer to TS 3.2.8, Pressurizer Pressure.

Bank:	1842	**Rev:**	0	**Rev Date:**	5/26/2012 11:29:2	**QID #:**	21	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	F	**Source:**	NEW		
Search	000024K102	**10CFR55:**	41.1 / 41.8	**Safety Function**	1				
System Title:	Emergency Boration	**System Number**	024	**K/A**	AK1.02				
Tier:	1	**Group:**	2	**RO Imp:**	3.6	**SRO Imp:**	3.9	**L. Plan:**	ASLP-RO-RXT08 **OBJ** 1

Description: Knowledge of the operational implications of the following concepts as they apply to Emergency Boration: - Relationship between boron addition and reactor power.

Question:

Consider the following:

- An event has occurred that requires Emergency Boration

To achieve the highest rate of change in Reactor Power due to Emergency Boration, the ATC should align Coolant Charging Pump (CCP) suction to the ________________________.

A. Volume Control Tank (VCT)

B. On Line Holdup Tank (2T-12)

C. Refueling Water Tank (RWT)

D. Boric Acid Makeup Tank (BAMT)

Answer:

D. Correct; the BAMT have the highest boron concentration therefore will provide the highest shutdown rate

Notes:

A. Incorrect; VCT is the normal suction source to CCPs and is not a source for Emergency Boration
B. Incorrect; Holdup tank is not a source of water to the CCP suction
C. Incorrect; this is an option for Emergency Boration but is at approximately half the boron concentration of a BAMT.

References:

T.S. 3.5.4 (RWT boron concentration) Rev. 48
TRM 3.1.8 (BAMT boron concentration) Rev. 49
Generic Fundamentals of effects and use of boron
A2LP-RO-RXT08, Rev. 3, Obj. Describe the neutron life cycle

Historical Comments:

New Question

EMERGENCY CORE COOLING SYSTEMS

REFUELING WATER TANK

LIMITING CONDITION FOR OPERATION

3.5.4 The refueling water tank shall be OPERABLE with:

a. An available borated water volume of between 384,000 and 503,300 gallons

b. Between 2500 and 3000 ppm of boron,

c. A minimum solution temperature of 40°F, and

d. A maximum solution temperature of 110°F

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With the refueling water tank inoperable, restore tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.5.4 The RWT shall be demonstrated OPERABLE:

a. At least once per 7 days by:

1. Verifying the contained borated water volume in the tank, and

2. Verifying the boron concentration of the water.

b. At least once per 24 hours by verifying the RWT temperature.

REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCES – OPERATING

TECHNICAL REQUIREMENT FOR OPERATION

3.1.8 Each of the following borated water sources shall be FUNCTIONAL:

a. At least one of the following sources with a minimum solution temperature of 55 °F.

1. One boric acid makeup tank, with the tank contents in accordance with TRM Figure 3.1.8-1, or

2. Two boric acid makeup tanks, with the combined contents of the tanks in accordance with TRM Figure 3.1.8-1, and

b. The RWT in accordance with Technical Specification 3.5.4.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With the above required boric acid makeup tank(s) non-functional, restore the makeup tank(s) to FUNCTIONAL status within 72 hours or immediately initiate a condition report to document the condition and, within the next 24 hours, determine any limitations for the continued operation of the plant.

b. With the RWT inoperable, refer to Technical Specification 3.5.4.

TEST REQUIREMENTS

4.1.8 Each of the above required boric acid makeup tank(s) shall be demonstrated FUNCTIONAL at least once per 7 days by:

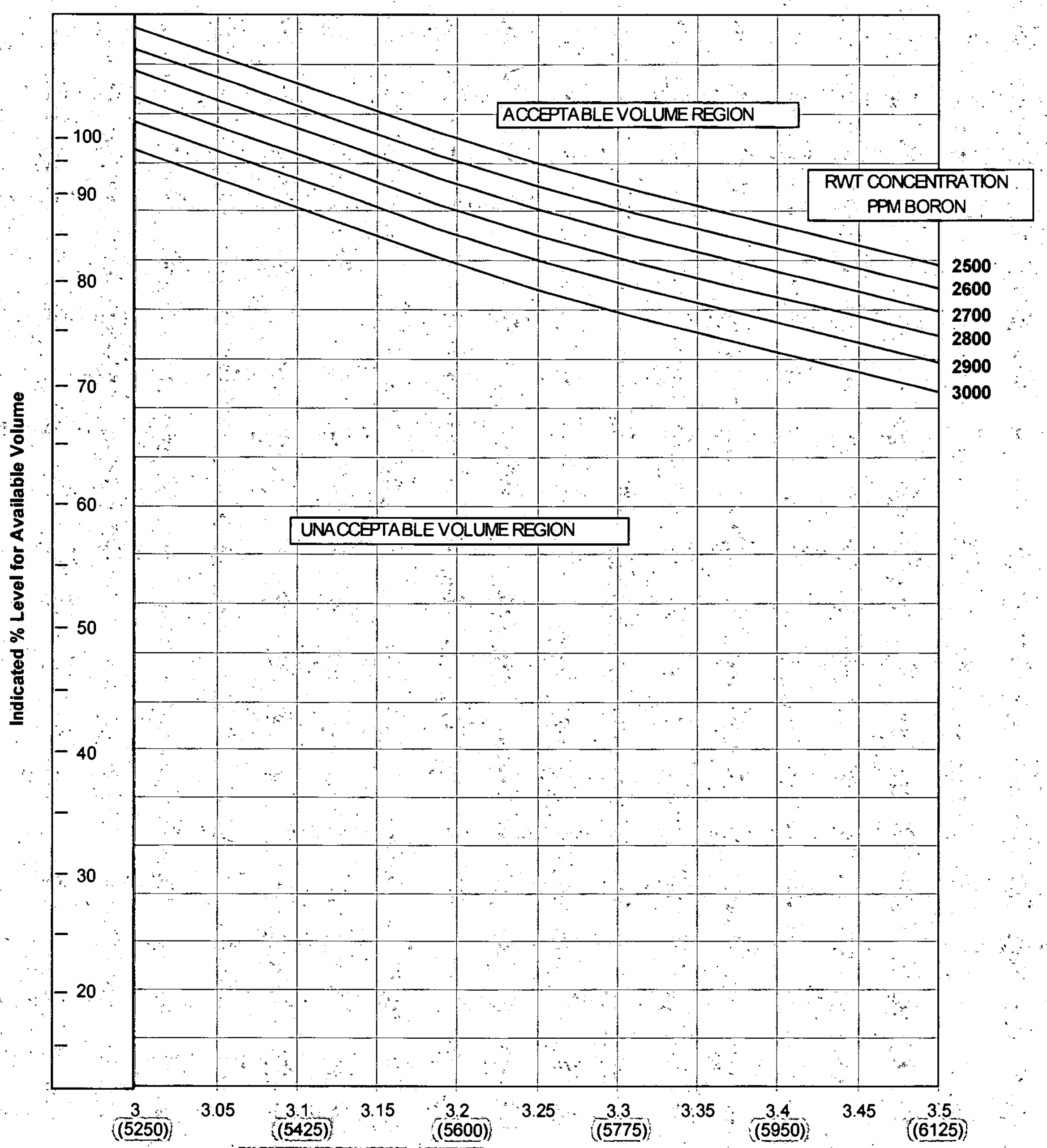
a. Verifying the boron concentration,

b. Verifying the contained borated water volume, and

c. Verifying the solution temperature is greater than 55 °F.

TRM Figure 3.1.8-1

Minimum Boric Acid Makeup Tank Volume as a Function of Stored BAMT Concentration and Refueling Water Storage Tank Concentration



Bank:	1843	**Rev:**	0	**Rev Date:**	5/29/2012 7:59:24	**QID #:**	22	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW		
Search	000028A102	**10CFR55:**	41.7	**Safety Function**	2				
System Title:	Pressurizer (PZR) Level Control Malfunction	**System Number**	028	**K/A**	AA1.02				
Tier:	1	**Group:**	2	**RO Imp:**	3.4	**SRO Imp:**	3.4	**L. Plan:**	A2LP-RO-APZRM **OBJ** 5

Description: Ability to operate and/or monitor the following as they apply to the Pressurizer Level Control Malfunctions: - CVCS

Question:

Consider the following:

- Unit 2 is operating at 100% power
- Pressurizer Level Control System master controller is in AUTO REMOTE
- Pressurizer Level Control is selected to "CH 4627-A" position
- Pressurizer Heater Low Level Cutout is selected to "A & B" position
- Charging Pump Selector Switch, 2HS-4868, is in "A & B" position
- Pressurizer Reference leg for level transmitter 2LT-4627-1 develops a leak
- NO OPERATOR ACTION IS TAKEN

With the above conditions, there should be ____ Coolant Charging Pump(s) running, and letdown flowrate should go to ______________ flow.

A. 3; minimum

B. 3; maximum

C. 1; minimum

D. 1; maximum

Answer:

D. Correct; with a leak on the PZR level reference leg, the indicated PZR level will go up as the actual level will go down [as indicated level goes up, letdown will respond by opening the flow control valve to lower level to stay at setpoint (max letdown 132 gpm), therefore actual level will trend down] also, the backup CCPs will receive a "off" signal due to the indicated insurge (makeup will be 44 gpm) as indicated level goes up. All PZR heater will energize due to the indicated insurge, but the over riding effect will be a lowering of RCS pressure.

Notes:

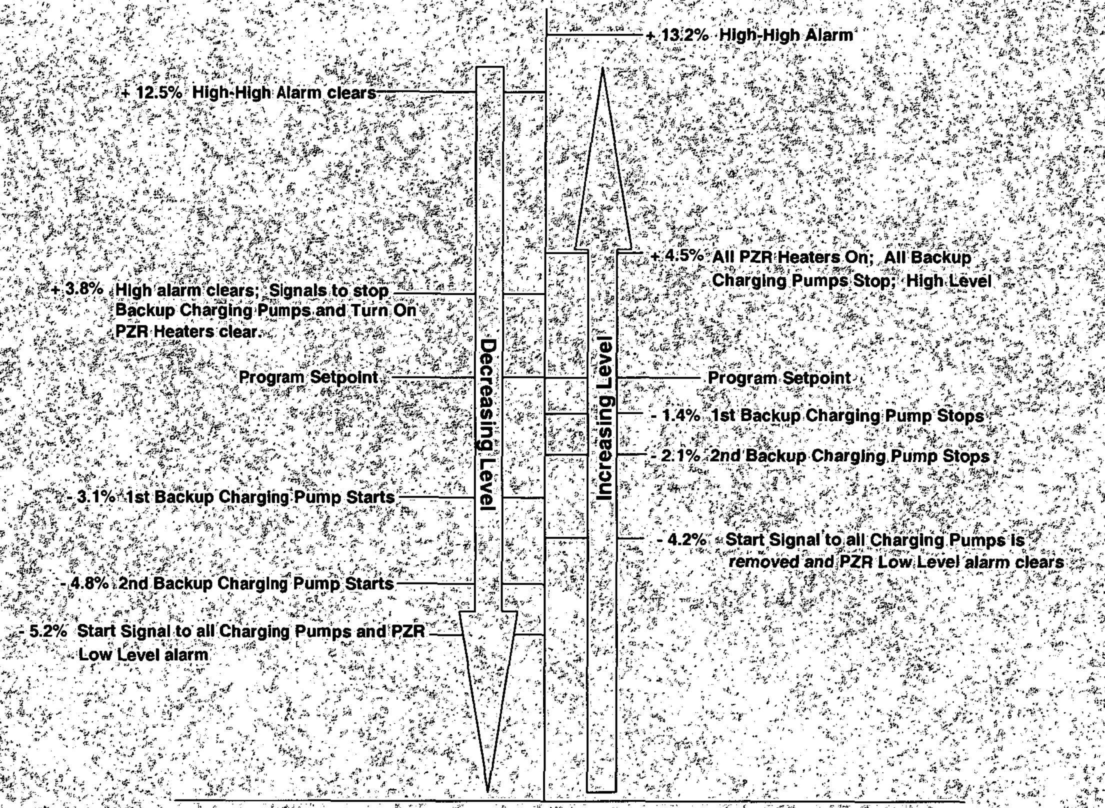
A, B, and C are incorrect due to reasons stated above.

References:

STM 2-04, Chemical and Volume Control System, Rev. 28, simplified drawing of PZR level control functions [page 78]
A2LP-RO-APZRM, Rev. 0, Obj. 5, Discuss the Unit 2 Technical specifications that are associated wit the Pressurizer Systems Malfunction AOP

Historical Comments:

New Question



Pressurizer Level Control Program

Bank:	1844	**Rev:**	0	**Rev Date:**	5/11/2012 9:10:44	**QID #:**	23	**Author:**	Foster
Lic Level:	R	**Difficulty:**	4	**Taxonomy:**	H	**Source:**	NEW		
Search	000032A101	**10CFR55:**	41.7 / 41.10 / 43.5	**Safety Function**	7				
System Title:	Loss of Source Range Nuclear Instrumentation	**System Number**	032	**K/A**	AA1.01				
Tier:	1	**Group:**	2	**RO Imp:**	3.1	**SRO Imp:**	3.4	**L. Plan:**	A2LP-RO-ED120
OBJ	9								

Description: Ability to operate and/or monitor the following as they apply to the Loss of Source Range Nuclear Instrumentation: - Manual restoration of power

Question:

Consider the following:

- Unit 2 is in Mode 6
- 2D01 disconnect has been tagged open for a battery cell replacement
- 2B5 Feeder Breaker from 2A3 [2A301] has tripped open and can not be reclosed due to a internal failure
- The ATC reports the channel 1 Boron Dilution Monitor has no indication due to a power loss

Channel 1 Boron Dilution Monitor is powered from ________ and restoring power to 2D01 should be accomplished by ______________________________.

A. 2Y1; aligning the AACDG to supply the Red vital bus

B. 2RS-1; aligning the swing battery charger, 2D31B, from Green power to 2D01

C. 2Y1; performing a dead bus cross tie of 2Y1 and 2Y2 with 2Y2 supplying

D. 2RS-1; aligning the AACDG to supply the Red vital bus

Answer:

B. Correct; the Startup channel which supplies Channel 1 Boron Dilution Monitor is powered from 2RS-1. Normal operations for a battery bus is the battery connected with the charger supplying loads. With the RED battery disconnected from its bus and a loss of Vital 480 VAC power the Battery charger will also lose power and the startup channel will be deenergize [due to the loss of power to 2RS-1) which supplies power to the channel 1 Boron Dilution monitor. Aligning the swing battery bus charger from its alternate source (green) is directed by Loss of 480 Volt Vital Bus AOP

Notes:

A and C are Incorrect for reasons stated above

D. is Incorrect, breaker 2A301 is the supply breaker from the vital 4160 volt bus [2A3] to the 480 vital buses. Aligning the AACDG to 2A3 will not restore power to the vital battery charger

References:

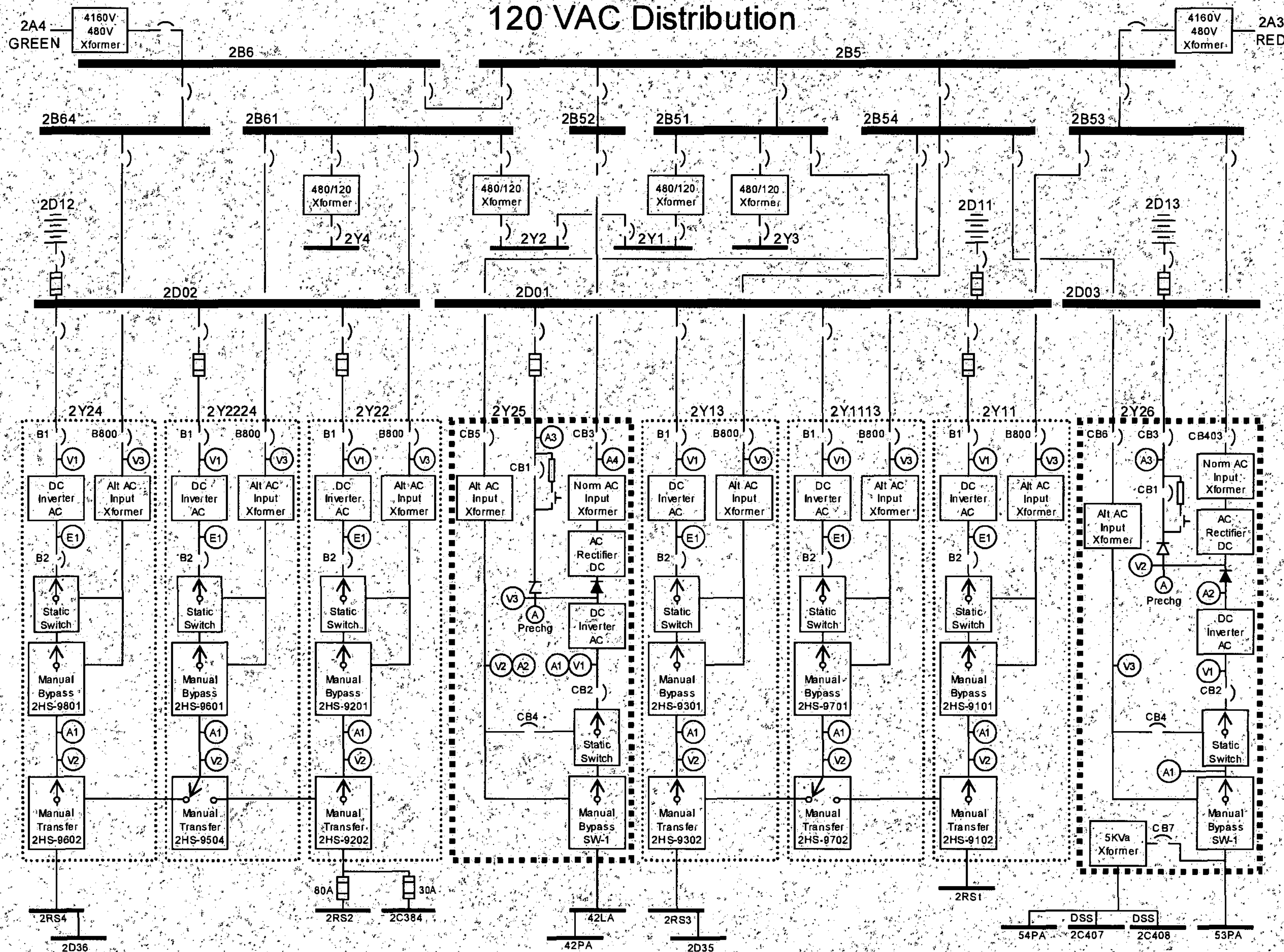
STM 2-67-1, Excore Nuclear Instrumentation, Rev. 10, section 2.3.1, description and power supply, [pages 6 and 7] and 2.3.3 startup channel output, (boron dilution monitors) [page 8]
STM 2-32-4, 120 Vac Distribution System, Rev 17, simplified drawing on page 31 showing power supply to 2RS-1 (which powers the startup channels)
STM 2-32-5, 125 Vdc Electrical Distribution, Rev. 17, simplified drawing on page 24 [showing the DC buses, power supplies, and loads]
OP-2203.045, Loss of 480 Volt Vital Bus AOP, Rev. 004, section 1, step 23 [page 7]
OP-2107.004, DC Electrical System Operation, Rev. 032, section 8.0, step 8.2 [page 7]

A2LP-RO-ED120, Rev. 2, Analyze a set of plant conditions that is causing an alarm on the following and determine the cause of the alarm and any action required to be taken.

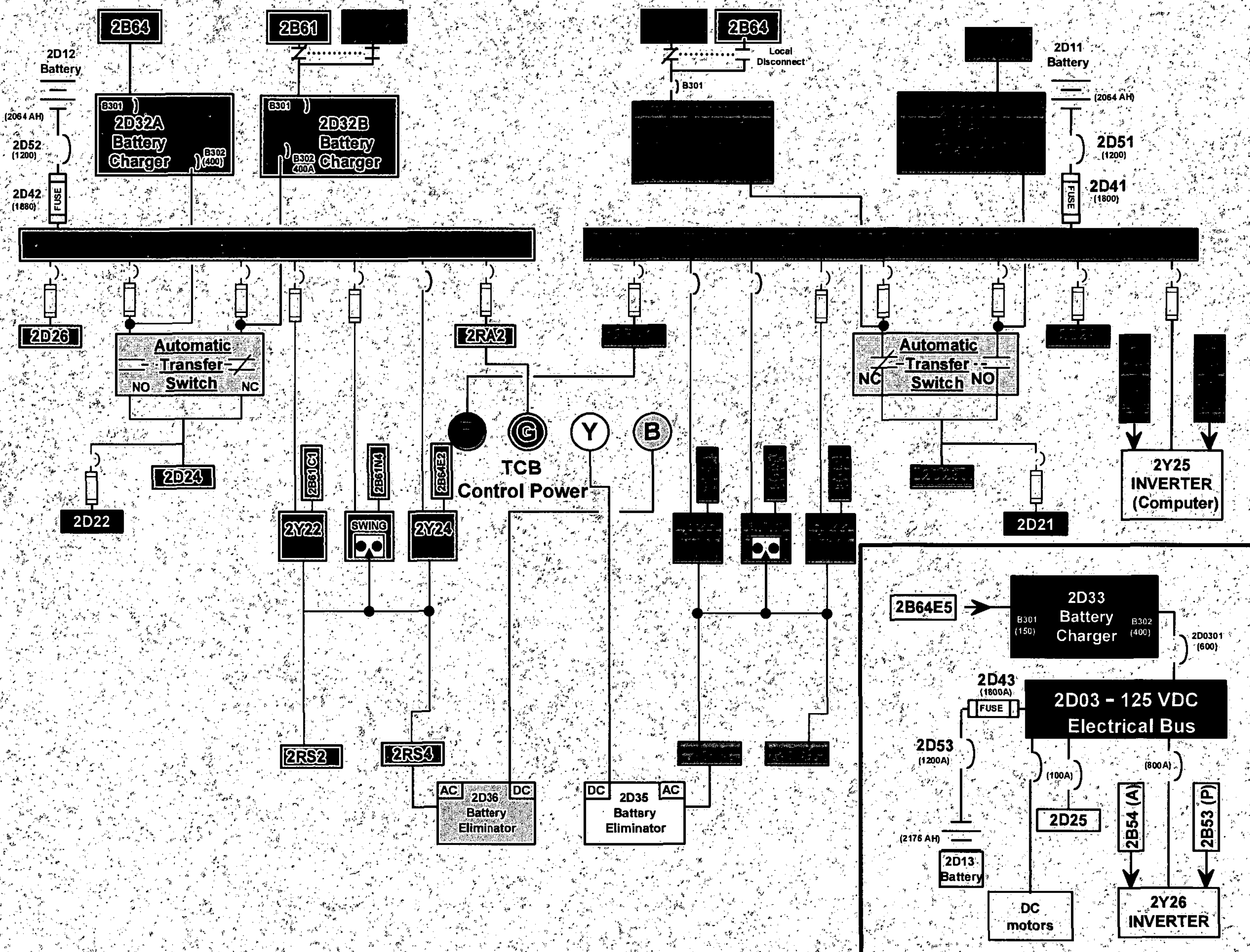
Historical Comments:

New Question

120 VAC Distribution



8.0 Figures


2B64
2B61
[redacted]
[redacted]
2B64
Local Disconnect
[redacted]
2D12 Battery
(2064 AH)
2D52 (1200)
2D42 (1880)
FUSE
B301
2D32A Battery Charger
B302 (400)
B301
2D32B Battery Charger
B302 400A
B301
[redacted]
[redacted]
2D11 Battery
(2064 AH)
2D51 (1200)
2D41 (1800)
FUSE
[redacted]
[redacted]
2D26
Automatic Transfer Switch
NO
NC
2D24
2D22
2B61C1
2B61N4
2B64E2
2RA2
[redacted]
G
Y
B
TCB Control Power
2Y22
SWING
2Y24
2RS2
2RS4
AC
2D36 Battery Eliminator
DC
DC
2D35 Battery Eliminator
AC
[redacted]
Automatic Transfer Switch
NC
NO
[redacted]
2D21
2Y25 INVERTER (Computer)
2B64E5
2D33 Battery Charger
B301 (150)
B302 (400)
2D0301 (600)
2D43 (1800A)
FUSE
2D03 - 125 VDC Electrical Bus
2D53 (1200A)
(100A)
(800A)
2D25
2B54 (A)
2B53 (P)
(2176 AH)
2D13 Battery
DC motors
2Y26 INVERTER

2.2.3 Safety Channel Instrumentation

Indication	Range	Type	Location
Linear Power	1-200%	meter	2C23
Linear Power	1-200%	chart	2C03
Log Power	10^{-8} - 200%	meter	2C23
Log Power	10^{-8} - 200%	bar graph	2C03
Log Power	10^{-8} - 200%	bar graph	2C80 (B only)
Log Power	10^{-8} - 200%	visual	PMS
Log Power	10^{-8} - 200%	visual	SPDS (A & B only)
Start-up Rate	-1 to +7 dpm	meter	2C23
Start-up Rate	-1 to +7 dpm	bar graph	2C03
Raw Power	1-200%	point display	CPCs

2.3 Startup Channels

This section will provide a detailed description of the Excore Startup Channels

2.3.1 Detectors

The startup channel detectors construction is the same as the safety channel detectors. Refer to figures 2 and 3 on pages 21 and 22.

The two startup channels have two detectors per channel located approximately 180° apart, outside the reactor vessel. The startup channel provides indication from the source range of 0.1 cps up to 200% power with the fission chamber detectors, and does not require deenergizing of high voltage as power is raised above the source range.

Both detectors in each channel are used for the source range only, from 0.1 to 10^6 cps. The log range of 10^{-8}% power to full power uses only one fission chamber detector. The source range uses both detectors for more sensitivity.

The output of each detector is connected directly to the amplifiers and signal processors located immediately outside containment. There are no electronic preamps or other circuits located inside containment. The only component other than the detectors, inside containment, is the connection box, which connects the detector cables to the transmission cable. The connection box is environmentally sealed to withstand a harsh containment environment.

Since all amplification is located outside containment and will not be exposed to high temperatures or high radiation, and the detectors are designed to operate in an extremely high gamma environment, Startup Channel 1 meets the requirements of Reg. Guide 1.97.

However, the cabling associated with Startup Channel 2 has exceeded its qualified dose limit of 3E9 rads, it is no longer considered reliable in a harsh environment. Therefore, Channel 2 does not meet the Reg. Guide 1.97 requirements.

The startup channels are also powered from class 1E power (2RS1 and 2RS2).

2.3.2 Startup Channel Amplifier Assembly and Signal Processor

The startup channel amplifiers contain the detector high voltage and signal conditioning circuits.

The startup channel signals from the detectors are first input to a preamplifier. Channel #1 preamp is located in the upper south electrical penetration room in the vicinity of the containment hatch. The amplified signal then goes to the control room to the Startup Channel unit located on 2C336-1, in the back of the control room. Startup Channel #2 is located in the upper north electrical penetration room. It has additional equipment to provide SPDS input that is isolated from the control room. Channel #2 has an amplifier and signal processor, but then has two outputs with isolation amplifiers, such that, shorting or opening one circuit will not affect the other circuit. One signal goes to the control room panel 2C336-2 (same as channel #1) and the other signal goes to a signal processor/display in the UNEPR. This signal processor only provides source range indication to SPDS, 10^{-1} to 10^{5} cps. The local processor has only the source range display, and at any power above 10^{5} cps, the display will flash, indicating that it is over-ranged. This is the most reliable indication during alternate shutdown due to a control room fire.

The startup channels provide indication for the following;

- Remote Shutdown Panel (Channel #1 only)
- SPDS (Channel #2 only)
- Chart recorder on 2C03, source range 1 to 10^{6} cps

The Excore Instrumentation for both the safety channels and the start-up channels is almost identical in operation. Both systems use fission chambers for detectors, and both use counting and campbelling for the log power and detector current power ranges. The most significant difference is that the start-up channel provides indication below 1 X 10^{-8}% power, by using a source range counting circuit. The theory of operation for both systems is very similar.

Start up channels preamplifiers, high voltage power supplies, and discriminators are located in the containment penetration rooms. This is as close as possible to the detectors, without being exposed to post-accident conditions, such as a Loss of Coolant Accident (LOCA) or Main Steam Line Break (MSLB).

The startup channels can provide an accurate indication of neutron flux over the full range with a gamma background of 10^{4} R/hr, and as low as 10^{-7}% power with a gamma background of 10^{6} R/hr. The startup channels are designed for a design basis seismic event following 40 years of operation under normal conditions.

The red train, channel #1, preamp is located in the upper south electrical penetration room (USEPR), on the wall opposite the containment personnel hatch. The amplified and conditioned signals are then sent to the control room signal processor, located at 2C336-1. The only indication on the signal processor itself is the source range, which covers 0.1 to 10^5 cps*. All other power indication has been deactivated by disabling the indicating circuit boards. This was done to prevent signal processor damage from the heat generated by the bar graph displays.

2.3.3 Startup Channel Outputs

The output of the startup channel #1 is supplied to the following;

- Source range 1 to 10^6 * cps on a chart recorder located on 2C03 combined with startup channel #2.
- Bar graph display on 2C03, indicating from 10^{-8} to 200% power.
- Audible counts for the control room and containment, the controls are located on 2C03.
- Boron Dilution monitors with a range of 1 cps to 10^4, located on 2C09.
- Source range 1 cps to 10^6 cps located on the remote shutdown panel 2C80 (channel #1 only).

*Note, the range is one decade higher on the chart on 2C03 than on the processor. This is due to a request from operations for more overlap of the source range and log range. Gamma Metrics considers the count range to be accurate and reliable up to only 10^5 cps and provided the chart output up to 10^6 cps as a convenience. There have been some instances of pulse pile up as power was raised above 10^6 cps, causing the indication to drop back below 10^6 cps, this is an expected indication.

Startup Channel #2 is green train powered and the preamp is located in the Upper North Electrical Penetration Room (UNEPR). The preamplifier and signal conditioner is the same as channel #1, however it outputs to two different signal conditioners. One of the outputs goes to the control room on 2C336-2, and the other is sent to SPDS. The SPDS processor is located in the UNEPR (in 2C384) also, but only has the count range processor (0.1 to 10^5 cps). If the power level is above 10^5 cps, the barograph display will flash, indicating that power level is above the indicating range.

The preamplifier output signal is split by an additional electronic circuit that uses optical isolators to prevent a fault from one signal processor from propagating back into the preamplifier, or into the other signal processor. (Note, the optical isolation is the means for isolating signals feeding back from the output, and are located in devices on the isolation circuit board. The interconnections are not fiber optics, but normal electrical signal conductors).

2.3.4 Signal Processor Alarms

The other features of the signal processors located on 2C336-1& 2C336-2 are (refer to figure 6);

18. Verify CAMS 2RITS-8271-2 in service per 2104.033, Containment Atmosphere Control.

19. Notify the FAA that Cooling Tower lights are deenergized using 2104.008, Circulating Water System Operation.

20. Demonstrate operability of #2 EDG within 24 hours per TS 3.8.1.1.b.2. (Requires Station Log entry).

*21. IF 2203.008, Natural Emergencies entered due to Loss of Lake Dardanelle, THEN manually shift Red Train SW pump suction to the ECP as directed.

22. Initiate a Condition Report to determine operability of 2A3 and 2B5 per Supplement 4 of 2107.001, Electrical System Operations.

23. WHEN Mode 5 conditions established, THEN shift 2D-11 Battery Charger (2D-31B) to ALTERNATE SUPPLY using 2107.004, DC Electrical System Operation.

24. WHEN 2B5 problem corrected, THEN energize bus as follows:

   A. Verify test switch TS9-3 open.

   B. Verify 2A3 Supply breaker (2A-309) closed.

   C. Close 2A3-2B5 Feeder breaker (2A-301).

   D. Close 2B5 Supply breaker (2B-512).

   E. Close test switch TS9-3.

   F. Verify PZR Proportional heaters (2SCR-1) powered from load center 2B5 restored.

25. Continue plant operations as directed by Plant Management.

END

8.0 SHIFTING BATTERY CHARGER 2D-31B AC SUPPLY

8.1 Verify the following breakers open:

- 2D-31B AC input breaker (B301)
- 2D-31B DC output breaker (B302)

CAUTION

2D-31B should only be aligned to alternate supply during Modes 5 or 6.

8.2 IF shifting 2D-31B to Alternate Supply,
THEN perform the following:

8.2.1 Open Battery Charger 2D-31B Supply breaker (2B54-G3).

CRITICAL STEP

8.2.2 Unlock Battery Charger 2D-31B Alternate Supply breaker (2B64-D5).

8.2.3 Close Battery Charger 2D-31B Alternate Supply breaker (2B64-D5).

8.2.4 Unlock 2D-31B Transfer switch (2S21).

8.2.5 Shift Transfer switch (2S21) from NORMAL to ALTERNATE.

8.2.6 Lock open Battery Charger 2D-31B Supply breaker (2B54-G3) using lock removed from 2B64-D5.

8.3 IF shifting 2D-31B to Normal Supply,
THEN perform the following:

8.3.1 Shift 2D-31B Transfer switch (2S21) from ALTERNATE to NORMAL.

8.3.2 Lock 2D-31B Transfer switch (2S21) in NORMAL position.

8.3.3 Open Battery Charger 2D-31B Alternate Supply (2B64-D5).

CRITICAL STEP

8.3.4 Unlock Battery Charger 2D-31B Supply breaker (2B54-G3).

8.3.5 Close Battery Charger 2D-31B Supply breaker (2B54-G3).

8.3.6 Lock open Battery Charger 2D-31B Alternate Supply breaker (2B64-D5) using lock removed from 2B54-G3.

8.4 Notify Control Room to verify EOOS Risk Assessment program updated to reflect current DC Charger Power Source Alignment.

Bank:	1845	**Rev:**	1	**Rev Date:**	6/27/2012 10:19:1	**QID #:**	24	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NEW				
Search	000037K308	**10CFR55:**	41.5 / 41.10	**Safety Function**	3						
System Title:	Steam Generator (S/G) Tube Leak	**System Number**	037	**K/A**	AK3.08						
Tier:	1	**Group:**	2	**RO Imp:**	4.1	**SRO Imp:**	4.3	**L. Plan:**	A2LP-RO-APSEC	**OBJ**	3

Description: Knowledge of the reasons for the following responses as they apply to the Steam Generator Tube Leak: - Criteria for securing RCP

Question:

Procedure OP-2203.038, Primary to Secondary Leakage AOP, directs securing 2 Reactor Coolant Pumps (RCPs) after the initial Reactor Coolant System (RCS) cooldown for Steam Generator (SG) isolation.

What is the bases for securing the two (2) RCPs in OP-2203.038, Primary to Secondary Leakage AOP?

A. To minimize RCP differential pressure to reduce Primary to Secondary Leakage

B. To prevent violating the RCPs minimum NPSH requirements

C. To aid in inventory backflow from the SG to the RCS

D. To minimize heat input to the RCS

Answer:

D. Correct, from Tech Guide

Notes:

A. Incorrect, RCS pressure [not RCP DP] is reduced to minimize break flow
B. Incorrect, NPSH requirements are not challenged at this temperature
C. Incorrect, backflow of the SG to the RCS is directed in the SGTR EOP not the Primary to Secondary Leakage AOP

References:

OP-2203.038, Primary to Secondary Leakage AOP, Rev. 013, Step 27 [page 12]
AOP-2203.038 Tech Guide, Rev. 013, page 23.F., Maximum of one RCP running in each loop to reduce heat input into the RCS [page 23]
A2LP-RO-APSEC, Rev. 0, Discuss the basis / strategy as stated in OP-2203.038 Technical Guidelines, for actions direcrted by the AOP

Historical Comments:

New Question
Rev. 1: added procedure number to stem. Changed wording in the answers
"A" changed minimize to reduced
"C" added inventory before backflow, and "of" to from in front of SG

INSTRUCTIONS	CONTINGENCY ACTIONS

27. (continued)

F. Verify maximum of ONE RCP running in EACH loop.

G. IF RCP 2P32A or 2P32B stopped, THEN verify associated PZR Spray valve in Manual and closed.

- RCP "A" Spray Valve (2CV-4651)
- RCP "B" Spray Valve (2CV-4652)

H. Minimize primary to secondary break flow as follows:

1) IF at least ONE RCP running, THEN maintain RCS pressure within 100 psia above minimum RCP NPSH requirements, refer to 2202.010 Attachment 1, P-T limits.

2) IF ALL RCPs stopped , THEN maintain RCS MTS 30°F to 45°F, refer to 2202.010 Attachment 1, P-T Limits.

I. IF ANY RCPs running, THEN initiate RCS cooldown using EITHER of the following:

1) SDBCS Bypass valves (condenser available) - most preferred.

2) SDBCS ADV from intact SG to atmosphere – least preferred

- IF necessary, THEN supplement with SDBCS ADV from ruptured SG to atmosphere as needed.

AOP STEP:

■27. **IF RCS greater than 535°F T_H,**
THEN perform RCS cooldown to less than 535°F T_H as follows:

BASIS:

A. If SG leakage greater than 44 gpm, then the operators are directed to trip the reactor if any CEA's are withdrawn, actuate SIAS and CCAS, exit this procedure and **GO TO** 2202.010, Diagnostic Actions. Pressurizer level could not be maintained due to shrinkage from cooldown and the leakage.

B. Charging pump suction is realigned to the BAM tank (1) to ensure that adequate SDM is achieved.

C. The AOP is designed to perform the cooldown using the SDBCS Bypass Valves if available, or if not, the ADVs.

D. The Low SG Pressure setpoint is reset during the cooldown to prevent an inadvertent MSIS. This prevents interruption of steaming capability via the SDBCS Bypass Valves to the condenser, thereby minimizing offsite release of radioactivity. A note informs the operator of the desirability of steaming to the condenser vice atmosphere with regard to offsite dose. The Low Pressurizer Pressure setpoint is reset during the cooldown to prevent an unnecessary SIAS. Since this procedure is designed to be used during an event where PZR level can be maintained near setpoint, it is desirable to prevent the SIAS from occurring.

E. Cooldown rate is monitored to prevent exceeding Tech Spec limits.

F. Maximum of one RCP running in each loop is verified to reduce heat input into the RCS.

G. An open normal spray valve without a RCP running would result in pressurizer spray flow going into the idle T_C loop rather than into the PZR.

H. RCS pressure is reduced to minimize RCS break flow through the rupture (6). RCS MTS (2) and RCP NPSH (7) must be maintained during the depressurization. At approximately 525°F, RCP NPSH limitations become more restrictive than RCS MTS. If MTS were maintained at 30°F during the cooldown for SG isolation, NPSH curve could be violated. Therefore, a distinction is provided for RCS pressure control dependent on RCP status.

I. RCP operation will allow cooldown of both SGs without steaming the ruptured SG. The operators are trained to minimize the spread of contamination and offsite releases using the SDBCS Bypass valves to cooldown the RCS. This is the preferred and most easily controlled method. The SDBCS ADVs are included should the condenser be unavailable.

Bank: 1845	**Rev:** 0	**Rev Date:** 4/5/2012 4:27:44		**QID #:** 24		**Author:** Foster	
Lic Level: R	**Difficulty:** 2	**Taxonomy:** F		**Source:** NEW			
Search 000037K308		**10CFR55:** 41.5 / 41.10		**Safety Function** 3			
System Title: Steam Generator (S/G) Tube Leak				**System Number** 037		**K/A** AK3.08	
Tier: 1	**Group:** 2	**RO Imp:** 4.1	**SRO Imp:** 4.3	**L. Plan:** A2LP-RO-APSEC		**OBJ** 3	

Description: Knowledge of the reasons for the following responses as they apply to the Steam Generator Tube Leak: - Criteria for securing RCP

Question:

The Primary to Secondary Leakage AOP directs securing 2 Reactor Coolant Pumps (RCPs) after the initial Reactor Coolant System (RCS) cooldown for Steam Generator (SG) isolation.

What is the bases for securing the two (2) RCPs?

A. To minimize RCP differential pressure to minimize Primary to Secondary Leakage

B. To prevent violating the RCPs minimum NPSH requirements

C. To aid in backflow of the SG to the RCS

D. To minimize heat input to the RCS

QID use History

	RO	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☑	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

Answer:

D. Correct, from Tech Guide

Notes:

A. Incorrect, RCS pressure [not RCP DP] is reduced to minimize break flow
B. Incorrect, NPSH requirements are not challenged at this temperature
C. Incorrect, backflow of the SG to the RCS is directed in the SGTR EOP not the Primary to Secondary Leakage AOP

References:

OP-2203.038, Primary to Secondary Leakage AOP, Rev. 013, Step 27 [page 12]
AOP-2203.038 Tech Guide, Rev. 013, page 23.F., Maximum of one RCP running in each loop to reduce heat input into the RCS [page 23]
A2LP-RO-APSEC, Rev. 0, Discuss the basis / strategy as stated in OP-2203.038 Technical Guidelines, for actions direcrted by the AOP

Historical Comments:

New Question

Bank:	1846	**Rev:**	0	**Rev Date:**	5/26/2012 1:19:14	**QID #:**	25	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	F	**Source:**	NEW				
Search	000067A216	**10CFR55:**	41.10	**Safety Function**	9						
System Title:	Plant Fire on Site	**System Number**	067	**K/A**	AA2.16						
Tier:	1	**Group:**	2	**RO Imp:**	3.3	**SRO Imp:**	4.0	**L. Plan:**	A2LP-RO-AAS	**OBJ**	5

Description: Ability to determine and interpret the following as they apply to the Plant Fire on Site: - Vital equipment and control systems to be maintained and operated during a fire

Question:

Consider the following :

- Unit 2 is operating at 100% power
- A fire is reported in the Cable Spreading Room
- OP-2203.014, Alternate Shutdown AOP, has been entered

During the performance of OP-2203.014, Alternate Shutdown AOP, vital equipment should be monitored by the Shift Manager using the __________ computer and the preferred source of feedwater to maintain and control Steam Generator levels is the __________ pump.

A. SPDS; "A" EFW

B. PMS; "A" EFW

C. SPDS; "B" EFW

D. PMS; "B" EFW

Answer:

A. Correct, as directed by the Alternate Shutdown AOP, OP-2203.014. Section 2 (SM) directs the startup and monitoring of plant parameters by using the Safety Parameter Display System (SPDS). The PMS system is addressed in this AOP [in the restoration section prior to returning to the control room] and is not used to monitor vital equipment during the event. "A" EFW pump is aligned for manual operation and is relied on for feeding the SGs [RO followup actions, section 5] the "B" EFW can be used, and is addressed for use after establishing control with "A" EFW pump.

Notes:

B, C, and D are Incorrect for reasons stated above

References:

OP-2203.014, Alternate Shutdown AOP, Rev. 025, section 2, SM Follow-up actions [page 6] and section 5, RO followup action [pages 21-23]
AOP-2203.014, Alternate Shutdown AOP Tech Guide, Rev. 023, discussion [page 6] SM followup, section 2 [page 15] RO 1 followup,section 5 [page 18]
A2LP-RO-AAS, Rev. 0, Obj. 5, Discuss the Safety Function Status Check acceptance criteria.

Historical Comments:

New Question

NOTE

•SPDS data may be obtained from either redundant TSC work station.

8. Select Alternate Shutdown display on SPDS.

9. IF AAC Diesel is required to energize any 4160V bus
THEN direct EO to place the AAC Diesel in service.

NOTE

SG A level indication NOT qualified for Alternate Shutdown use.

10. Select SG A Level indications (L1079-1/L1079-2) on SPDS operator console.
    - Cross-check between indications to determine operable instruments.

11. Establish communications with operators by radio or phone.

12. IF NOT previously performed,
THEN dispatch Fire Brigade by performing the following:
    - Notify operators on Fire Brigade via radio or telephone.
    - Notify Security at CAS (ext 3109.3388) to dispatch Fire Brigade officers.

13. IF it is determined that a potential or actual threat exists that would affect Spent Fuel Pool level (inventory) or cooling capability,
THEN refer to Spent Fuel Pool Emergencies (2203.002).
(CR-ANO-C-2011-01102-CA 31 IER 11-2 Recommendation 4)

14. Declare 50.54X, refer to TS 6.2.2, Facility Staff.

15. Commence Attachment A, Safe Shutdown Systems Checklist.

16. Monitor SPDS display for indications of RCS overcooling which may be caused by EITHER of the following:

    A. Excessive steaming of SGs.

    B. Excessive EFW flow.

5. **Open the following valves:**

   - 2EFW-0773A "2P7A DISCH 2PI-0773"
   - 2EFW-0773B "2P7A DISCH 2PI-0773"

6. **WHEN the CRS has deenergized 2D26 and 2D27**
   THEN verify "2P7A COND SUCT MOV" (2CV-0795-2) open.

7. **IF 2P7A is operating, THEN slowly throttle EFW Pump 2P7A "TRIP & TV" valve (2CV-0336) to allow governor valve to open fully as follows:**

   A. Adjust 2P7A turbine speed to ~3700 rpm with the governor valve fully open.

   B. WHEN 2P7A speed is being controlled with the Trip Throttle Valve,
   THEN notify EO to open Breaker 1 in 2D24.

8. **IF 2P7A is NOT operating AND is NOT tripped**
   THEN perform the following:

   A. Close the Trip Throttle valve.

   B. Verify "EFW PUMP 2P7A STEAM SUPPLY" valve (2CV-0340-2) open.

   C. WHEN EO has verified "SG 2E-24B TO EFW PUMP 2P7A ISOL" (2CV-1050-2) open,
   THEN slowly open the Trip Throttle valve to raise turbine speed to ~3700 rpm.

   D. WHEN 2P7A speed is being controlled with the Trip Throttle Valve,
   THEN notify EO to open Breaker 1 in 2D24.

9. <u>IF</u> EFW pump 2P7A tripped, <u>THEN</u> reset Trip and Throttle valve as follows:

A. Turn "TRIP & TV" valve (2CV-0336) handwheel clockwise so screw rotation will raise sliding nut and latch lever to engage with trip hook.

> **<u>NOTE</u>**
>
> **This action allows tappet spring force to move the emergency tappet downward and the tappet nut to locate in the "trip reset" position. This holds the emergency connecting rod *in position* under its spring tension.**

B. Manually reset mechanical trip linkage by pulling emergency connecting rod against spring force, moving emergency head lever away from emergency tappet and tappet nut.

> **<u>CAUTION</u>**
>
> **Applying ANY lateral force when pushing downward on emergency tappet may result in *bending*.**

C. <u>IF</u> tappet spring force does <u>NOT</u> reposition emergency tappet, <u>THEN</u> press downward on emergency tappet to place it in trip reset position on head bracket.

D. Verify flat side of tappet nut aligned to flat of emergency head lever to prevent disengaging latch lever and trip hook.

E. Verify "EFW PUMP 2P7A STEAM SUPPLY" valve (2CV-0340-2) open.

F. <u>WHEN</u> EO has opened 2CV-1050-2, "SG 2E-24B TO EFW PUMP 2P7A ISOL", <u>THEN</u> slowly open "TRIP & TV" valve (2CV-0336) until both of the following are true:

- Turbine speed is ~ 3700 rpm.
- Turbine governor valve is 100% open.

G. <u>WHEN</u> 2P7A speed is being controlled with the Trip Throttle Valve, <u>THEN</u> notify the EO to open Breaker 1 in 2D24.

10. <u>WHEN</u> 2P7A is capable of feeding S/Gs, <u>THEN</u> notify Shift Manager.

11. Perform the following to align 2P7A to feed the 'B' Steam Generator:

A. Verify "2P7A DISCH CV TO SG B" valve (2CV-1039-1) open.

B. Verify "2P7A DISCH CV TO SG B" valve (2CV-1076-2) open.

C. Inform SHIFT MANAGER that 2P7A is aligned to feed the "B" Steam Generator.

D. Control 2P7A speed as directed by SHIFT MANAGER to maintain level in SG B.

***12. Verify 2P7A speed adequate to control SG level as follows:**

- 2P7A Discharge Pressure is ~ 1250 psig.
- 'B' Steam Generator levels and flow rates are acceptable to Shift Manager.

13. <u>WHEN</u> CRS has opened 2D23, Breaker 1, <u>THEN</u> perform the following:

- Verify "2P7A/7B RECIRC FLUSH LINE CV" valve (2CV-0798-1) closed.
- Verify "EFW FLUSH VALVE" (2CV-0714-1) closed.

14. <u>IF</u> notified by SM to align 2P7A to feed SG A, <u>THEN</u> perform the following:

A. Verify "2P7A DISCH CV TO SG A" valve (2CV-1037-1) open.

B. Verify "2P7A DISCH CV TO SG A" valve (2CV-1026-2) open.

C. Inform SHIFT MANAGER that 2P7A is aligned to feed SG A.

D. Control 2P7A speed as directed by SHIFT MANAGER to maintain level in SG A.

15. <u>IF</u> notified by Shift Manager to align the 2P7B EFW train, <u>THEN</u> verify the following:

A. "2P7B COND SUCT MOV" valve (2CV-0789-1) open.

B. "SW TO EFWP 2P7B" valve (2CV-0716-1) closed.

C. "2P7B DISCH TO SG 'B' CV" valve (2CV-1036-2) open.

D. "2P7B DISCH CV TO SG B" valve (2CV-1075-1) closed.

E. "2P7B DISCH TO SG 'A' CV" valve (2CV-1038-2) open.

F. "2P7B DISCH CV TO SG 'A' CV" valve (2CV-1025-1) closed.

G. Inform SHIFT MANAGER EFW Pump 2P7B standby alignment to SG B complete.

16. Maintain communications with SHIFT MANAGER (radio or extension 6605, 6611, or 6601).

END

Instrumentation:

Instrument strings totally independent of the Control Room and Cable Spreading room have been provided via the SPDS "Alternate Shutdown" display. The power source and cable routing of these instrument strings assures their reliability. All other instrumentation should be verified, where possible, against the SPDS display prior to use.

These instruments are:

Steam generator B level (wide range) (L1179-2)
Steam generator B pressure (P1141-2)
Cold leg D temperature (T4716)
Hot leg B temperature (T4714-2A)
Pressurizer level (L4627-2C)
Neutron flux (startup channel 2) (NISU2N)
RCS pressure (wide range) (P4624-2)
Pressurizer temperature (T4627-2)

COMMUNICATIONS

The plant phone and page system cables are not on controlled routing lists and for this reason their reliability cannot be assured in a Control Room/Cable Spreading room fire scenario. A "leaky coax" radio antenna and repeater system has been installed in the plant and evaluated for post Control Room/Cable Spreading room fire operability. This radio system is the primary method of communication. The backup means of communication is the plant dial telephone system (extensions 6605, 6611, and 6601). The third means of communications is the plant Gaitronics System.

SECURITY KEYS

Each Control Room has 4 sets of assigned emergency key rings. Operators should take the emergency key ring with them as they leave the Control Room. If operators are out of the Control Room when an Alternate Shutdown is initiated, they should obtain an emergency key ring from the Key room prior to performing the Alternate Shutdown procedure. The Key room has 8 sets of emergency key rings (4 sets/unit).

LOCAL BREAKER OPERATIONS

Manual operation of 4160/6900 volt and 480 volt breakers is relied upon because spurious operation is prevented by removing DC control power. This method of isolation was chosen because the 4160/6900 volt breaker local and remote handswitches do not sufficiently isolate the control circuit from the control room to assure no spurious operation. 480 volt breakers do not have "local and remote" handswitches.

Manual tools necessary for closing spring charging and for breaker operation are located in the Alternate Shutdown file cabinet in the foyer of the Control Room Extension. Directions for local and manual operations of breakers can be found in procedure 2107.001, Electrical System Operations. Manual operation exhibits are posted locally at all 4160/480 volt buses and load centers.

SECTION 2: SM FOLLOW-UP ACTIONS

The Shift Manager establishes supervisory control of the plant from the TSC, where he has indication of key plant parameters via the SPDS computer. This provides a central location where he has access to outside phone lines for calling desired personnel and plant phones for communication with personnel on site.

He will perform two actions prior to reporting to the TSC. He opens breaker 2D22-27 to remove the control DC from SW Pump 2P-4B MODs. This will ensure that MODs associated with SW pump 2P-4B (swing) do not chatter (open/close) and their positions stay where they are. He will also place both #1 and #2 EDG local control switches in LOCKOUT. This will help to prevent EDG damage during the initial portions of this casualty and will ensure EDG availability once more stable conditions are established.

Calling up the Dispatcher to check on Main Generator Output breakers is a double verification that these breakers are open.

Calling up SG A level indications upon arrival at the TSC allows the SM to determine if reliable indication is available for SG A. Reliable indication will be necessary in order to feed SG A. Two channels of SG A level indication are called up so the SM can compare the channels for accuracy.

The Shift Manager is responsible for making an Emergency Class Declaration. A Control Room evacuation requires an Alert classification at a minimum. 10 CFR 50.54(X) is declared following control room evacuation. Technical Specifications require a minimum staff in the control room at all times, which is not maintained during Alternate Shutdown.

The Safe Shutdown Systems Checklist is provided as a means to assist the Shift Manager in keeping track of the major goals being accomplished by the crew. These goals are intended to stabilize the RCS in Hot Standby with natural circulation cooling established.

Guidance is given to the Shift Manager to be aware of overcooling conditions which may be caused by either an overfeeding or an over steaming condition. This step serves as an indirect verification that MSIVs and/or turbine control/stop valves are closed.

Keeping track of the CCP run times will help determine when sufficient boric acid has been added to the RCS from the BAMTs. 160 minutes CCP run time will provide enough boric acid to ensure −1.0% shutdown margin.

The indications given to check for Natural Circulation flow are the standard parameters that would normally be used. Core exit thermocouples are mentioned as being used if available, because CET availability is not guaranteed.

SECTION 5: RO 1 FOLLOW-UP ACTIONS

RO 1's primary area of responsibility will be Aux Bldg 335' and the Upper North Piping Penetration Room.

Isolates and bleeds off Instrument Air to the Letdown Flow Control valves to ensure they are closed. This backs up actions taken in the Control Room to prevent the valves from re-opening

Verifies 2CV-4840-2 open to provide a flow path for the Charging Pumps.

Throttles 2P7A's Trip/Throttle valve and takes turbine control away from the Governor. The Governor valve fails open on a loss of power, which would result in a turbine overspeed trip if left unchecked. The Alternate Shutdown procedure assumes that a fire is in progress and directs actions to mitigate the detrimental effects of a fire. Actions are taken here to throttle the Trip/Throttle valve, open DC control power, and take control of 2P7A speed to control EFW flow and pressure.

The instructions given for resetting 2P7A are identical to those posted locally with the exception of 2CV-0340 position and final Trip/Throttle valve position. 2CV-0340 is not closed prior to resetting 2P7A. This allows 2P7A to slowly raise speed as the Trip/Throttle valve is throttled open. Since the Trip/Throttle valve is throttled to control 2P7A, it is not fully opened as specified in the local exhibit.

After EFW valves 2CV-1039-1 and 2CV-1076-2 are de-energized by the CRS, verifies the valves in their correct position and throttles 2CV-1076-2 as necessary to control SG B level. SG A may also be used for RCS heat removal if level indication is responding properly. Feeding both SGs is desirable in order to prevent an asymmetric cooldown.

Once the CRS has de-energized all of the 2P7A train EFW valves, the valves can then be verified in their correct positions. RO 1 will manually control SG B level from the Upper North Piping Penetration Room.

The EFW recirc/flush valves (2CV-0714-1 and 2CV-0798-1) are verified closed because some EFW flow is allowed to bypass the SG's if the valves are open.

2P7B is verified aligned for standby operation after its associated valves have been de-energized. This leaves 2P7B available as a backup should 2P7A fail to operate properly.

Bank:	1847	**Rev:**	0	**Rev Date:**	4/6/2012 7:08:48	**QID #:**	26	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NRC bank question 0232		
Search	000068K202	**10CFR55:**	41.7	**Safety Function**	8				
System Title:	Control Room Evacuation	**System Number**	068	**K/A**	AK2.02				
Tier:	1	**Group:**	2	**RO Imp:**	3.7	**SRO Imp:**	3.9	**L. Plan:**	A2LP-RO-ARS
OBJ	2								

Description: Knowledge of the interrelations between the Control Room Evacuation and the following: - Reactor trip system

Question:

Consider the following:

- Unit 2 is operating at 100% power
- A Fire breaks out in Unit 1 control room
- Heavy smoke and fumes are rapidly filling Unit 2 control room
- OP-2203.030, Remote Shutdown AOP, has been entered
- The CRS orders a control room evacuation after initial actions of OP-2203.030, Remote Shutdown AOP, have been completed

As directed by OP-2203.030, Remote Shutdown AOP, which ONE (1) of the following describes the method used to shutdown the reactor?

A. CBOT will commence emergency boration locally

B. ATC will manually trip the reactor from the control room

C. CRS will open Reactor Trip Circuit Breakers 1 through 8 locally

D. Auxiliary Operator will open Load Center 2B7 and 2B8 feeder breakers

Answer:

B. Correct, ATC will manually trip the reactor from the control room

Notes:

A. Incorrect, the CBOT will commence emergency boration locally but this action is for post trip shutdown margin

C. Incorrect, this action is directed by the AOP [CRS follow-up actions] to backup the reactor trip shutdown] not as the method to shutdown the reactor when there is time to perform the initial actions prior to evacuating the control room.

D. Incorrect, action not directed by this AOP. This action is directed as a way to trip the reactor from the control room in SPTAs, not a normal action the AO would perform in the field.

References:

OP-2203.030, Remote Shutdown AOP, Rev. 013, Initial Control Room Actions, step 1 [page 2]
AOP-2203.030, Remote Shutdown AOP Tech Guide, Rev. 012, AOP introduction [page 4]
A2LP-RO-ARS, Rev. 0, Obj. 2: Describe the mitigation strategy and instructions for actions directed in the Remote Shutdown AOP, OP-2203.030

Historical Comments:

NRC bank question 0232

REMOTE SHUTDOWN

PURPOSE

This procedure provides actions in the event Unit 2 Control Room must be evacuated for ANY reason other than a fire in Unit 2 Control Room or in ANY Unit 2 Alternate Shutdown fire zone.

Note: If Unit 1 is performing an "Alternate Shutdown", all Unit 2 NLOs will be assigned to the Fire Brigade. If Unit 1 is NOT performing an "Alternate Shutdown", all Unit 2 NLOs will be available and may be used as determined by the SM/CRS.

ENTRY CONDITIONS

ANY condition which renders the Control Room inaccessible, but does NOT affect the ability to operate equipment normally operated from the Control Room.

EXIT CONDITIONS

WHEN ONE of the following conditions exist, THEN exit this procedure.

1. Plant control has been re-established from Control Room.

2. Plant has been placed in Cold Shutdown.

AOP Introduction:

The control room can become uninhabitable for reasons other than fire (i.e. toxic gas or security threat). 10 CFR 50, Appendix A requires the capability to perform a shutdown, maintain the plant in hot shutdown, and cooldown from a location outside the control room. This procedure meets these requirements.

The remote shutdown panel, 2C80, is located outside of the control room. The instrumentation and controls at the remote shutdown panel are adequate to monitor and control the plant under normal post trip conditions. The limited controls prevent many routine evolutions from being performed. For this reason, this procedure assumes that all components and automatic control systems are operable and capable of performing their intended functions. It is also assumed that the MSIV's remain open and that a vacuum exists in the condenser.

This procedure directs the control room staff to take specific action before evacuating the control room. These actions trip the reactor and place support systems in a configuration where they will automatically respond, or where they can be manually operated from outside the control room.

If post trip response is normal, the plant should stabilize with minimal operator intervention. In the event that normal post trip responses are not achieved, the procedure directs contingency operations. The limited instrumentation and controls available at the remote shutdown panel prevent the operators from performing every necessary operation from the remote shutdown panel. Under these circumstances, this procedure provides instructions for local/manual equipment operation.

Once the plant is stabilized in hot standby, the plant can be maintained in hot standby until the control room is re-manned, or the plant is placed in cold shutdown. Evaluation criteria are provided to the shift superintendent to assist in making this decision.

If a plant cooldown is required, this procedure provides all instructions needed to perform the cooldown and place shutdown cooling in service. RCS and pressurizer cooldown tables, P/T curves, auxiliary spray data, and condensate makeup curves are part of this procedure and can be used to perform the cooldown. The remote shutdown cooldown closely follows a normal cooldown except for the fact that many operations that are normally performed from the control room are performed locally.

QID: 0232 **Rev:** 001 **Rev Date:** 3/6/2000 3:1 **RO Select:** **SRO Select:** **Points:** 1.00

Lic Level: RS **Difficulty:** 3 **Taxonomy:** Ap **Source:** New **Originator:** Hatman

10CFR55_41: 41.7 **10CFR55_43:** **Section:** 4.2 **Type:** Generic APE

System Title: Control Room Evacuation **System Number** 068 **K/A:** K2.02

RO Tier: 1 **RO Group:** 1 **RO Imp:** 3.7 **SRO Tier:** **SRO Group:** **SRO Imp:** 3.9

Description: Knowledge of the interrelations between the Control Room Evacuation and Reactor trip system.

Question:

A disgruntled and armed Security Guard enters the Unit 2 Control Room and directs all operations personnel to leave. Which of the following describes the preferred method of reactivity control which should be employed?

A. Auxiliary Operator will open Load Center 2B7 and 2B8 feeder breakers.

B. Waste Control Operator will open the MG Set output breakers locally.

C. CBOR will open Reactor Trip Circuit Breakers 1 through 8 locally.

D. CBOT will commence emergency boration locally.

Answer:

C. CBOR will open Reactor Trip Circuit Breakers 1 through 8 locally.

Notes:

References:

2203.030, Remote Shutdown Section 4, Rev 006-04-0.

Historical Comments:

02/24/00 - NRC Comment - Stem focus allows room to argue other choices.
03/06/00 - Rev 001 - Added word "preferred" to stem.

Bank:	1848	**Rev:**	0	**Rev Date:**	4/6/2012 8:20:59	**QID #:**	27	**Author:**	Foster
Lic Level:	R	**Difficulty:**	4	**Taxonomy:**	H	**Source:**	Modified NRC bank 0226		
Search	000076K306	**10CFR55:**	41.5 / 41.10	**Safety Function**	9				
System Title:	High Reactor Coolant Activity	**System Number**	076	**K/A**	AK3.06				
Tier:	1	**Group:**	2	**RO Imp:**	3.2	**SRO Imp:**	3.8	**L. Plan:**	A2LP-RO-ARCSA
OBJ	2								

Description: Knowledge of the reasons for the following responses as they apply to the High Reactor Coolant Activity: - Actions contained in EOP for high reactor coolant activity

Question:

Consider the following:

- Unit 2 is operating at 100% power
- Annunciator 2K12 A-1, LETDOWN RADIATION HI/LO is in alarm
- Letdown recorder (2RR-4806) is checked and shows both Gross and Iodine activity have trended up and are now stable

Chemist has performed an RCS sample and reports the following results:

- RCS Gross Activity is 33 microcuries/gram
- RCS Iodine Activity is 80 microcuries/gram
- Annunciator 2K11 B-10, AREA RADIATION HI/LO is in alarm
- Several Auxiliary Building Area Radiation Monitors on 317', 335', and 354' elevations are reading >1.1 R/Hr
- OP-2203.020, High Activity in the RCS AOP has been entered

Due to the above conditions, OP-2203.020, High Activity in the RCS AOP, should direct the following action be performed?

A. Isolate letdown

B. Trip the Reactor

C. Place Letdown DI in service

D. Place the control room ventiailation on emergency recirculation

Answer:

A. Correct, step 9 contingency column step 9.A isolate Letdown, step 9.D perform a plant shutdown

Notes:

B. Incorrect; Tripping the Reactor is never directed by OP-2203.020 AOP
C. Incorrect; the AOP direct isolating Letdown with this high of rad levels
D. Incorrect; Placing the control room ventilation system on emergency recirculation is not directed by this AOP
Alarms, trends, and chemist samples should prompt the student to consider T.S. actions which will require the plant to be off line [in hot standby] in 6 hours and cold shutdown within the next 30 hours

References:

OP-2203.020, High Activity in the RCS AOP, Rev. 011, step 9, contingency column 9.A and 9.D [page 5]
AOP-2203.020, High Activity in the RCS AOP Tech Guide, Rev. 011, [pages 9 and 10]
OP-2203.012-L, ACA, Rev. 040, 2K12 window A-1, steps 1.1, 1.2, 2.1, and 2.2 [page 5]
OP-2203.012-K, ACA, Rev. 040, 2K11 window B-10, step 2.3 [pages 103 and 104]

T.S. 3.4.8, RCS Specific Activity, Rev. 48
A2LP-RO-ARCSA, Rev. 0, Obj. 2, Describe the mitigation strategy and instructions for actions directed in OP-2203.020, High Activity in the RCS AOP.

Historical Comments:

Modified NRC bank question 0226

INSTRUCTIONS	CONTINGENCY ACTIONS
8. <u>IF</u> Iodine 131 activity rising, <u>THEN</u> contact Reactor Engineering to monitor fuel using NF-102, Corporate Fuel Reliability.	
***9. Check BOTH the following conditions exist:** • Aux Building Area Radiation monitors less than 0.1 R/hr. • RCS Letdown Gross monitor (2RITS-4806A) activity stable or lowering.	***9. At SM discretion perform the following:** A. Isolate Letdown by verifying at least ONE Letdown Isolation valve closed: • 2CV-4820-2 • 2CV-4821-1 • 2CV-4823-2 (least preferred) B. Maintain PZR level within 5% of setpoint by cycling Charging pumps. C. Record Charging Header data on 2202.010 Attachment 44, Charging Header Data. D. <u>IF</u> plant shutdown required, <u>THEN</u> perform the following: 1) Refer to applicable reactivity plan. 2) Commence Plant shutdown using 2102.004, Power Operation. E. Refer to 1903.010, Emergency Action Level Classification. F. <u>IF</u> Letdown isolated <u>AND</u> Aux Building radiation high, <u>THEN</u> close RCP Bleedoff to VCT valves: • 2CV-4846-1 • 2CV-4847-2
10. Notify RP to perform Aux Building area radiation surveys.	

END

AOP STEP:

7. **Check BOTH the following conditions exist:**

BASIS:

It takes approximately 2 hours for chemistry to obtain an I-131 sample using normal sampling methods. Due to this time delay if RCS specific activity is rising and is projected to peak above the limits for declaring an NUE, an NUE should be declared. An event has to have occurred that could result in failed fuel, (i.e. dropped CEA, sudden power rise, loss of MTS, exceeding LPD or DNBR limits.)

An NUE should not be declared early unless an initiating event occurred. If specific activity is rising during steady state operation, no declaration should be made until the limits are reached.

SOURCE DOCUMENTS:

1 - OP2-94-0057, OPS Action

AOP STEP:

8. **<u>IF</u> Iodine 131 activity rising,**
<u>THEN</u> contact Reactor Engineering to monitor fuel using NF-102, Corporate Fuel Reliability.

BASIS:

The Fuel Integrity Monitoring procedure provides indication of the amount of failed fuel. This procedure is performed by Reactor Engineering on a monthly basis under normal circumstances. Reactor Engineering needs to be notified in case of indications of failed fuel to commence raised monitoring. If Iodine levels exceed those specified in the procedure a power derate or Unit shutdown maybe required.

SOURCE DOCUMENTS:

1 - NF-102, Corporate Fuel Reliability

AOP STEP:

*** 9 Check BOTH the following conditions exist:**

BASIS:

High RCS activity circulating though the auxiliary building may raise radiation levels and limit access to vital areas. The .1R/hr limit indicates that "high radiation areas" may now be present where "radiation areas" were present earlier. Letdown is isolated to limit activity levels in the auxiliary building.

Previously, the letdown isolation valve outside containment was used to allow for local operation or inspection in the event of valve malfunction. However, a failure of the backpressure regulator control and subsequent failure of outside isolation valve to fully isolate Letdown led to CR-ANO-2-1999-0743. (4) This CR determined that 2CV-4823-2 is not designed to isolate full RCS letdown at normal letdown pressure/flow. In fact, the valve is designed to isolate a broken pipe against Containment design pressure (about 54 psid) i.e. 2CV-4823-2 is a containment isolation valve vice an RCS isolation valve. Consequently the step has been restructured to allow the operator to isolate Letdown by verifying at least one letdown isolation valve closed, and listing all three isolation valves as options with
2CV-4823-2 being least preferred. Verify means that the operator will use any and all valves to ensure that Letdown is isolated.

If letdown is isolated, the charging pumps must be cycled to maintain pressurizer level. Charging header data is recorded each time the charging pumps are cycled to track charging nozzle thermal stresses.

If letdown is isolated and Auxiliary Building radiation levels are still high, then RCP controlled bleedoff flow is isolated to the VCT. This will divert controlled bleedoff flow to the Quench Tank via relief valve 2PSV-4836.

SOURCE DOCUMENTS:

1 - 1010.002, Transient History/Transient Cycle Logging and Reporting.
2 - 2102.004, Power Operation.
3 - P10616, Isolate Letdown and Controlled Bleedoff flow at a set radiation level.
4. - CR-ANO-2-1999-0743, Letdown isolation valve 2CV-4823-2 failure

ANNUNCIATOR 2K11

B-10

AREA RADIATION HI/LO

NOTE

- This alarm will reflash.
- Setpoints are in Radiation Monitoring and Evacuation Alarm System (2105.016).
- Reflash unit in 2C25 responds faster then the horn logic for 2K11-B10; horn may not sound on a reflash.

1.0 CAUSES

1.1 Any of the following Area Radiation Monitors in alarm (High or Low):

- 2RITS-8900 317′ General Area
- 2RITS-8901 335′ CCP Area
- 2RITS-8902 335′ 2E-3A/B Area
- 2RITS-8903 354′ VCT Area
- 2RITS-8904 354′ Resin Add Tank Area
- 2RITS-8906 369′ Vac Degas Room Hallway
- 2RITS-8907 372′ Corridor to EDG Rooms
- 2RITS-8908 335′ Drumming Station Access
- 2RITS-8910 386′ Emergency Chiller Area
- 2RITS-8911 386′ RP Office and CA2
- 2RITS-8913 404′ SFP Access Hallway
- 2RITS-8914 404′ SFP Cask Washdown Area (TS 3.3.3.1)
- 2RITS-8915 404′ New Fuel Storage Area (TS 3.3.3.1)
- 2RITS-8916 404′ Spent Fuel Area (TS 3.3.3.1)
- 2RITS-8917 354′ Hot Lab Sample Room
- 2RITS-8905 354′ Containment Equipment Hatch
- 2RITS-8918 354′ Hot Machine Shop Hallway
- 2RITS-8919 335′ Drumming Station Cask Washdown
- 2RITS-8909 386′ Containment Personnel Hatch
- 2RITS-8920 335′ Drumming Station Cask Washdown
- 2RITS-8912 404′ CNTMT, SW End Refueling Deck
- 2RITS-8922 354′ Hot Machine Shop
- 2RITS-8924 354′ CCW Room Hallway

1.2 Loss of power to any of above Rad Monitors.

(B-10 Continued on next page)

ANNUNCIATOR 2K11

B-10

AREA RADIATION HI/LO
(Continued)

2.0 ACTION REQUIRED

2.1 Check 2C25 for initiating alarm and radiation levels.

2.2 IF testing in progress,
THEN no further action required.

2.3 IF valid high alarm,
THEN notify Radiation Protection to check radiation level locally.

2.4 IF alarm due to any of the following,
THEN verify WR/WO submitted as applicable:

- Loss of power to detector.
- Detector failed high.
- Detector failed low.

2.5 IF desired to raise alarm setpoint for Non-TS/Non-Containment Area Radiation monitors,
THEN perform Radiation Monitoring and Evacuation System (2105.016) Attachment I (Non-Tech Spec Area Monitor Alarm Setpoint Change).

3.0 TO CLEAR ALARM

3.1 Reset high alarm on module on 2C25.

3.2 Low alarm will automatically reset.

3.3 IF monitor failed OR out of service,
THEN perform the following:

3.3.1 Place monitor in Level Cal.

3.3.2 Verify WR/WO submitted.

3.3.3 Complete Annunciator Removal From Service or Modification Form 1015.001B per Conduct of Operations (1015.001).

4.0 REFERENCES

4.1 E-2457-2

4.2 CR-ANO-2-2009-03271 CA00003

ANNUNCIATOR 2K12

A-1

LETDOWN RADIATION HI/LO

1.0 CAUSES

1.1 RCS Letdown Gross Activity $\geq$ 4 X 10^5 cpm (2RITS-4806A)

1.2 RCS Letdown Iodine (I-131) Activity exceeding selected scale setpoint (2RITS-4806B):

- 1E2 ≥ 67 cpm
- 1E3 ≥ 670 cpm
- 1E4 ≥ 6700 cpm
- 1E5 ≥ 67,000 cpm
- 1E6 ≥ 670,000 cpm

1.3 ≤ 10 CPM over a rolling 1 minute time period.

2.0 ACTION REQUIRED

2.1 Check Gross and Iodine Activities on NSSS Process Radiation Recorder (2RR-4806).

2.2 <u>IF</u> RCS Activity rising,
<u>THEN</u> GO TO High Activity in RCS (2203.020).

2.3 <u>IF</u> alarm caused by instrument malfunction or loss of power,
<u>THEN</u> initiate WO/WR.

3.0 TO CLEAR ALARM

3.1 Reduce detected gross activity levels and iodine activity levels to below alarm setpoint.

3.2 To clear Iodine Alarm, scales may be changed as necessary to provide alarm function.

3.3 Restore instrument to normal operation > 10 CPM.

4.0 REFERENCES

4.1 E-2457-3

4.2 ER-ANO-2002-1401-000, Letdown Radiation Hi/Lo alarm modification

SPECIFIC ACTIVITY

LIMITING CONDITION FOR OPERATION

3.4.8 RCS DOSE EQUIVALENT I-131 and DOSE EQUIVALENT XE-133 specific activity shall be within limits.

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

ACTION

Note: The provisions of Specification 3.0.4.c are applicable to ACTION a and b.

a. With the DOSE EQUIVALENT I-131 not within limit:

1. Verify DOSE EQUIVALENT I-131 ≤ 60 μCi/gm once every 4 hours, and

2. Restore DOSE EQUIVALENT I-131 within limit within 48 hours.

b. With the DOSE EQUIVALENT XE-133 not within limit, restore DOSE EQUIVALENT XE-133 within limit within 48 hours.

c. With the requirements of ACTION a and/or b not met, or with DOSE EQUIVALENT I-131 > 60 μCi/gm, be in at least HOT STANDBY in 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.4.8.1 Verify reactor coolant DOSE EQUIVALENT XE-133 specific activity ≤ 3100 μCi/gm once every 7 days.*

4.4.8.2 Verify reactor coolant DOSE EQUIVALENT I-131 specific activity ≤ 1.0 μCi/gm:*

a. once every 14 days, and

b. between 2 and 6 hours after THERMAL POWER change of ≥ 15% RATED THERMAL POWER within a 1 hour period.

* Only required to be performed in MODE 1.

Next Page is 3/4 4-22

QID:	0226	**Rev:**	001	**Rev Date:**	2/6/2000 9:1	**RO Select:**		**SRO Select:**	
Points:	1.00	**Lic Level:**	RS	**Difficulty:**	4	**Taxonomy:**	C	**Source:**	New
Originator:	Hatman	**10CFR55_41:**	41.5, 41.10	**10CFR55_43:**		**Section:**	4.2	**Type:**	Generic APE
System Title:	High Reactor Coolant Activity	**System Number**	076	**K/A:**	AK3.06				
RO Tier:	1	**RO Group:**	1	**RO Imp:**	3.2	**SRO Tier:**		**SRO Group:**	
SRO Imp:	3.8								

Description: Knowledge of the actions contained in EOP for high reactor coolant activity.

Question:

Given the following plant conditions:

* Full Power Operations.
* RCS Gross Activity is 3.3 microcuries/gram.
* RCS Iodine Activity is 12 microcuries/gram.
* Auxiliary Building Area Radiation Monitors are reading 0.4 R/Hr.
* Letdown System is isolated.

Which of the following actions should be performed for the given conditions?

A. Immediately trip the Reactor.

B. Restore Letdown System to service and place demineralizers in service.

C. Secure all Reactor Coolant Pumps.

D. Isolate Controlled Bleedoff from RCPs.

Answer:

D. Isolate Controlled Bleedoff from RCPs.

Notes:

References:

2203.020, High Activity In RCS, Rev 007, Step 8.F

Historical Comments:

Rev 001 - 02/06/00 - Added "Full Power Operations" to stem to address comments made by exam reviewers.

Data for 2012 NRC RO/SRO Exam

05-Jul-12

Bank:	1849	**Rev:**	0	**Rev Date:**	4/9/2012 3:31:58	**QID #:**	28	**Author:**	Foster
Lic Level:	R	**Difficulty:**	4	**Taxonomy:**	H	**Source:**	NEW		
Search	003000K302	**10CFR55:**	41.7	**Safety Function**	4				
System Title:	Reactor Coolant Pump System (RCPS)	**System Number**	003	**K/A**	K3.02				
Tier:	2	**Group:**	1	**RO Imp:**	3.5	**SRO Imp:**	3.8	**L. Plan:**	A2LP-RO-CPC
OBJ	19								

Description: Knowledge of the effect that a loss or malfunction of the RCPS will have on the following: - S/G

Question:

Consider the following:

- Unit 2 is operating at 100% power
- "B" Reactor Coolant Pump (RCP) Shaft shears

The Reactor Trip is caused by ____________________.

A. Variable Overpower Trip (VOPT)

B. Low Linear Power Density (LPD)

C. High Departure Nucleate Boiling Ratio (DNBR)

D. Asymmetric Steam Generator Transient (ASGT)

Answer:

D. Correct, with a "B" RCP shaft sheer, RCS heat transfer is shifted to "A" SG causing a Asymmetric Steam Generator Transient (ASGT)

Notes:

A. Incorrect, Variable Overpower Trip (VOPT) provides protection for rapid power increases
B. Incorrect, there is no calculated RCS flow change (RCS flow is calculated off the motor speed sensor) therefore no calculated change in LPD
C. Incorrect, there is no calculated RCS flow change (RCS flow is calculated off the motor speed sensor) therefore no calculated change in DNBR

References:

STM 2-63, Reactor Protection System, Rev. 11, section 4.0 [page 18)
STM 2-65-1, Core Protection Calculator System, Rev. 16, section 2.4.4, LPD trip, 2.4.5 DNBR Trip and 2.4.6 Aux Trips (pages 15 and 16)
A2LP-RO-CPC, Rev. 12, Obj. 19, List the Aux trips associated with each CPC and the conditions they protect against.

Historical Comments:

New Question

4.0 Detailed Description

The Reactor Protection System, or RPS, consists of the following major subsections. Refer to the figure on page 55:

a. NSSS Parameter Measurement Channel
b. Bistable or Auxiliary Trip Units
c. Coincidence Logic Matrices
d. RPS Trip Paths
e. RPS Testing System

The signals from the NSSS measurement channels supply the information to the PPS for the selected parameters. The inputs are in the form of a positive 0-10 volt DC signal. The Bistable Comparator Trip Units compare these electrically positive signals with a respective negative DC reference setpoint. If the input signals reach or exceed the negative setpoint value, the Bistable Comparator Trip Units provide trip signals to the Bistable Trip Units which, in turn, provides trip signals to the coincidence logic. The coincidence logic matrices provide trip signals to the Reactor Trip Circuit Breakers upon selected coincident trip signals from the Bistable or Auxiliary Trip Units. The Bistable/Auxiliary Trip Units provide trip signals to the coincidence logic upon receipt of an external contact status input from the Core Protection Calculators (refer to STM-2-65-1).

4.1 Power - Channels and Components

The figures on pages 56 and 57 list the power supplies to the Plant Protection System cabinets 2C23 including, their respective voltages and an over-all simplified usage listing. The figure on page 58 shows a typical PPS cabinet power supply arrangement (not shown are the Test and Status Panel power supplies). This figure outlines the power supply inputs, power supply indication, supply alarm contact and the supply distribution.

Power for each Channel, which includes the PPS loops and ESFAS Cabinets 2C39 and 2C40, is channelized. The power supplies are arranged as follows:

There are six inverters which may be used to supply Vital AC power to the cabinets. Of the six inverters, four are available only to their respective power panels. That is, 2Y-11 supplies 2RS-1; 2Y-22 supplies 2RS-2; 2Y-13 supplies 2RS-3; and 2Y-24 supplies 2RS-4. Additionally, there are 2 swing inverters. 2Y-1113 may be aligned to either 2RS-1 or 2RS-3, and 2Y-2224 may be aligned to either 2RS-2 or 2RS-4.

These power panels then provide power to the PPS channels;

2RS-1 to 2C23-A	2RS-2 to 2C23-B	2RS-3 to 2C23-C	2RS-4 to 2C23-D

Each PPS Channel cabinet is equipped with its own power supply circuit breaker.

- Quality Margin $\leq$ 0.05
  - These conditions will cause a Pre-Trip alarm on 2K04 and a CEA Withdrawal Prohibit (CWP)

2.4.3 CEA Withdrawal Prohibit (CWP)

A CEA Withdrawal Prohibit (CWP) prevents the outward motion of CEAs in all modes except Manual Individual. A CWP is initiated when ANY of the following conditions exist on 2 out of 4 channels:

- DNBR Pre-Trip
- LPD Pre-Trip
- Either CEAC detects an outward or inward CEA deviation of 5 inches.
- CEA Subgroup deviation $\geq$ 4.95 inches
- CEA Regulating Group Out Of Sequence (sequential subgroups get within 7.5 inches of each other)
- High Pressurizer Pressure Pre-Trip (from RPS)

2.4.4 LPD Trip

If conditions continue to degrade following the Pre-Trip setpoint, the following condition will cause an LPD Trip:

- LPD $\geq$ 21 kw/ft

2.4.5 DNBR Trip

If conditions continue to degrade following the Pre-Trip setpoint, the following conditions will cause a DNBR Trip:

- DNBR < 1.25
- Quality Margin $\leq$ 0

2.4.6 Aux Trips

In addition, there are conditions that will cause a DNBR and an LPD Trip without initiating a Pre-Trip. These conditions are referred to as Aux Trips and will cause the above trips if particular parameters are outside the "design space" for CPCs. These trips do not mean that an actual DNBR or LPD limit have been exceeded, they just indicate the parameters are outside the design limits for the CPC calculations. They are:

2.4.6.1 JTRP

JTRP (PID 189) is the trip flag which is set when the plant is operating outside of the design space for CPCs. The conditions that will set the JTRP flag are:

- **Tcold out of range** (< 495 °F or $\geq$ 580 °F). This sets JTRP to 1.
- **Pressurizer Pressure out of range** (< 1860 psia OR $\geq$ 2375 psia). This sets JTRP to 1
- **QASI (Hot Pin Axial Shape Index) out of range** (< -0.48 OR $\geq$ +0.48). This sets JTRP to 1
  - This trip uses a "static" value below 17% power and shifts to a live value at 17% on an up power. On a down power, the value shifts back to a "static" value at 14.5% power.
- **One Pin Peaking factor out of range** (< 1.28 OR $\geq$ 7.00). This sets JTRP to 1
- **Asymmetric Steam Generator Transient (ASGT).** This sets JTRP to 20.

- Refer to the figure on page 55. ASGT is a power dependent trip. Its function is to protect against transients that cause power asymmetries between the two SGs (inadvertent closure of one MSIV at power). It uses the maximum of either Calibrated Excore Neutron Flux Power or ΔT Power and it uses both cold leg temperatures (remember each CPC uses two cold leg inputs from diagonally opposite loops). The ASGT uses a constant setpoint of 11°F ΔT between SGs (PID 096) and adds to that constant based upon current power level.
  - From 0 to 20% power, the setpoint is 31°F (PID 096 + 20°F)
  - From 20 to 50% power, the setpoint is ramped from 31°F to 16°F (PID 096 + 20°F to 5°F ramped based on power)
  - From 50 to 80% power, the setpoint is ramped from 16°F to 11°F (PID 096 + 5°F to 0°F ramped based on power).
  - From 80 to 100% power the setpoint is 11°F (PID 096 + 0°F)

- **Variable Overpower Trip (VOPT).** This sets JTRP to 40
  - Refer to the figure on pages 56 and 57. VOPT provides protection from transients with rapid power increases such as low power CEA withdrawals or large excess load events.
  - VOPT uses the maximum of the following to compare to the trip setpoint:
    - Raw excore power
    - Raw excore power that has been temperature compensated
    - Calibrated Neutron Flux power
    - ΔT power
  - The setpoint is a constant offset of 15% from the maximum of the above powers. However, this offset is limited in how fast it can follow changes in power. Its limit for a downpower transient is 300%/minute and 12%/minute for an up power transient.

2.4.6.2 Less than Two RCPs Running

CPCs were never designed for single pump operation, and should less than 2 RCPs be detected the CPCs will immediately trip, without going through any detailed calculation. Should two or three RCPs be detected running, the CPCs will still trip, but in this case it is not an auxiliary trip, since 3 pump operation is within the CPC operating parameter space. The NSSS was, in fact, designed for operation with less than 4 RCPs running, however the safety analysis for this condition was never completed. As a result, the penalty factors calculated in the flow program are sufficiently large for less than 4 RCPs running that a trip will result. An RCP is considered to

Bank: 1850	**Rev:** 0	**Rev Date:** 4/6/2012 9:02:05		**QID #:** 29		**Author:** Foster			
Lic Level: R	**Difficulty:** 2	**Taxonomy:** F		**Source:** NEW					
Search 0040002127	**10CFR55:** 41.7			**Safety Function** 1					
System Title: Chemical and Volume Control System (CVCS)				**System Number** 004		**K/A** 2.1.27			
Tier: 2	**Group:** 1	**RO Imp:** 3.9	**SRO Imp:** 4.0	**L. Plan:** A2LP-RO-CVCS		**OBJ** 1			

Description: Conduct of Operations - Knowledge of system purpose and/or function.

Question:

The following is NOT a purpose and/or function of the Chemical and Volume Control (CVCS) System?

A. Maintains volume of the Reactor Coolant System

B. Collects contriolled bleed-off flow from the RCP seals

C. Provides continuous measurement of fission product activity

D. Provides water for resin transfer for the Letdown Demineralizers

Answer:

D. Correct, makeup is supplied by Reactor Makeup Water Tank (RMWT via 2P-109) not the CVCS system

Notes:

A, B, and C are incorrect. STM section 1.1 list all as functions of the CVCS system

References:

STM2-04 ,Chemical and Volume Control System, Rev. 28, section 1.1 [page 2]
A2LP-RO-CVCS, Rev. 13, Obj. State and describe the functions of the Chemical and Volume Control System (CVCS)

Historical Comments:

New Question

- "chemical addition" - the portion of CVCS that provides makeup and chemical addition to the 2T-4 and charging pump suction.

1.1 Functions of the CVCS

The chemical and volume control system (CVCS) is provided to perform the following functions:

- maintain chemistry and purity of the RCS during normal operation and during shutdowns, including crud burst cleanup;
- maintain the desired volume of water in the RCS,
- provide control of the boron concentration in the RCS,
- provide an alternate mechanism to reduce RCS pressure through the use of auxiliary pressurizer spray,
- provide leak testing of safety injection system check valves,
- provide continuous measurement of fission product activity in the RCS,
- collect controlled bleed-off flow from RCP seals,
- allow detection of any leakage that exists in the RCS,
- provide injection of concentrated boric acid during a safety injection actuation signal (SIAS),
- provide an alternate method of filling RCS,
- automatically divert letdown to the boron management system (BMS) when the volume control tank (VCT) reaches its highest permissible level.

1.1.1 Design Criteria of the CVCS

The chemical and volume control system is designed to be capable of performing the following:

- accept letdown when heating up the RCS at the administrative heat-up rate, or provide makeup using two of the three charging pumps when the RCS is cooled down at the administrative cool-down rate in order to maintain the desired RCS water volume.
- allow for a design plant power change of ± 10% step change, and a ramp change of ± 5% of full power per minute when power is between 15 and 100% power.
- with VCT level in its normal operating level band, the CVCS will provide sufficient capacity to accommodate an RCS inventory change resulting from a power decrease from 100% to 0% power with no make-up.
- maintain RCS activity within technical specification limits assuming 1% failed fuel and continuous full power.
- maintain RCS chemistry within technical specification limits.
- allow addition of boric acid to the RCS at a rate capable of counteracting the positive reactivity addition produced during an administrative RCS cooldown rate and the maximum xenon decay rate using only one charging pump.
- allow the operator to borate the RCS to the refueling boron concentration required by technical specifications.

1.2 Functions of the Chemical Addition System

The reactor coolant and auxiliary systems chemical concentrations must be controlled to minimize corrosion and to control reactivity in the core.

Bank:	1851	**Rev:**	0	**Rev Date:**	4/6/2012 10:13:15	**QID #:**	30	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NEW		
Search	005000K201	**10CFR55:**	41.7			**Safety Function**	4		
System Title:	Residual Heat Removal System (RHRS)			**System Number**	005	**K/A**	K2.01		
Tier:	2	**Group:**	1	**RO Imp:**	3.0	**SRO Imp:**	3.2	**L. Plan:**	A2LP-RO-ECCS
OBJ	19								
Description:	Knowledge of bus power supplies to the following: - RHR pumps								

Question:

The "A" Low Pressure Safety Injection (LPSI) Pump (2P-60A), when used to support/supply Shutdown Cooling (SDC) is powered by electrical bus ________.

A. 2A1

B. 2A2

C. 2A3

D. 2A4

Answer:

C. Correct, 2A3 is the correct power supply to the RED train Vital Equipment

Notes:

A. Incorrect, 2A1 is a RED non vital bus and 2P-60A is not a load
B. Incorrect, 2A2 is a Green non vital bus and 2P-60A is not a load
D. Incorrect, 2A4 is a Green vital bus and 2P-60A is not a load

References:

OP-2104.040, LPSI System Operations, Rev. 059, section 3.0 [page 2]
A2LP-RO-ECCS, Rev. 12, Given appropriate reference material, determine the power supplies foe ECCS components including pumps and valves..

Historical Comments:

New Question

1.0 PURPOSE

This procedure provides instructions for operating and testing Low Pressure Safety Injection (LPSI) system. Also included are instructions for flushing portions of LPSI System where hot spots may exist.

2.0 SCOPE

This procedure controls operation of LPSI System. Tests performed in this procedure satisfy requirements of Tech Spec 4.5.2.f.2 and parts of 4.5.2.h, and implement Inservice Test (IST) Program requirements for LPSI System components.

3.0 DESCRIPTION

LPSI Pumps (2P-60A and 2P-60B) are single stage, motor driven, centrifugal pumps, powered from 2A3 and 2A4. Pump seals are cooled by an external cooler. Pumps are rated for 3100 gpm at 150 psig. They are normally aligned with suction from Refueling Water Tank (SIAS Standby); however, they can be aligned to take suction from RCS for long term shutdown cooling. 2P-60A and 2P-60B start on SIAS after a 15 second time delay and LPSI Header Injection MOVs to 2P-32 Loop valves open. Recirculation Actuation Signal (RAS) stops both LPSI pumps.

LPSI Discharge Header Isolation (2CV-5091) is locked open for SIAS standby and used in conjunction with SDC HX Return (2CV-5093) for temperature control. Both valves are pneumatically operated valves controlled by hand indicating controllers on 2C04 or 2C80.

LPSI Header to 2P-32 Loop valves are four motor operated control valves that open upon SIAS to admit LPSI flow to RCS loops immediately downstream of RCPs. The open limit switches on these control valves are adjusted to obtain balanced flow between headers. The flow restricting orifice (2F0-5090) in main header is sized as required to provide system resistance suitable for precluding excessive pump run-out.

SDC RC Isolation valves (2CV-5084-1, 2CV-5086-2 and 2CV-5038-1) allow LPSI pumps to take suction from RCS hot leg piping for Shutdown Cooling (SDC). 2CV-5084-1 and 2CV-5086-2 are pressure interlocked to prevent them from opening if RCS Pressure exceeds 350 psia. Thermal reliefs are installed in piping between control valves to protect piping from water expansion due to heatup. LPSI Header Relief (2PSV-5089), located on common LPSI Header, aids in protecting discharge piping from overpressure.

2SI-5091-3, LPSI Header CV Bypass, is sized to provide adequate flow for LPSI System design functions per SAR. Isolating 2CV-5091 for maintenance or other activities will not render LPSI inoperable as long as a flow path exists through 2SI-5091-3.

Bank:	1852	**Rev:**	0	**Rev Date:**	4/6/2012 12:43:01	**QID #:**	31	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NRC Bank 1518				
Search	005000K407	**10CFR55:**	41.7	**Safety Function**	4						
System Title:	Residual Heat Removal System (RHRS)	**System Number**	005	**K/A**	K4.07						
Tier:	2	**Group:**	1	**RO Imp:**	3.2	**SRO Imp:**	3.5	**L. Plan:**	A2LP-RO-SDC	**OBJ**	4

Description: Knowledge of RHRS design feature(s) and/or interlock(s) which provide for the following: - System protection logics, including high-pressure interlock, reset controls, and valve interlocks

Question:

Consider the following:

- Unit 2 has entered mode 5 after completing a 500 day operating cycle
- SDC in service with the "A" LPSI pump through the "A" SDC Hx
- RCS Temperature 185°F
- RCS pressure 275 psia
- "A" LPSI pump has tripped

If RCS pressure reaches ________ psia it should ________________________ the Shutdown Cooling suction MOV's (2CV-5084-1 and 2CV-5086-2) isolation valves.

A. 300, prevent opening

B. 300, automatically close

C. 350, prevent opening

D. 350, automatically close

Answer:

C. Correct, >350 psia in the RSC will not allow the SDC suction valves to open

Notes:

The Automatic Closing Interlock (ACI) for the SDC Suction Isolation Valves was removed. The valves used to automatically close at > 300 psig but this feature has been removed and now an alarm is received at 350 psig and the Annunciator Corrective Action (ACA 2K07 D-7) will direct closing of the suction isolations. Therefore:
A. Incorrect, wrong pressure
B. Incorrect, wrong pressure and the SDC suction valves no longer auto close
D. Incorrect, SDC suction valves no longer auto close

References:

STM 2-14, Shutdown Cooling System, Rev. 11, section 2.1.1, 2.1.2, [page 9]
OP 2104.004, Shutdown Cooling System, Rev. 053, section 6.1.1 and 6.1.2 [page 7]
A2LP-RO-SDC, Rev. 13, Obj. 4, Given a set of plant off-normal SDC system parameters for selected evolutions: determine potential causes AND actions necessary to correct. Identify applicable annunciators AND required response for the alarms including entry to related AOPs and EOPs.

Historical Comments:

NRC bank question used on the 2008 RO/SRO Exam

2.0 Detailed System Description

2.1 Suction Valves

There are three isolation valves in the shutdown cooling suction line between the loop 2 RCS hot leg and the pump. Two of the valves are inside the containment and one is outside containment. The two valves inside the containment are interlocked with pressurizer pressure while the valve outside the containment has no interlocks.

The following sections will discuss the construction and operation of these valves.

2.1.1 Suction Isolation 2CV-5084-1

The first valve in series from the loop 2 hot leg is 2CV-5084-1. It is a 14 inch, motor operated, gate valve that is powered from 480VMCC 2B51 breaker G2.

It is controlled by one of two switches. There is a 3-position (OPEN-REMOTE-CLOSE) maintained switch locally at the MCC cubicle and a 2-position (OPEN-CLOSED) maintained, key operated switch on control room panel 2C17. The switch on the MCC will cause 2K07 F7, "MCC 2B51 VLV SEL SW NOT IN REMOTE" to alarm if it is taken out of the remote position. The switch on 2C17 is a "captured key" type switch with the key removable only in the CLOSE position.

To prevent overpressurization of the SDC system, SDC suction valves 2CV-5084-1 and 2CV-5086-2 can NOT be opened if pressurizer pressure is greater than 350 ± 8 psia from 2PC-4623-1 and 2PS-4623-2. In order to open the valves, RCS pressure must be reduced to less than setpoint. If pressure has been reduced and the valves have been opened, a subsequent rise in pressure to greater than or equal to setpoint causes annunciator 2K07 E7, "SDC ISOL VLV MISPOS/FAILURE" to alarm.

Another condition that causes the alarm would be a loss of power to the relay that provides the interlock discussed previously and the associated valve not fully closed. This relay is powered from 120V AC in panel 2C21-1 that comes from 120V AC instrument panel 2RS1 breaker 8.

Since motor operated valve 2CV-5084-1 is located inside the containment and its power supply is located outside the containment, it is required by technical specifications to have a back up overcurrent device (series breaker). This is supplied by breaker 2B51-L2.

2.1.2 Suction Isolation 2CV-5086-2

The next valve in line is containment isolation valve 2CV-5086-2. The construction and operation of this valve is identical to that of 2CV-5084-1 discussed above. The areas where this valve is different are as follows:

- It is powered by 480V MCC 2B62-E5.
- It is interlocked with pressurizer pressure switch 2PS-4623-2.
- Its control room switch location is 2C16

6.0 SETPOINTS

6.1 2PC-4623-1 and 2PS-4623-2 provide the following interlocks/alarms:

6.1.1 2PC-4623-1

- Open Permissive Interlock to prevent opening 2CV-5084-1 with RCS pressure ≥ 350 ± 8 psia.
- High pressure alarm with 2CV-5084-1 off its closed seat and RCS pressure ≥ 350 ± 8 psia.

6.1.2 2PS-4623-2

- Open Permissive Interlock to prevent opening 2CV-5086-2 with RCS pressure ≥ 350 ± 8 psia.
- High pressure alarm with 2CV-5086-2 off its closed seat and RCS pressure ≥ 350 ± 8 psia.

6.2 Low RWT Level bypasses should be in BYPASS to prevent LPSI pump stop on low RWT level ≤ 6% (RAS).

6.3 LPSI Recirc valves (2CV-5123-1 and 2CV-5124-1) are closed by RAS.

Questions For All QID In Exam Bank

QID: 1518 **Rev:** 0 **Rev Date:** 10/30/2007 **RO Select:** **SRO Select:** **Points:** 1.00

Lic Level: R **Difficulty:** 2 **Taxonomy:** F **Source:** ık ANO-OpsUnit2 **Originator:** Coble

10CFR55_41: **10CFR55_43:** **Section:** **Type:**

System Title: Residual Heat Removal System (RHRS) **System Number** 005 **K/A:** K4.07

RO Tier: 2 **RO Group:** 1 **RO Imp:** 3.2 **SRO Tier:** **SRO Group:** 1 **SRO Imp:** 3.5

Description: Knowledge of RHRS design feature(s) and/or interlock(s) which provide for the following: - System protection logics, including high-pressure interlock, reset controls, and valve interlocks.

Question:

The interlock for the Shutdown Cooling suction MOV's (2CV-5084-1 and 2CV-5086-2) will ____________________ if RCS pressure is approximately __________ psia.

A. prevent opening the valves; 350

B. prevent opening the valves; 300

C. automatically close the valves; 350

D. automatically close the valves; 300

Answer:

A. prevent opening the valves; greater than 350 psia

Notes:

This is a recent change to the Automatic Closing Interlock (ACI) for the SDC Suction Isolation Valves. The valves used to automatically close at > 300 psig but this feature has been removed and now an alarm is received at 350 psig and the Annunciator Corrective Action (ACA) will direct closing of the suction isolations.

References:

STM 2-14, SDC System, Section 2.1
OP 2104.004, SDC System Operations.

Historical Comments:

Has never been used on an NRC Exam 10/30/2007.

Bank:	1853	**Rev:**	1	**Rev Date:**	6/27/2012 10:23:5	**QID #:**	32	**Author:**	Foster
Lic Level:	R	**Difficulty:**	4	**Taxonomy:**	H	**Source:**	NEW		
Search	006000K204	**10CFR55:**	41.7 / 41.10	**Safety Function**	2				
System Title:	Emergency Core Cooling System (ECCS)	**System Number**	006	**K/A**	K2.04				
Tier:	2	**Group:**	1	**RO Imp:**	3.6	**SRO Imp:**	3.8	**L. Plan:**	A2LP-RO-ECCS
OBJ	13								

Description: Knowledge of bus power supplies to the following: - ESFAS-operated valves

Question:

Consider the following:

- Unit 2 is operating at 100% power
- A LOCA has occurred
- Unit 2 Reactor is Tripped
- RCS pressure is 1400 psia and trending down
- Annunciator 2K08 A-3, LOAD CENTER 2B5 UNDERVOLTAGE is in alarm
- Breaker 2A-301, 2B5 bus feeder from 2A3 is open
- All other systems are operating as designed
- OP-2202.001, Standard Post Trip Actions (SPTAs), have been completed

Based on the above conditions, RCS MAKEUP will be supplied by ____________ HPSI train(s).

A. ONLY 2P-89A

B. ONLY 2P-89B

C. BOTH 2P-89A and 2P-89B

D. NEITHER 2P-89A or 2P-89B

Answer:

B. Correct, the low RCS pressure will cause the reactor to trip (RPS signal) the SIAS signal will start both "A" and "B" HPSI pumps [2P-89A/B] but, with 2A301 beaker open, the "A" HPSI Train injection MOVs will not open [all 4 are powered from 480 volt vital power] therefore, RCS makeup will be provided by the "B" HPSI Train only.

Notes:

A, C, and D are Incorrect due to reason stated above

References:

STM 2-05, Emergency Core Cooling System, Rev. 24, section3.1 [page 14] and section 3.5 [page 19]
A2LP-RO-ECCS, Rev. 12, Obj. 13: Describe a SIAS as it relates to the ECCS including the cause of the SIAS; the components actuated by the SIAS; HPSI and LPSI pump response to the SIAS; and flowpaths available during SIAS operation of the ECCS system.

Historical Comments:

New Question
Rev. 1: spelled out SPTA in stem, moved the word only to infront of pump number in answers "A" and "B", capitialized the words only, both, and Neither in the answers.

3.0 High Pressure Safety Injection System

3.1 Overview

The HPSI system injects borated water from the refueling water tank (RWT) into the reactor coolant system (RCS) at a high pressure. The system performs this function automatically when initiated by a Safety Injection Actuation Signal (SIAS). It maintains flow to keep the core covered and cooled for a small break loss of coolant accident (LOCA). It provides recirculation of coolant through the reactor core for an extended period following a LOCA. The HPSI system also injects borated water into the RCS to raise shutdown margin following a rapid cooldown of the RCS caused by a steam line rupture incident.

The HPSI system is a subsystem of the emergency core cooling system (ECCS) also called the safety injection system (SIS). Refer to the drawing on page 64. The HPSI system has three electric motor-driven pumps installed in parallel. Two high pressure injection headers and eight motor operated injection valves connect the pumps to the four injection points on the RCS loop cold legs. A manual throttle valve is located upstream of each of the injection valves. The manual valves are throttled to balance flow between injection legs. A handle restraint is welded to the yoke of the manual throttle valves to prevent operation except during flow balancing.

Two more motor-operated valves connect to the "B" hot leg through the shutdown cooling (SDC) suction piping penetration. This connection allows balancing of the hot leg and cold leg injection flow after a LOCA has occurred. An orifice in each injection header prevents pump runout under low pressure conditions (#1 header - 2FO-5101, #2 header - 2FO-5102).

The "C" pump is considered a swing pump and can be aligned to either high pressure header. It is placed in automatic service if one of the other pumps is not operable. The "A" and "B" pumps are powered from 2A-3 and 2A-4 buses respectively. The "C" pump can be powered from either bus depending on its alignment. Normally, both handswitches in the control room are in the PULL-TO-LOCK position with their associated breakers racked up. A kirk key interlock system at the breaker makes the non-aligned train breaker NOT available. Also the operating springs for the non-aligned breaker are normally discharged.

Pressure actuated relief valves in each high pressure header provide over pressure protection. Another relief in header #1 protects against over pressure from the discharge of the charging pumps when the HPSI piping is used as a flowpath for charging into the RCS.

The refueling water tank (RWT) provides storage for the borated water to be injected. This tank is shared with the containment spray system. When the tank level reaches a low level (6%), both systems then take water from the containment sump.

The HPSI pumps are located in the lowest level of the auxiliary building to provide maximum net positive suction head (NPSH). The "A" and "B" pumps each share a room with a low pressure safety injection (LPSI) pump and a SDC heat exchanger. The "C" pump is in a separate room. This design prevents failure of a single component or

3.4 HPSI Relief Valves

Relief valves 2PSV-5110 and 2PSV-5111 provide over pressure protection to the high pressure headers which could be caused by a temperature rise in isolated piping. These valves, located between the pump discharge check valves (2SI-10A & B) and the header flow detectors, are set at 1950 psi and relieve to the boron management system (BMS) holdup tanks.

Another relief valve (2PSV-5112) installed in header #1 downstream of check valve 2SI-12 protects against over pressure which could occur when using the high pressure header as a flow path from the charging pumps to the RCS. It is set at 2485 psig and also relieves to the BMS holdup tanks.

3.5 HPSI Header Shutoff Valves

The four HPSI headers are required to provide balanced flow to the RCS to mitigate the effects of a break in one of the injection paths. All of the HPSI header shutoff valves are of the same type. The HPSI header shutoff valves are 2CV-5015-1, 2CV-5016-2, 2CV-5035-1, 2CV-5036-2, 2CV-5055-1, 2CV-5056-2, 2CV-5075-1, and 2CV-5076-2.

The header shutoff valves are 2" Anchor/Darling globe valves. These motor operated injection valves open fully upon actuation, relying on manual throttle valves affixed in their throttled position for system flow balance.

The power supplies for the HPSI header shutoff valves are:

Unit:	Power Supply:
2CV-5015-1	2B51-J3
2CV-5016-2	2B61-K1
2CV-5035-1	2B52-F3
2CV-5036-2	2B62-F3
2CV-5055-1	2B51-J2
2CV-5056-2	2B61-J2
2CV-5075-1	2B52-F4
2CV-5076-2	2B62-F4

3.6 HPSI Controls and Interlocks

3.6.1 HPSI Pumps 2P-89A/B

The HPSI pump remote control switches 2HS-5078-1 and 2HS-5079-2 with their associated indicating lights are located on control room panels 2C17 and 2C16 respectively. The switches are spring return to normal with START, NORMAL AFTER START, NORMAL AFTER STOP, STOP and PULL TO LOCK positions. The mechanical indicator on the switch shows a red flag in START and NORMAL AFTER START, a green flag in STOP and NORMAL AFTER STOP, and a black flag in the PULL-TO-LOCK position.

Bank: 1853 **Rev:** 0 **Rev Date:** 5/24/2012 12:48:2 **QID #:** 32 **Author:** Foster

Lic Level: R **Difficulty:** 4 **Taxonomy:** H **Source:** NEW

Search 006000K204 **10CFR55:** 41.7 / 41.10 **Safety Function** 2

System Title: Emergency Core Cooling System (ECCS) **System Number** 006 **K/A** K2.04

Tier: 2 **Group:** 1 **RO Imp:** 3.6 **SRO Imp:** 3.8 **L. Plan:** A2LP-RO-ECCS **OBJ** 13

Description: Knowledge of bus power supplies to the following: - ESFAS-operated valves

Question:

Consider the following:

- Unit 2 is operating at 100% power
- A LOCA has occurred
- Unit 2 Reactor is Tripped
- RCS pressure is 1400 psia and trending down
- Annunciator 2K08 A-3, LOAD CENTER 2B5 UNDERVOLTAGE is in alarm
- Breaker 2A-301, 2B5 bus feeder from 2A3 is open
- All other systems are operating as designed
- SPTA actions have been completed

Based on the above conditions, RCS MAKEUP will be supplied by ______________ HPSI train(s).

QID use History

	RO	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☑	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

A. 2P-89A only

B. 2P-89B only

C. both 2P-89A and 2P-89B

D. neither 2P-89A or 2P-89B

Answer:

B. Correct, the low RCS pressure will cause the reactor to trip (RPS signal) the SIAS signal will start both "A" and "B" HPSI pumps [2P-89A/B] but, with 2A301 beaker open, the "A" HPSI Train injection MOVs will not open [all 4 are powered from 480 volt vital power] therefore, RCS makeup will be provided by the "B" HPSI Train only.

Notes:

A, C, and D are Incorrect due to reason stated above

References:

STM 2-05, Emergency Core Cooling System, Rev. 24, section3.1 [page 14] and section 3.5 [page 19]
A2LP-RO-ECCS, Rev. 12, Obj. 13: Describe a SIAS as it relates to the ECCS including the cause of the SIAS; the components actuated by the SIAS; HPSI and LPSI pump response to the SIAS; and flowpaths available during SIAS operation of the ECCS system.

Historical Comments:

New Question

Bank:	1854	**Rev:**	0	**Rev Date:**	4/9/2012 10:28:36	**QID #:**	33	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NRC bank 1461		
Search	007000K502	**10CFR55:**	41.5 / 41.7	**Safety Function**	5				
System Title:	Pressurizer Relief Tank/Quench Tank System (	**System Number**	007	**K/A**	K5.02				
Tier:	2	**Group:**	1	**RO Imp:**	3.1	**SRO Imp:**	3.4	**L. Plan:**	A2LP-RO-PZR

OBJ 11

Description: Knowledge of the operational implications of the following concepts as they apply to the PRTS: - Method of forming a steam bubble in the PZR

Question:

Consider the following:

- Unit 2 has completed a refueling outage
- Pressurizer Steam Bubble formation is in progress

Which of the following parameter changes, during the Pressurizer Steam Bubble formation, should indicate that all of the non-condensable gases have been removed from the Pressurizer?

A. Pressurizer pressure lowering with Pressurizer water temperature above saturation

B. Pressurizer pressure rising with Pressurizer water temperature below saturation

C. Quench Tank pressure rising continuously with Quench Tank level stable

D. Quench Tank pressure rising slowly with Quench Tank level rising slowly

Answer:

D. Correct, Quench Tank pressure and level rising slowly (OP-2102.003 section 9.0 note before step 9.20)

Notes:

A. and B. are Incorrect due to the Psat Tsat relationship
C. incorrect, this is indication of non-condensable gases still entering the QT

References:

OP-2103.002, Filling and Venting the RCS, Rev. 057, section 9.0, note before step 9.20 [page 29]
OP 2103.007, QT and RDT Operations, Rev.021, section 3.0 [page 2]
STM 2-03, Reactor Coolant System, Rev. 20, section 2.4 [page 25] and figure on page 47
A2LP-RO-PZR, Rev. 3, Obj. 11, Explain the following: Establishing a steam bubble in the Pressurizer

Historical Comments:

NRC bank 1461, changed the wording of the question but does not met the requirements of a modified question

9.19 IF Quench Tank pressure reaches 30 psig OR Quench Tank venting desired, THEN perform the following: ______

9.19.1 Close the following valves:

- Pressurizer Vent 2SV-4636-1 (2HS-4636-1)
- Pressurizer Vent 2SV-4636-2 (2HS-4636-2)
- Vent to Quench Tank Isolation 2SV-4669-1 (2HS-4669-1)

9.19.2 Open Quench Tank Vent To CVH 2CV-4691 (2HS-4691) to vent Quench Tank to CNTMT sump or Waste Gas System.

9.19.3 WHEN Quench Tank pressure less than 5 psig, THEN close Quench Tank Vent To CVH 2CV-4691 (2HS-4691).

NOTE

When all non-condensable gases vented from PZR and only steam being vented and condensed, Quench Tank pressure and level will rise slightly.

9.20 Repeat steps 9.17 through 9.19 until Quench Tank pressure rises only slightly (less than 5 psig) when Pressurizer vented. ______

9.21 Verify the following valves closed to raise RCS pressure: ______

- Pressurizer Vent 2SV-4636-1 (2HS-4636-1)
- Pressurizer Vent 2SV-4636-2 (2HS-4636-2)
- Vent to Quench Tank Isolation 2SV-4669-1 (2HS-4669-1)

NOTE

Cold Shutdown Valve Testing (2305.006), Supplement 3 must be completed prior to exceeding 75 psia.

9.22 WHEN BOTH of the following conditions met, ______

- RCS Pressure greater than 25 psia
- 18 Month Reactor Coolant System Vent Valve Test required

THEN perform Cold Shutdown Valve Testing (2305.006), Supplement 3.

1.0 PURPOSE

To provide instructions for evolutions involving Quench Tank (2T-42), Reactor Drain Tank (2T-68) and associated systems.

2.0 SCOPE

This procedure provides a description and instructions for operation of Reactor Drain Tank (2T-68), Quench Tank (2T-42) and Reactor Drain Tank Pumps (2P-41A and 2P-41B).

3.0 DESCRIPTION

The purpose of the Quench Tank is to collect and condense discharge of Pressurizer Safety valves and to collect Reactor Coolant Pump (RCP) controlled bleed-off if normal bleed-off path fails or isolates. Pressurizer Low Temperature Over Pressure Protection relief valves, Pressurizer Emergency Core Cooling System vents and Pressurizer and Reactor Vessel Head High Point vents discharge to the Quench Tank through the Pressurizer Safety Valves discharge line. Quench Tank is maintained partially filled with water from Reactor Makeup water to allow for discharge of Pressurizer Safety Valves below water level for steam condensing. The Quench Tank drains to the Reactor Drain Tank. A relief valve and rupture diaphragm provide overpressure protection for the Quench Tank.

The Reactor Drain Tank collects water from the following systems and components:

- Quench Tank (2T-42)
- Reactor Coolant System (RCS) Loop drains
- Regenerative Heat Exchanger (2E-23) drain
- Letdown Line drain

- Gasket Leak-off from the Vessel Head and RCPs
- Shutdown Cooling Relief Valves (2PSV-5085 and 2PSV-5087)
- Safety Injection Tank Drains and Drain Header Relief
- Vapor Seal Leakage from the RCPs

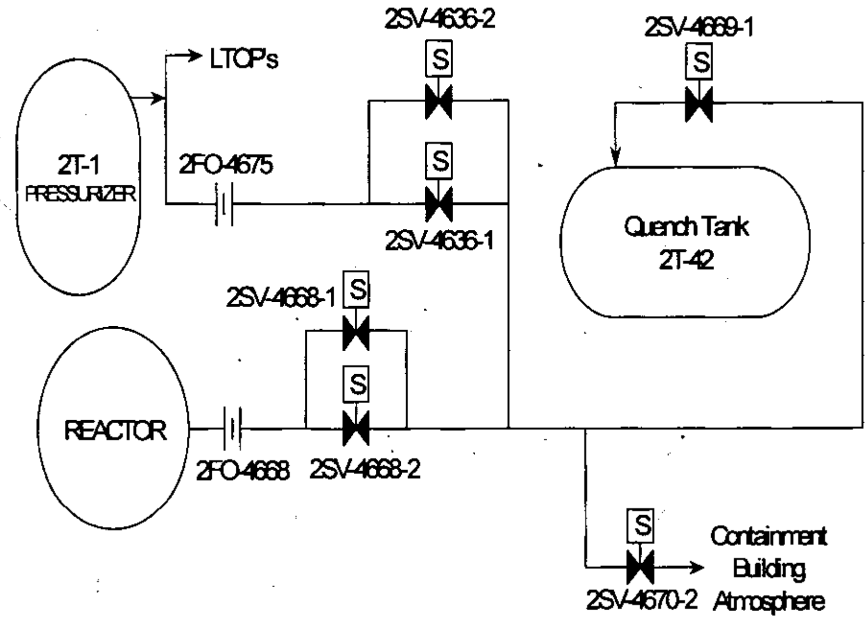
The Reactor Drain Tank is a horizontal, cylindrical tank located in the Containment Building and has 1600 gallons capacity. It is designed for 250°F and internal pressure of < 25 psig. The Reactor Drain Tank is pumped to the Boron Management System (BMS) using the Reactor Drain Pumps (2P-41A and 2P-41B). These pumps have sufficient capacity to completely drain the Reactor Coolant System in 8 hours.

Annunciator 2K10-E4, "QUENCH TANK LEVEL HI/LO", is actuated at > 87% and < 73%.

Pressure transmitter, 2PT-4694, allows the quench tank pressure to be monitored on 2C-04 (2PIS-4694) and the Plant Computer. The "QUENCH TANK PRESSURE HI" annunciator, 2K10-D4, alerts the operator when pressure exceeds 40 PSIG.

2.4 Reactor Coolant System High Point Vents

The RCS High Point Vents are provided to exhaust non-condensable gases and/or steam that could inhibit natural circulation cooling in the RCS. Natural circulation uses the difference in temperature and elevation of the Reactor (heat source) and Steam Generators (heat sink) to provide the driving force for flow. In this mode of cooling, low flow areas such as the Reactor vessel head area may not be sufficiently cooled and have the fluid flash to steam creating a void. If the void grows large enough it can impede the natural circulation and therefore needs to be removed. The high point

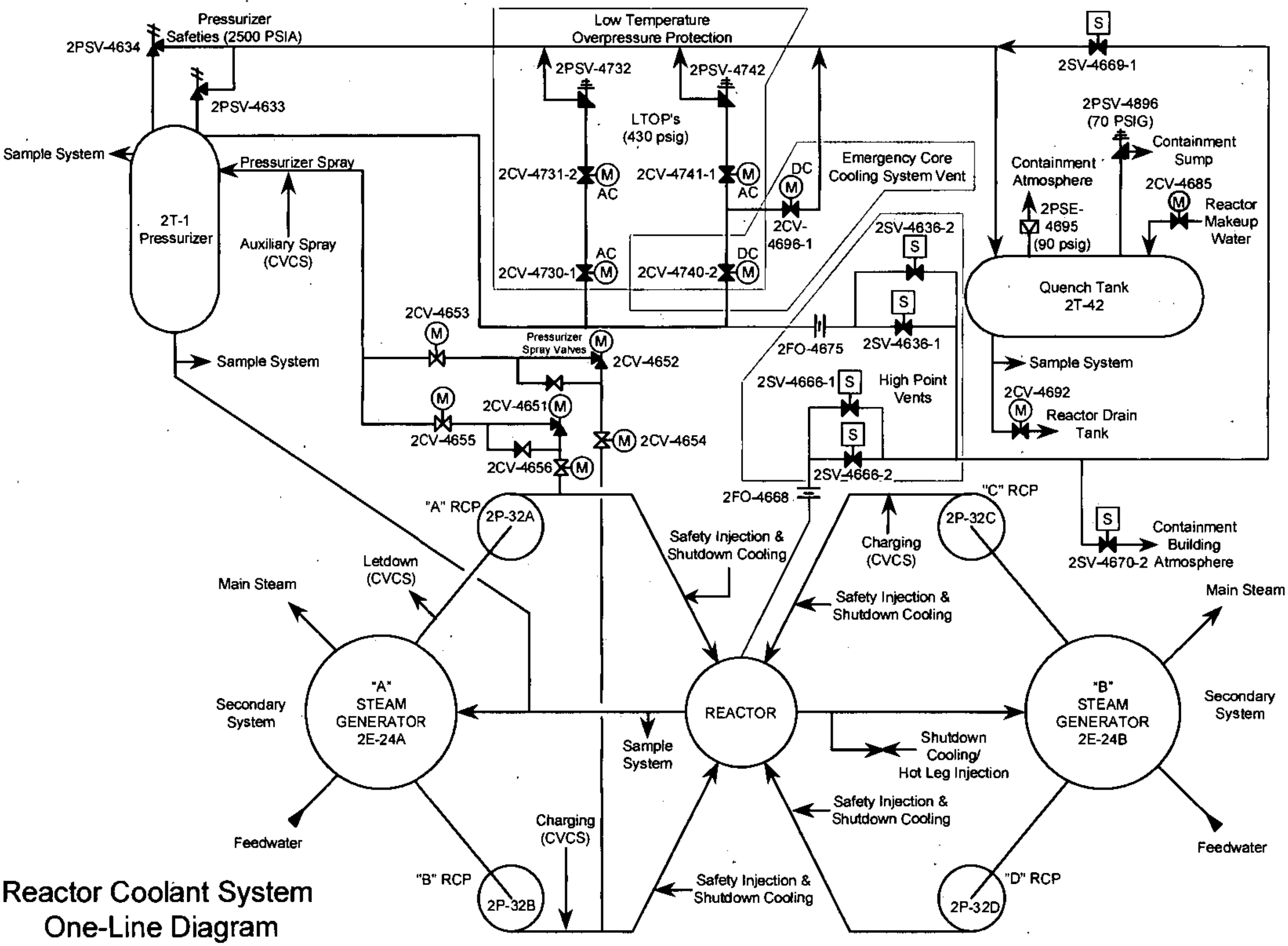


vents are one method that can be used to aid in void removal.

In addition to the above function, the RCS High Point Vents are used to remove non-condensable gases from the RCS during RCS fill and provide a vent path during RCS draining activities.

Six solenoid valves are provided on the RCS for a means of venting the RCS. These "energize to open" solenoids provide a vent path from the top of the pressurizer (2SV-4636-1 and 2SV-4636-2) and the Reactor vessel head (2SV-4668-1 and 2SV-4668-2). The two remaining solenoids determine the vent path, either to the containment atmosphere (2SV-4670-2) or the quench tank (2SV-4669-1).

Figures



Reactor Coolant System One-Line Diagram

QID: 1461 **Rev:** 0 **Rev Date:** **RO Select:** **SRO Select:** **Points:** 1.00

Lic Level: R **Difficulty:** 3 **Taxonomy:** An **Source:** NEW **Originator:** Coble

10CFR55_41: **10CFR55_43:** **Section:** **Type:** OLD

System Title: Pressurizer Relief Tank/Quench Tank System (**System Number** 007 **K/A:** K5.02

RO Tier: 2 **RO Group:** 1 **RO Imp:** 3.1 **SRO Tier:** **SRO Group:** 1 **SRO Imp:** 3.4

Description: Knowledge of the operational implications of the following concepts as they apply to the PRTS: - Method of forming a steam bubble in the PZR

Question:

Given the following:

* A refueling outage has been completed.
* The PZR has been filled to 85% in preparation of forming a steam bubble.
* All PZR heaters have been energized and the temperature of the PZR is rising.
* The PZR is being vented to the Quench Tank to remove non-condensable gases.
* The Quench Tank is being vented when it reaches 30 psig.

Which of the following parameter changes would indicate that all of the non condensable gases have been removed from the Pressurizer.

a. Quench Tank pressure stable with Quench Tank level rising slowly.

b. Pressurizer pressure rising with PZR water temperature below saturation .

c. Quench Tank pressure rising continuously with Quench Tank level stable.

d. Pressurizer pressure lowering with PZR water temperature above saturation .

Answer:

a. Quench Tank pressure stable with Quench Tank level rising slowly.

Notes:

References:

OP 2103.002, Filling and Venting of the RCS, Section 9 and note before step 9.19.
OP 2103.007, QT and RDT Operations, Section 3.0
STM 2-03, RCS, Section 2.4 and figure on page 58.

Historical Comments:

Bank: 1855	**Rev:** 0	**Rev Date:** 5/26/2012 12:03:0		**QID #:** 34		**Author:** Foster			
Lic Level: R	**Difficulty:** 2	**Taxonomy:** H		**Source:** NEW					
Search 008000A102		**10CFR55:** 41.5 / 41.7		**Safety Function** 8					
System Title: Component Cooling Water System (CCWS)				**System Number** 008		**K/A** A1.02			
Tier: 2	**Group:** 1	**RO Imp:** 2.9	**SRO Imp:** 3.1	**L. Plan:** A2LP-RO-CCW		**OBJ** 12			

Description: Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCWS controls including: - CCW temperature

Question:

Consider the following:

- Unit 2 is operating at 100% power
- Lake temperature is 45°F
- The Letdown Flow control valves [2CV-4816 and 2CV-4817] have failed closed
- NO operator actions have been taken

Due to the above conditions, Component Cooling Water (CCW) temperature should ________ and if actions were taken to RAPIDLY return CCW temperature to the middle of its normal control band, the component(s) of concern should be ______________.

A. rise; RCP seals

B. lower, RCP seals

C. rise; Isophase duct system

D. lower, Isophase duct system

Answer:

B. Correct, with the L/D Flow Control valves failed closed the heat load on the L/D heat exchanger will go away [large load on the CCW system] therefore, CCW flow will lower thru the Hx removing less heat which will cause overall CCW temperature to lower. RCP seal concerns are with a quick change in CCW temperature [L&P 5.7]

Notes:

A and C are Incorrect; CCW temp will lower,

D. Incorrect; CCW temp will lower without operator action. Concern with a low CCW temperature [<80°F and per the limit and precaution 5.4 in OP-2104.028] is moisture intrusion in the isophase duct cooling system

References:

OP-2104.028, Component Cooling Water, Rev. 040, section 5.0, Limits & Precautions, 5.4 and 5.7 [page 4]
A2LP-RO-CCW, Rev. 3, Obj. 12, List the loads supplied by CCW to include: method of CCW flow control through the components, fail position of any flow control valves and, any automatic actuations associated with any isolation valves

Historical Comments:

New Question

5.0 LIMITS AND PRECAUTIONS

5.1 Severe throttling with Hx SW outlet valves (2SW-5, 2SW-7 or 2SW-9) should be minimized due to downstream piping erosion, valve wear, and poor control capability.

5.2 Adjustment to CCW outlet temperature should be accomplished in a slow and controlled manner to prevent damage to RCP seals.

5.3 When operating 2P-33A/B Crossover valves (2CV-5220 and 2CV-5230) or 2P-33B/C Crossover valves (2CV-5221 and 2CV-5232) in either direction, hold valve handswitch in the appropriate position for ~ 5 seconds after receiving full open or full closed position indication to ensure complete valve travel. These valves have no seal-in feature and air is only applied to valve operator while handswitch is held in position.

5.4 If Loop II CCW Temperature (2TIS-5209) < 80°F, contact System Engineering. If Loop II CCW Temperature (2TIS-5209) < 80°F for > 1 hour, then initiate Condition Report to evaluate possible moisture intrusion into Isophase Bus Cooling system. (ER-ANO-2000-3316-008)

5.5 Normal pump bearing temperature is 70 to 80°F above ambient. Bearing temperatures more than 160°F above ambient should be investigated.

5.6 Prior to starting a CCW pump, ensure the system and components are filled and vented.

5.7 Maintain Loop 2 CCW temperature as steady as possible within a 90 to 100°F band. Note that a steady CCW temperature is more important than the absolute value of the CCW temperature. If the Loop 2 CCW temperature falls outside this band, slowly adjust the temperature back into this band. Maintaining this temperature band will have a positive impact on the health of the RCP mechanical seals. (Reference CR-ANO-2-2009-01126)

Bank:	1856	**Rev:**	0	**Rev Date:**	5/26/2012 12:25:3	**QID #:**	35	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	H	**Source:**	NEW		
Search	0080002128	**10CFR55:**	41.7	**Safety Function**	8				
System Title:	Component Cooling Water System (CCWS)	**System Number**	008	**K/A**	2.1.28				
Tier:	2	**Group:**	1	**RO Imp:**	4.1	**SRO Imp:**	4.1	**L. Plan:**	A2LP-RO-CCW
OBJ	1, 17								

Description: Conduct of Operations - Knowledge of the purpose and function of major system components and controls.

Question:

The purpose of the Component Cooling Water [CCW] surge tanks [2T-37A/B] is to provide net positive suction head [NPSH] to the CCW pumps and in the event a high radiation condition in the CCW system, the CCW surge tank vents should be ______________ aligned to ______________________.

A. manually; atmosphere

B. automatically; atmosphere

C. manually; the Auxiliary Building exhaust fan suction [2VEF-8A/B]

D. automatically; the Auxiliary Building exhaust fan suction [2VEF-8A/B]

Answer:

C. Correct; system design

Notes:

A, B and D are incorrect due to either wrong method of aligning vent path or wrong vent path

References:

STM 2- 43, Component Cooling Water System, Rev. 13, section 1.1 [page 1] section 2.8.2 [page 11]
A2LP-RO-CCW, Rev. 3, Obj. 1: Describe the purpose of the Component Cooling Water (CCW) System. And Obj. 17: Describe the design features of the CCW system which reduce the possibility of radioactive release to the environment.

Historical Comments:

New Question

STM 2-43

Component Cooling Water System

1.0 Introduction

1.1 Purpose of the System

The Component Cooling Water (CCW) System functions to serve three purposes:

- It provides cooling water to remove heat from components in various reactor auxiliary systems which carry radioactive or potentially radioactive fluids,
- Provides a monitored intermediate barrier between reactor auxiliary system fluids and the Service Water System to prevent accidental release of radioactivity to the environment, and
- Removes heat from various other sources that are not potentially contaminated but require higher water quality than that offered by the Service Water System.

The CCW system is designed to reduce the possibility of radioactive liquid from escaping the system and reaching the environment. This is accomplished with the following design features:

1. Radiation monitors are installed in the system to detect activity.
2. Surge tanks vents are designed to be vented to the 2VEF-8A/B suction via the Aux Building Radwaste Area Vent Header.
3. The Surge tanks can be drained to the Liquid Radwaste System (LRW).
4. Chemistry control extends the life of the components thereby minimizing potential of radioactive water leaking into CCW.
5. Service water pressure at the CCW heat exchangers is greater than CCW pressure so SW will leak into the CCW system instead of CCW leaking out to the environment.

1.2 System Introduction

The CCW System is comprised of three pumps. Two CCW pumps are normally operating supplying cooling water to two-10 inch closed loop headers designated Loop I and Loop II.

- Loop I supplies CCW to components which may be secured at times and, if necessary, could be shutdown.
- Loop II supplies CCW to loads which are in continuous use.

The suction head on the CCW pumps is maintained by the use of surge tanks. The discharge header of the pumps is provided with pressure control bypass valves that maintain a constant pressure to both loops regardless of system demand.

The CCW removes heat from various plant components and in turn, is cooled by the Service Water System. The system is provided with three shell and tube type heat exchangers. Two heat exchangers are normally in service with CCW on the shell side and Service Water on the tube side.

housing turns, the jacking nut will also turn and travel up or down the stem dependent upon the direction the handwheel is turned. Once the jacking nut is "bottomed out", as the handwheel is rotated in the counter-clockwise direction, the jacking nut will be able to pull the stem up which opens the valve. The thing to realize at this point is the stem is rising against spring pressure so there will be considerable resistance.

If taking manual control and the handwheel is easy to rotate, chances are the jacking nut is not bottomed out. This means the valve is not opening. When manual operation is complete, it is essential to ensure the stem jacking nut is backed off of the bottom of the stem protector housing to enable proper automatic operation.

2.8.2 Vent Valves

Each CCW Surge tank is equipped with its own Vent valve. The Surge Tank Vent valves are designated 2CV-5217 for tank "A" and 2CV-5218 for tank "B". Both valves are air piston operated, 3-way, plug valves. The valves are positioned when their associated solenoid valve 2SV-5217 for 2T-37A and 2SV-5218 for 2T-37B, is energized or de-energized.

Normally these valves are lined up to vent the Surge tanks to atmosphere. In the event of a high radiation alarm on one of the CCW process radiation monitors, the vents can be manually aligned to the suction of the Radwaste Area filter Units, 2VEF-8A and B. This is accomplished using the Vent valve's 2- position handswitches on 2C14 in the Control Room. The two positions available are "ATMOS" and "2VEF-8A/B SUCTION".

When the Control Room handswitch is taken to the 2VEF-8A/B SUCTION position, the Surge tank Vent valve solenoid valve is energized to port air to the top of the Vent valve actuator piston. This will cause the valve to shift to the Radwaste Area Filter Units. When the handswitch is taken back to the ATMOS position, the solenoid valve will de-energize and vent air from the top of the piston causing the Vent valve to shift back to atmosphere.

2SV-5217 receives power from 120V AC in panel 2C14 which is supplied from 2Y-1 breaker 14. 2SV-5218 receives power from 120V AC in panel 2C14 which is supplied from 2Y-2 breaker 14. Both valves fail to vent the Surge tanks to the atmosphere on a loss of Instrument Air or a loss of power to the solenoid valve

2.9 Chemical Addition Pots

As with any water system, whether an open or closed system, chemistry control is very important to the CCW system.

Chemicals to the CCW system are added through three chemical addition pots (one pot per pump). The chemicals normally added to the system to control water chemistry are:

- **Biocide** to prevent biological growth that could cause fouling within the system, and
- **Corrosion Inhibitor** (as determined by the Chemistry Department) used for corrosion control.

Bank:	1857	**Rev:**	0	**Rev Date:**	4/9/2012 4:47:16	**QID #:**	36	**Author:**	Foster	
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	Modified NRC exam bank 1745			
Search	010000K502	**10CFR55:**	41.5			**Safety Function**	3			
System Title:	Pressurizer Pressure Control System (PZR PCS)			**System Number**	010	**K/A**	K5.02			
Tier:	2	**Group:**	1	**RO Imp:**	2.6	**SRO Imp:**	3.0	**L. Plan:**	aslp-ro-tm004	**OBJ** 22

Description: Knowledge of the operational implications of the following concepts as they apply to the PZR PCS: - Constant enthalpy expansion through a valve

Question:

Consider the following:

- Unit 2 has tripped from 100%
- An RCS pressure transient has occurred
- Pressurizer Code Safeties are lifting
- Quench Tank pressure is 30 psig and trending up

What is the condition of the fluid entering the Quench Tank?

A. wet steam

B. dry steam

C. subcooled liquids

D. superheated steam

Answer:

A. Correct

Notes:

The examinee will be required (from memory) to know the pressurizer code safety lift setpoint [2500 psia]. Using the steam tables, determine the condition of the leaking fluid. [fluid change from 2500 psia [lift setpoint of the code safeties] convert to 2485 psig going to 30 psig [QT pressure]

References:

T.S. 3.4.3, amendment 281[code safety setpoint of 2500 psia]
current copy of steam tables

Historical Comments:

Modified NRC bank question 1745; used on the 2011 NRC RO/SRO Exam

SAFETY VALVES – OPERATING

LIMITING CONDITION FOR OPERATION

3.4.3 All pressurizer code safety valves shall be OPERABLE with a lift setting 2500 psia ± 3%*.

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

a. With one pressurizer code safety valve inoperable, either restore the inoperable valve to OPERABLE status within 15 minutes or be in HOT SHUTDOWN within 12 hours.

b. The provisions of specification 3.0.4.c may be applied and the requirements of ACTION "a" suspended for one valve at a time for up to 18 hours for entry into and during operation in MODE 3 for the purpose of setting the pressurizer code safety valves under ambient (hot) conditions provided a preliminary cold setting was made prior to heatup.

SURVEILLANCE REQUIREMENTS

4.4.3 No additional Surveillance Requirements other than those required by the Inservice Testing Program.

* The lift setting pressure shall correspond to ambient conditions of the valve at nominal operating temperature and pressure. If found outside of a ± 1% tolerance band, the setting shall be adjusted to within ± 1% of the lift setting shown.

QID: 1745 **Rev:** 1 **Rev Date:** 12/17/2010 **RO Select:** **SRO Select:** **Points:**

Lic Level: R **Difficulty:** 3 **Taxonomy:** H **Source:** RC Exam Bank #1 **Originator:** Jim Wright

10CFR55_41: **10CFR55_43:** **Section:** **Type:**

System Title: Pressurizer Pressure Control System (PZR PC **System Number** 010 **K/A:** K5.02

RO Tier: 2 **RO Group:** 1 **RO Imp:** 2.6 **SRO Tier:** **SRO Group:** 1 **SRO Imp:** 3.0

Description: Knowledge of the operational implications of the following concepts as they apply to the PZR PCS: - Constant enthalpy expansion through a valve

Question:

Given the following conditions:

* Unit 2 operating at full power.
* A steam leak develops on the "A" Main Steam line outside containment.
* A one (1) gpm RCS leak develops upstream of the Pressurizer High Point vent valve.
* Containment pressure is at atmospheric.

Which of the following statements correctly describes the condition of the steam exiting each leak?

A. The primary side steam is saturated, the secondary steam is saturated.

B. The secondary steam is superheated, the primary steam is saturated.

C. The primary steam is superheated, the secondary steam is superheated.

D. The secondary steam is saturated, the primary steam is superheated.

Answer:

B. The secondary steam is superheated, the primary steam is saturated.

Notes:

The examinee will be required to know both primary and secondary temperatures and pressures. Using the steam tables, determine the condition of the leaking fluid.

References:

Steam Tables/ Mollier Diagram. Figure A-1

Historical Comments:

QID 196 was used on the 2000 NRC Exam

Bank:	1858	**Rev:**	0	**Rev Date:**	4/27/2012 4:02:46	**QID #:**	37	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	H	**Source:**	NEW				
Search	010000K601	**10CFR55:**	41.7	**Safety Function**	3						
System Title:	Pressurizer Pressure Control System (PZR PCS)	**System Number**	010	**K/A**	K6.01						
Tier:	2	**Group:**	1	**RO Imp:**	2.7	**SRO Imp:**	3.1	**L. Plan:**	A2LP-RO-APZRM	**OBJ**	2

Description: Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: - Pressure detection systems

Question:

Consider the following:

- Unit 2 is operating at 100% power
- Annunciator 2K10 E-6, CNTRL CH 1 Pressures HI/LO, is in alarm
- Annunciator 2K10 E-7, CNTRL CH 2 Pressures HI/LO, is in alarm
- OP-2203.028, Pressurizer Malfunctions AOP, has been entered

As directed by OP-2203.028, Pressurizer Malfunctions AOP, the FIRST action the CRS directs should be to:

A. Place SDBCS Master controller in Auto local and adjust the controller setpoint to 1010 psia

B. Manually control Pressurizer Heater and Spray Valves and restore RCS pressure to 2025 to 2275 psia

C. Verify a maximum of ONE SDBCS 11 1/2% Bypass OR Downstream ADV Permissive switch in MANUAL

D. Verify a maximum of ONE SDBCS 11 1/2% Bypass AND Downstream ADV Permissive switch in MANUAL

Answer:

B. Correct, OP-2203.028, Pressurizer Malfunctions AOP step 5 contingency column 5.E

Notes:

A. Incorrect, this action is directed for a loss of "B" control channel
C. Incorrect, this action would be for a loss of the "A" control channel
D. Incorrect, just one SDBCS 11 1/2% dump valve is required the " AND" implies 2 valves vs. one

References:

OP-2203.012-J ACA, Rev. 037, windows E6, step 2.3 [page 61] and E-7, step 2.3 [page 71]
OP-2203.028, Pressurizer Malfunctions AOP, Rev. 010, entry section [page 1] step 6, contingency column, 6.B.1) [page 6]
A2LP-RO-APZRM, Rev, 0, Obj. 2, Describe the mitigation strategy and instructions for actions directed in OP-2203.028, Pressurizer System Malfunction AOP.

Historical Comments:

New Question

ANNUNCIATOR 2K10

E-6

CNTRL CH 1 PRESSURE HI/LO

1.0 CAUSES

1.1 High - ≥ 2340 psia RCS pressure (2PS-4626A).

1.2 Low - ≤ 2100 psia RCS pressure (2PS-4626A).

2.0 ACTION REQUIRED

2.1 Refer to Tech Spec 3.2.8.

2.2 IF reducing pressure due to Safety valve leakage, THEN no further action required.

2.3 Refer to 2203.028, PZR Systems Malfunction.

3.0 TO CLEAR ALARM

3.1 Restore RCS pressure to between 2100 psia and 2340 psia.

4.0 REFERENCES

4.1 E-2456-4

ANNUNCIATOR 2K10

E-7

CNTRL CH 2 PRESSURE HI/LO

1.0 CAUSES

1.1 High - $\geq$ 2340 psia RCS pressure (2PS-4626B).

1.2 Low - $\leq$ 2100 psia RCS pressure (2PS-4626B).

2.0 ACTION REQUIRED

2.1 Refer to Tech Spec 3.2.8.

2.2 IF reducing pressure due to Safety valve leakage, THEN no further action required.

2.3 Refer to 2203.028, PZR Systems Malfunction.

3.0 TO CLEAR ALARM

3.1 Restore RCS pressure to > 2100 psia and < 2340 psia.

4.0 REFERENCES

4.1 E-2456-4

PZR SYSTEMS MALFUNCTION

PURPOSE

This procedure provides actions for a PZR System Malfunction.

ENTRY CONDITIONS

ANY of the following conditions exist:

1. PZR level deviating from setpoint during steady state operations.
2. RCS pressure deviating from setpoint during steady state operations.
3. "CNTRL CH 1/2 PRESSURE HI/LO" annunciator (2K10-E6/E7) in alarm.
4. "CNTRL CH 1/2 LEVEL LO" annunciator (2K10-G6/G7) in alarm.
5. "CNTRL CH 1/2 LEVEL HI" annunciator (2K10-J6/J7) in alarm.
6. PZR Spray valve failed open or closed.

EXIT CONDITIONS

ANY of the following conditions exists:

1. Unaffected PZR level control channel has been selected and Letdown restored.
2. Unaffected PZR pressure control channel has been selected and RCS pressure restored to 2025 psia to 2275 psia.

INSTRUCTIONS	CONTINGENCY ACTIONS
6. **Check "CNTRL CH 1/2 PRESSURE HI/LO" annunciators (2K10-E6/E7) clear.**	6. **Perform the following:**

A. Compare PZR pressure instruments to determine affected channel.

B. IF BOTH PZR Pressure Control channels failed,
THEN perform the following:

1) Manually control PZR Heaters and Spray Valves to restore RCS pressure 2025 psia to 2275 psia.

2) Place the SDBCS in required contingency alignment using Attachment A, SDBCS Operations.

C. IF only the selected control channel affected, THEN perform the following:

1) Place PZR Pressure Channel Select switch (2HS-4626) to the unaffected channel.

NOTE

Proportional Heater controller is located on Page 3.

2) Restore PZR Spray valves and Heater control to automatic.

D. IF Pressure Control Channel 1 failed, THEN place the SDBCS in required contingency alignment using Attachment A, SDBCS Operations.

E. IF Pressure Control Channel 2 failed, THEN place the SDBCS in required contingency alignment using Attachment A, SDBCS Operations.

Bank:	1859	**Rev:**	0	**Rev Date:**	4/11/2012 9:42:05	**QID #:**	38	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	Modified ANO-OpsUnit2-10334				
Search	012000K201	**10CFR55:**	41.7	**Safety Function**	7						
System Title:	Reactor Protection System	**System Number**	012	**K/A**	K2.01						
Tier:	2	**Group:**	1	**RO Imp:**	3.3	**SRO Imp:**	3.7	**L. Plan:**	A2LP-RO-RPS	**OBJ**	14

Description: Knowledge of bus power supplies to the following: - RPS channels, components, and interconnections

Question:

Consider the following:

- Unit 2 is operating at 100% power
- A loss of 120v Vital AC to 2RS-4 has occurred

Which of the following Reactor Trip Circuit Breakers (TCBs) should be open?

A. Breakers 1 and 5

B. Breakers 2 and 6

C. Breakers 3 and 7

D. Breakers 4 and 8

Answer:

D. Correct, K-4 relay is powered from 2RS-4

Notes:

A. Incorrect, K-1 relay (trips breakers 1 and 5) is powered from 2RS-1
B. Incorrect, K-2 relay (trips breakers 2 and 6) is powered from 2RS-2
C. Incorrect, K-3 relay (trips breakers 3 and 7) is powered from 2RS-3

References:

STM 2-63, Reactor Protection System, Rev. 11, section 4.0 (power supply) [page 18] and section 5.0 (table on page 37) trip paths (breaker combinations)
A2LP-RO-RPS, Rev. 10, Obj. 14; Given a set of plant conditions related to the Reactor Protection System, predict the system response to these conditions and determine the final state of system components.

Historical Comments:

Modified from ANO Exam Bank ,ANO-OpsUnit2-10334

4.0 Detailed Description

The Reactor Protection System, or RPS, consists of the following major subsections. Refer to the figure on page 56:

a. NSSS Parameter Measurement Channel

b. Bistable or Auxiliary Trip Units

c. Coincidence Logic Matrices

d. RPS Trip Paths

e. RPS Testing System

The signals from the NSSS measurement channels supply the information to the PPS for the selected parameters. The inputs are in the form of a positive 0-10 volt DC signal. The Bistable Comparator Trip Units compare these electrically positive signals with a respective negative DC reference setpoint. If the input signals reach or exceed the negative setpoint value, the Bistable Comparator Trip Units provide trip signals to the Bistable Trip Units which, in turn, provides trip signals to the coincidence logic. The coincidence logic matrices provide trip signals to the Reactor Trip Circuit Breakers upon selected coincident trip signals from the Bistable or Auxiliary Trip Units. The Bistable/Auxiliary Trip Units provide trip signals to the coincidence logic upon receipt of an external contact status input from the Core Protection Calculators (refer to STM-2-65-1).

4.1 Power - Channels and Components

The figures on pages 57 and 58 list the power supplies to the Plant Protection System cabinets 2C23 including, their respective voltages and an over-all simplified usage listing. The figure on page 59 shows a typical PPS cabinet power supply arrangement (not shown are the Test and Status Panel power supplies). This figure outlines the power supply inputs, power supply indication, supply alarm contact and the supply distribution.

Power for each Channel, which includes the PPS loops and ESFAS Cabinets 2C39 and 2C40, is channelized. The power supplies are arranged as follows:

There are six inverters which may be used to supply Vital AC power to the cabinets. Of the six inverters, four are available only to their respective power panels. That is, 2Y-11 supplies 2RS-1; 2Y-22 supplies 2RS-2; 2Y-13 supplies 2RS-3; and 2Y-24 supplies 2RS-4. Additionally, there are 2 swing inverters. 2Y-1113 may be aligned to either 2RS-1 or 2RS-3, and 2Y-2224 may be aligned to either 2RS-2 or 2RS-4.

These power panels then provide power to the PPS channels;

2RS-1 to 2C23-A	2RS-2 to 2C23-B	2RS-3 to 2C23-C	2RS-4 to 2C23-D

Each PPS Channel cabinet is equipped with its own power supply circuit breaker.

5.0 RPS Trip Paths

The RPS Trip Paths are used to provide automatic opening of the Reactor Trip Circuit Breakers (TCBs). This action interrupts power to the CEDMs allowing the CEAs to drop into the core.

There are four Trip Paths designated TP1, TP2, TP3, and TP4. Each RPS Trip Path controls a Trip Path Relay (which is a solid state relay, sometimes designated as SSR) set, which in turn controls respective TCB control relays ("K" relays). The table below shows the component relationships between the Trip Paths and the TCBs.

RELAY	TRIP PATH	LOCATION	ACTUATES
K1	Trip Path 1	Channel A	TCBs 1 & 5
K2	Trip Path 2	Channel B	TCBs 2 & 6
K3	Trip Path 3	Channel C	TCBs 3 & 7
K4	Trip Path 4	Channel D	TCBs 4 & 8

Again, refer to the figure on page 56. Each Trip Path contains six series contacts. Each one of the six series contacts in a given trip path is operated by a Logic Matrix Relay in each of the six different Logic Matrices Ladders. For example Trip Path 1 contains contacts from Logic Matrix Relays AB1, BC1, BD1, AC1, CD1 and AD1. In all there are 4 Trip Paths with 6 Matrix Contacts in each. With this contact arrangement, you readily see how any "2-out-of-4" channel actuation will trip the TCBs.

Each Trip Path controls three solid state Trip Path relays (SSRs). The three SSRs control the TCB control relays K1 through K4, and also provides for indication and annunciators (see page 64).

Each TCB Control Relay, K(X), operates two pair of contacts;

- One pair associated with two parallel Under Voltage (UV) trip coils
- The other pair, associated with two parallel Shunt Trip (ST) coils.

The figures on pages 70 and 71 illustrate RPS Trip Path 1 in Channel A. The first figure shows the trip path de-energized or with a trip signal present. The second figure illustrates the Trip Path when no trip is initiated.

Each Trip Path and TCB control relay is associated with two parallel TCBs. Each TCB can be tripped by either de-energizing its associated UV coils or by energizing its associated ST coils. The UV and ST coils for a given TCB are located in the Reactor Trip Switchgear cabinet 2C75. These coils are connected in parallel across a common 125 vDC power supply (2RA-1 through 2RA-4). The TCB control relays, in 2C23(X), are powered by 120 vAC vital power supplies 2RS-1, 2RS-2, 2RS-3, and 2RS-4.

 ANO-OpsUnit2-10334

Which of the following Reactor Trip Circuit Breakers would open on a loss of 120V Vital AC bus 2RS-1?

A. Breakers 1 and 5.
B. Breakers 2 and 7.
C. Breakers 3 and 6.
D. Breakers 4 and 8.

Answer: A

Question Comments: QID 0655, Unit 2;

Image Reference: None

QuestionID: ANO-OpsUnit2-10334

Objectives:

1. CourseID: A2LP-RO-RPS Objective: 14

KA References:

1. 057 AA2.19 The plant automatic actions that will occur on the lossof a vital ac electrical instrument bus [4/4]

References:

1. STM 2-63

Training Programs:

Categories:

Systems:

Task References:

Cognitive Level: 2: Comprehension or Analysis

Point Value: 1.0

Exam Bank: OpsUnit2

Review Status: Not Reviewed

Comments:

ORIGINAL

Bank:	1860	**Rev:**	0	**Rev Date:**	4/24/2012 3:32:25	**QID #:**	39	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	F	**Source:**	NRC bank 0482				
Search	013000K601	**10CFR55:**	41.7	**Safety Function**	2						
System Title:	Engineered Safety Features Actuation System (	**System Number**	013	**K/A**	K6.01						
Tier:	2	**Group:**	1	**RO Imp:**	2.7	**SRO Imp:**	3.1	**L. Plan:**	A2LP-RO-ESFAS	**OBJ**	7

Description: Knowledge of the effect of a loss or malfunction of the following will have on the ESFAS: - Sensors and detectors

Question:

Consider the following:

- Unit 2 is operating at 80% power
- Pressurizer Pressure Wide Range Pressure Transmitter, 2PT-4624-1, has failed low
- CRS directs placing Low Pressurizer Pressure bistable #6 in 2C-23A in Trip Channel Bypass

After the above actions are completed, which Engineered Safety Features Actuation System (ESFAS) function's Logic Matrixes are operating in "2 out of 3" logic?

A. Containment Spray Actuation Signal (CSAS); Containment Cooling Actuation Signal (CCAS)

B. Safety Injection Actuation Signal (SIAS); Containment Isolation Actuation Signal (CIAS)

C. Containment Isolation Actuation Signal (CIAS); Containment Cooling Actuation Signal (CCAS)

D. Safety Injection Actuation Signal (SIAS); Containment Cooling Actuation Signal (CCAS)

Answer:

D. Correct, Safety Injection Actuation Signal (SIAS) and Containment Cooling Actuation Signal (CCAS)

Notes:

A, B, and C are Incorrect due to CIAS and CSAS are only affected by Containment Pressure Transmitters which have not failed.

References:

STM 2-70, ESFAS, Rev. 18, section 3.1.1 [page 9]
A2LP-RO-ESFAS, Rev. 12, Obj. 7, Describe a typical flowpath from a measurement channel through the ESFAS system to components actuated.

Historical Comments:

NRC bank question 0482, used of 2005 RO/SRO Exam

3.0 Detailed Description

The Emergency Safety Features Actuation System consists of the following major subsections:

- NSSS Parameter Measurement Channel
- Bistable or Auxiliary Trip Units
- Coincidence Logic Matrices
- ESFAS Trip Paths
- ESFAS Actuation Circuits
- ESFAS Testing System

Refer to the figure on page 67.

The input signals from the variable measurement channels supply the information to the ESFAS logic circuits on the selected parameters.

The Bistable Comparator Trip Units compare the input signals, which are a positive electrical signal, with reference setpoint values, which are negative signals. If the measured process parameter exceeds the reference setpoint, the Trip Units provide trip signals to the Bistable Relay Ladder Trip Unit, which in turn provides trip signals to its coincidence logic matrices.

The Coincidence Logic Matrices provide trip signals to ESFAS upon selected coincident trip signals from the Bistable Trip Units. These ESFAS actuating relays provide proper ESF system actuation.

The following sections detail each of these subsections.

3.1 NSSS Parameter Measurement Channel

As mentioned previously, several parameter transmitters provide input signals to the Engineered Safety Features Actuation System. Each of these parameters are monitored by four distinctly separate, yet redundant, transmitters. Each transmitter inputs to it's respective ESFAS channel. These signals are then compared to associated setpoints, and trip signals are developed if the setpoints are reached.

Below is a detailed discussion of each of the Parameter Measurement Channels.

3.1.1 Low Pressurizer Pressure

Two ESFAS actuations on Low Pressurizer Pressure are provided in the event of a Loss of Coolant Accident. These ESFAS actuations are the Safety Injection Actuation Signal (SIAS) and the Containment Cooling Actuation Signal (CCAS).

The four Bistable Trip Units receive input signals from four wide range pressurizer pressure transmitters. These transmitters (as well as the channels which they provide input to) are as follows:

- 2PT-4624-1 - Channel A
- 2PT-4624-2 - Channel B
- 2PT-4624-3 - Channel C
- 2PT-4624-4 - Channel D

All of these transmitters are physically located in the Unit 2 Reactor building.

QID:	0482	**Rev:**	0	**Rev Date:**	10/14/2004	**RO Select:**		**SRO Select:**		**Points:**	1.00
Lic Level:	RS	**Difficulty:**	2	**Taxonomy:**	A	**Source:**	IH BANK 9385	**Originator:**	Coble		
10CFR55_41:	41.7	**10CFR55_43:**	NA	**Section:**	3.2	**Type:**	RCS INVENTORY CON				
System Title:	ENGINEERED SAFETY FEATURES ACTU	**System Number**	013	**K/A:**	K6.01						
RO Tier:	2	**RO Group:**	1	**RO Imp:**	2.7	**SRO Tier:**	2	**SRO Group:**	1	**SRO Imp:**	3.1

Description: Knowledge of the effect of a loss or malfunction of the following will have on the ESFAS: Sensors and detectors.

Question:

The plant is at full power with the following conditions :

* Pressurizer Pressure Wide Range Pressure Transmitter 2PT-4624-3 has failed low.
* Bistable #6 for Low Pressurizer Pressure has been placed in Trip Channel Bypass on Channel C.

Which Engineered Safety Features Actuation System (ESFAS) function's Logic Matrixes are now operating in "2 out of 3" logic for the Low Pressurizer Pressure function?

A. Containment Cooling Actuation Signal (CCAS) and Containment Isolation Actuation Signal (CIAS).

B. Containment Cooling Actuation Signal (CCAS) and Safety Injection Actuation Signal (SIAS).

C. Safety Injection Actuation Signal (SIAS) and Containment Isolation Actuation Signal (CIAS).

D. Safety Injection Actuation Signal (SIAS) and Containment Spray Actuation Signal (CSAS).

Answer:

B. Containment Cooling Actuation Signal (CCAS) and Safety Injection Actuation Signal (SIAS).

Notes:

Distracter A is incorrect because CIAS is only affected by Containment Pressure Transmitters which have not failed.

Distracter C is incorrect because CIAS is only affected by Containment Pressure Transmitters which have not failed.

Distracter D is incorrect because CSAS is only affected by Containment Pressure Transmitters which have not failed.

References:

STM 2-70, ESFAS, Section 3.1.1
A2LP-RO-ESFAS, OBJ. 7, Describe a typical flowpath from a measurement channel through the ESFAS system to component actuation.

Historical Comments:

This question has not been used on any previous NRC exams. BNC 10/14/2004.

Bank:	1861	**Rev:**	0	**Rev Date:**	4/11/2012 8:52:59	**QID #:**	40	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	022000A301	**10CFR55:**	41.7	**Safety Function**	5						
System Title:	Containment Cooling System (CCS)	**System Number**	022	**K/A**	A3.01						
Tier:	2	**Group:**	1	**RO Imp:**	4.1	**SRO Imp:**	4.3	**L. Plan:**	A2LP-RO-CVENT	**OBJ**	4
Description:	Ability to monitor automatic operation of the CCS, including: - Initiation of safeguards mode of operation										

Question:

Consider the following:

- Unit 2 has tripped from 100% power
- RCS Pressure is trending down
- Containment pressure is 19.3 psia and rising

The Control Room Operator, when checking Containment Cooling fan operations, should expect ___________ Water to be aligned to Containment Coolers and the Containment Coolers bypass dampers to be __________.

A. Chilled, open

B. Chilled, closed

C. Service, open

D. Service, closed

Answer:

C. Correct, containment pressure is above CCAS setpoint (18.3 psia) which will place the containment cooling groups in service in emergency mode (all fans running, normal cooling (chilled water) isolated, dampers open, and service water aligned)

Notes:

A. Incorrect, Chilled water aligned is normal lineup (it is isolated on a CCAS)
B. Incorrect, Chilled water aligned and bypass dampers closed is the normal lineup
D. Incorrect, Service water would be aligned but the bypass dampers receive an open signal with a CCAS

References:

STM 2-70, Engineering Safety Features Actuation System, Rev. 18, section 2.0 (2.2.3) [page 5] section 8.0 table on page 43 (setpoint for CCAS actuation) section 9.0 components that are actuated by CCAS [page 45]
A2LP-RO-CVENT, Rev. 4, Obj. 4, Describe the automatic actuation associated with the Containment Cooling Units.

Historical Comments:

New Question

2.2.1 Safety Injection Actuation Signal (SIAS)

The Safety Injection Actuation Signal, referred to as SIAS, provides for Safety Injection during design basis Loss of Coolant Accidents (LOCA), Main Steam Line Break (MSLB) events, or Steam Generator Tube Ruptures (SGTR). This actuation provides cooling to limit core damage and assure adequate shutdown margin, regardless of temperature.

The SIAS, along with the Containment Cooling Actuation Signal (CCAS), is actuated by a Low Pressurizer Pressure trip and/or High Containment Pressure. CCAS will be discussed shortly.

All components actuated by a SIAS are listed in the ESFAS Actuated Components table starting on page 60.

2.2.2 Containment Isolation Actuation Signal (CIAS)

The Containment Isolation Actuation Signal (CIAS) provides for Containment Isolation during a design LOCA or MSLB event to prevent the release of radioactive material.

The CIAS is actuated by a High Containment pressure. Certain CIAS valves are automatically actuated (closed) by a SIAS. This provides diverse signals for these valves for containment isolation.

All components actuated by a CIAS are listed in the ESFAS Actuated Components table starting on page 46.

2.2.3 Containment Cooling Actuation Signal (CCAS)

A Containment Cooling Actuation Signal (CCAS) provides for Containment Cooling during a design basis LOCA or MSLB event. This actuation limits post-accident containment pressure to design values during and following these events.

The CCAS is actuated by a Low Pressurizer Pressure signal, which actuates SIAS at the same time, and/or a High Containment Pressure.

All components actuated by a CCAS are listed in the ESFAS Actuated Components table starting on page 45.

2.2.4 Containment Spray Actuation Signal (CSAS)

A Containment Spray Actuation Signal (CSAS) provides for Containment Spray during a design basis LOCA or MSLB accident in order to remove heat and iodine from the containment area, and to hold containment temperature and pressure below design values.

The CSAS is initiated by a High-High Containment Pressure, in conjunction with a SIAS.

The operating mode of the CSAS is automatically changed by receipt of a Recirculation Actuation Signal (RAS). The RAS actuation is discussed in the following paragraphs. The operating mode of the CSAS will be discussed later.

All components actuated by a CSAS are listed in the ESFAS Actuated Components table starting on page 49.

2.2.4.1 Main Feedwater Isolation Signal (MFWIS)

Safety analysis performed for the steam generator replacement project, and subsequent power uprate, indicated that Containment Building (CB) pressure with Main Feedwater (MFW) and Main

8.0 PPS Setpoints Table

ESFAS SETPOINTS

Bi-stable	Parameter	Actuation	Range	Tech Spec limit	Pretrip	Trip
6	Lo PZR PRS	SIAS CCAS	0-3000 psia	100 psia	Min Setpoint	1.167v (125.25 psia)
				≥1650 psia	Max Setpoint (Trip Setpoint)	3.238v (1678 psia)
				1725 psia	Pretrip	3.334v
				174.75 psia	Step Adjust	0.233v
				588.74/ 2362.5 psia	Dev. Ann. Low SP	0.785/ 4.150v
7	Lo S/G A Lvl	EFAS	0-100%	>22.2%	3.000v (50.0%)	1.892v
8	Lo S/G B Lvl	EFAS	0-100%	>22.2%	3.000v (50.0%)	1.892v
11 & 12	Lo SG A&B PRS	MSIS	0-1200 psia	-150 psia	Min Setpoint	0.500v
				≥751 psia	Max Setpoint (Trip Setpoint)	3.508v (752 psia)
				800 psia	Pretrip	3.490v
16	Hi Cont PRS-ESF	SIAS CIAS CCAS	0-27 psia	<18.3 psia	3.506v (16.92 psia)	3.699v (18.22 psia)
17	Hi Hi Cont	CSAS	0-27 psia	<23.3 psia	3.950v	4.439v (23.21 psia)
18	Lo RWT Lvl	RAS	0-100%	6% Above Tap	2.600v (40.0%)	1.240v
19	SG A ΔP	EFAS	0-1200 psia	<90 psid	#20 input plus 0.253v	#20 input plus 0.290v (87 psid)
20	SG B ΔP	EFAS	0-1200 psia	<90 psid	#19 input plus 0.253v	#19 input plus 0.290v (87 psid)

9.0 ESFAS Actuation Table

CCAS - CONTAINMENT COOLING ACTUATION SIGNAL				
Component	**Designation**	**Actuated Position**	**Time Delay**	**Relay Number**
2C39 Aux Relay Cabinet - Red				
Cnmt Cooling Fan	2VSF-1A	Running	18.2 seconds	K-306A
Bypass Damper	2UCDM-8203-1	Open		
SW from Cnmt Cooler	2CV-1519-1	Open		
SW to Cnmt Cooler	2CV-1511-1	Open		
Cnmt Cooling Fan	2VSF-1B	Running	18.2 seconds	K-413A
Bypass Damper	2UCDM-8209-1	Open		
Thermal O/L Bypass for: 2UCD-8203-1 2UCD-8209-1	CCASX3-1	Dropped out / bypassed		
Thermal O/L Bypass for: 2CV-1511-1 2CV-1519-1	CCASX4-1	Dropped out / bypassed		
2C40 Aux Relay Cabinet - Green				
Cnmt Cooling Fan	2VSF-1C	Running	18.2 seconds	K-306B
Bypass Damper	2UCDM-8216-2	Open		
SW from Cnmt Cooler	2CV-1513-2	Open		
SW to Cnmt Cooler	2CV-1510-2	Open		
Thermal Overload Bypass	CCASX4-2	Dropped out / bypassed		
Cnmt Cooling Fan	2VSF-1D	Running	18.2 seconds	K-413B
Bypass Damper	2UCDM-8222-2	Open		
Thermal O/L Bypass for 2CV-1510-2 & 1513-2	CCASX3-2	Dropped out / bypassed		
CNTMT SW Lo Flow Alarm	2K05 H7	Enable Alarm	60 seconds	

Bank:	1862	**Rev:**	0	**Rev Date:**	5/29/2012 4:16:53	**QID #:**	41	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	0260002244	**10CFR55:**	41.7 / 41.10	**Safety Function**	5						
System Title:	Containment Spray System (CSS)	**System Number**	026	**K/A**	2.2.44						
Tier:	2	**Group:**	1	**RO Imp:**	4.2	**SRO Imp:**	4.4	**L. Plan:**	A2LP-RO-ELOCA	**OBJ**	6, 12

Description: Equipment Control - Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.

Question:

Consider the following:

- A large break LOCA has occurred on Unit 2
- RCS Pressure is 1250 psia and trending down
- Containment pressure is 47 psia and slowly trending down
- RWT level 5.5%
- OP-2202.001, Standard Post Trip Actions (SPTAs), have been completed
- OP-2202.003, Loss of Coolant Accident EOP, is being implemented
- Approximately 25 minutes have past since the LOCA began
- Containment HIGH Range Rad Monitors are trending up

OP-2202.003, Loss of Coolant Accident EOP should direct the ATC to secure _______ Reactor Coolant Pumps [RCPs] and verify a minimum required Containment Spray Header flow of ___________.

A. 2; 2000 gpm

B. 2; 1875 gpm

C. all; 2000 gpm

D. all; 1875 gpm

Answer:

C. Correct, SPTAs, step 6.C (contingency column), will secure the RCPs, The 2000 gpm spray header flow is verified in the LOCA EOP, section 3, step 22 (required spray header flow post RAS)

Notes:

A, B, are incorrect; SPTAs will direct securing 2 RCPs if RCS pressure drops below 1400 psia, but the valid Containment spray signal dictates securing all RCPs
D. is incorrect based on the required Spray header flow with a RAS

References:

OP-2202.003, Loss of Coolant Accident EOP, Rev. 013, section 1 Step 16. [page 11] contingency 16.B (verifies RCPs are secured) and 6.E (verifies Spray Header Flow 1875 gpm) section 3, step 22 (required spray header flow post RAS) [page 43]
OP-2202.001, Standard Post Trip Actions EOP, Rev. 013, step 6 contingency 6.C. (if a valid containment spray in progress, then secure all RCPs) [page 7]
A2LP-RO-ELOCA, Rev. 9, Obj. 6, Given a set of plant conditions during a LOCA, demonstrate understanding of the LOCA EOP and the ability to use the LOCA EOP to control the plant. And Obj. 12, Discuss the reasons for securing all RCPs during a large break LOCA event.

Historical Comments:

New Question

INSTRUCTIONS	CONTINGENCY ACTIONS
6. Check RCS Pressure Control:	**6. Perform as necessary:**
___ • 1800 psia to 2250 psia.	A. IF RCS pressure lowers to less than 1400 psia, THEN trip ONE RCP in EACH loop.
___ • Trending to setpoint.	B. IF NPSH requirements violated OR RCS MTS less than 30°F, THEN verify ALL RCPs tripped.
• Normal PZR Spray and heaters controlling pressure.	C. IF valid CNTMT Spray in progress, THEN verify ALL RCPs tripped.
• Valid CNTMT Spray NOT in progress.	D. IF RCP 2P32A or 2P32B stopped, THEN verify associated PZR Spray valve in MANUAL and closed. • RCP A Spray Valve (2CV-4651) • RCP B Spray Valve (2CV-4652)
	E. IF RCS pressure lowers to 1650 psia or less, THEN perform the following: 1) Verify SIAS actuated on PPS inserts. 2) **GO TO** Step 7.
	F. Verify PZR Pressure Control system restoring pressure to setpoint.
	G. IF ALL RCPs stopped AND RCS pressure control required, THEN initiate Aux spray using 2202.010 Attachment 48, RCS Pressure Control.

INSTRUCTIONS	CONTINGENCY ACTIONS
14. Check LOCA limited to CNTMT: • CNTMT Sump level rising. • CNTMT temperature, dewpoint, and pressure greater than pre-LOCA values. • Aux Building area radiation levels stable. • Aux Building Sump level less than 53%. • Waste Tanks 2T20A and 2T20B levels stable.	**14. <u>IF</u> LOCA occurring outside CNTMT, <u>THEN</u> perform the following:** A. Verify CIAS actuated on PPS inserts. B. Isolate leak using 2202.010 Attachment 22, LOCA Outside CNTMT Isolation. C. <u>IF</u> LOCA occurring ONLY outside CNTMT, <u>THEN</u> **GO TO** Step 19.
■15. Check CNTMT isolation parameters: A. CNTMT pressure trend has <u>NOT</u> exceeded 18.3 psia. B. "CNTMT RADIATION HI" annunciator (2K10-A6) clear.	**■15. Perform the following:** • Manually actuate CIAS. • Commence 2202.010 Attachment 5, CIAS Verification. • Verify ONE Emergency Penetration Room Vent Fan running.
■16. Check CNTMT pressure trend has <u>NOT</u> exceeded 23.3 psia.	**■16. Perform the following:** A. Verify CSAS actuated on PPS inserts. B. Stop ALL RCPs. C. Verify BOTH PZR Spray valves in MANUAL and closed. D. Commence 2202.010 Attachment 41, CSAS Verification. E. Check EACH CNTMT Spray header flow 1875 gpm or greater. F. <u>IF</u> only ONE CNTMT Spray header flow 1875 gpm or greater, <u>THEN</u> verify ALL available CNTMT Cooling fans running in Emergency Mode using 2202.010 Exhibit 9, ESFAS Actuation.

INSTRUCTIONS	CONTINGENCY ACTIONS
■22. **WHEN RWT level less than 6%, THEN perform the following:**	
A. Check CNTMT sump level greater than 86 inches.	A. IF CNTMT sump level less than 86 inches, THEN perform the following: 1) Verify ALL HPSI pumps in PTL. 2) Notify TSC.
B. Check RAS actuated on PPS inserts.	B. Manually actuate the following: • Train A RAS on 2C39 • Train B RAS on 2C40
C. Verify CNTMT Spray header flow greater than 2000 gpm.	
D. Verify RAS components actuated using 2202.010 Attachment 16, RAS Verification.	
E. Check EACH running HPSI pump flow greater than 240 gpm.	E. IF ANY running HPSI pump flow less than 240 gpm, THEN perform the following: 1) Stop Charging pumps one at a time as needed to raise HPSI flow to greater than 240 gpm per pump. **NOTE** **Core Cooling is provided with ONE HPSI pump in service.** 2) IF EACH HPSI header flow still less than 240 gpm with ALL Charging pumps stopped, THEN perform the following: a) Transfer ALL HPSI flow to ONE HPSI pump. b) Place HPSI pump NOT aligned to RCS in PTL.

(Step 22 continued on next page)

Bank: 1863	**Rev:** 0	**Rev Date:** 4/26/2012 10:33:2	**QID #:** 42	**Author:** Foster					
Lic Level: R	**Difficulty:** 3	**Taxonomy:** F	**Source:** NEW						
Search 039000K404	**10CFR55:** 41.7	**Safety Function** 4							
System Title: Main and Reheat Steam System (MRSS)	**System Number** 039	**K/A** K4.04							
Tier: 2	**Group:** 1	**RO Imp:** 2.9	**SRO Imp:** 3.1	**L. Plan:** A2LP-RO-SDBCS	**OBJ** 6				

Description: Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following: - Utilization of steam pressure program control when steam dumping through atmospheric relief/dump valves, including T-ave. limits

Question:

Considering the operation of the Steam Dump & Bypass Control System (SDBCS):

ALL of the SDBCS Atmosphere DUMP valves and Condenser BYPASS valves should receive a Quick Open Block based on a ______________________.

A. Reactor Trip

B. Reactor Trip with Degraded Condensed Vacuum >5.75"HgA

C. Reactor Trip and RCS Average Coolant Temperature <540°F

D. Reactor Trip and RCS Average Coolant Temperature <553°F

Answer:

D. Correct, Reactor Trip and RSC Average Coolant Temperature <553°F will produce a Quick Open Block (STM 2-23 section 2.3.6.1)

Notes:

A. Incorrect, a Reactor Trip by itself will generate a Quick Open Block but only to the Upstream Atmosphere Dump valves (STM 2-23 section 2.3.6.1)
B. Incorrect, a Reactor Trip with Degraded Condensed Vacuum >5.75" HgA will not produce a Quick Open Block. The Upstream Atmosphere Dumps will Receive one and the Bypass Valves will not open due to the high condenser pressure.
C. Incorrect, Reactor Trip and RCS low Average Coolant Temperature will produce the Quick Open Block Signal but the RCS temperature of <540°F is wrong (this is the minimum temp for criticality)

References:

STM 2-23, Steam Dump & Bypass Control System, Rev 16, sections 2.3.6.1 (Quick open block signal) [page 19], section 2.7 (Condenser Interlock) [page 22] and simplified drawing (page 36)
A2LP-RO-SDBCS, Rev. 11, Obj. 6, Describe the Quick Open signal used in the SDBCS including how it is generated and its effects on the SDBCS valve operation.

Historical Comments:

New Question

account, following a large load rejection the available SDBCS valves would remain wide open due to the X and Y Quick Open demand signals for as long as 12-18 seconds. (The figure on the previous page shows only this demand signal, not actual valve position). In actuality, if a Load rejection occurred that was significant enough to cause a Quick Open signal to be generated and Plant power exceeded the available capacity of the SDBCS, normally 51% with the 2 Upstream ADVs disabled, the Reactor will trip. The reactor trip will block quick open signals to the two upstream atmospheric dump valves that are normally isolated and will have no affect on the system. If RCS T_{AVE} lowers low enough then the five remaining valves also receive a Quick Open block signal. Even though the input to the Quick Open Comparators may be greater than their respective threshold voltage values, the SDBCS valves will be prevented from responding to a Quick Open demand. Once the Quick Open solenoid valves de-energize and shift, the valves will begin to respond to Modulation demands from the Master Controller, providing a Permissive signal is present.

Procedural constraints prevent operating the Upstream Atmospheric Dump valves in Automatic, so the actual Q.O. response is limited to the two Downstream ADVs and the three Bypass valves.

2.3.6.1 *Quick Open Block signal*

The SDBCS uses two signals to "block" the Quick Opening of the valves. This signal when present prevents the Quick Open signal from energizing the Quick Open solenoid valves and the Permissive solenoids on the affected valves. The first Q.O. Block signal is a Reactor Trip signal made up of four Reactor Tripped signals from the FWCS. A Reactor Trip will automatically block the Quick Open signal to the two Upstream valves (2CV-1001, 2CV-1051) because the capacity of these valves are not needed if the Reactor is tripped.

The other Quick Open Block signal is provided to the remaining five valves and is generated to prevent excessive NSSS cooldown following a Reactor trip. This Q.O. Block signal is produced whenever RCS T_{AVE} (from FWCS) is less than 553°F AND a Reactor Tripped signal (also from FWCS) is present.

2.4 SDBCS Valve Open Permissives

Several conditions must be satisfied before the SDBCS valves will open automatically due to either a Modulation signal or a Quick Open signal.

2.4.1 SDBCS Valve Modulation Permissives

Before any valve will open *automatically* due to a Modulation signal the following conditions need to be met:

1) Modulation Signal from Master Controller
2) Permissive Signal (Modulation Permissive or Manual)
3) The Master Controller has to be in Auto/Remote or Auto/Local,
4) The valve's respective HIC must be in Auto,
5) The valve's Permissive switch can not be in OFF,
6) No Condenser Interlock (Bypass valves Only)
7) No Emergency Off

compares this signal to P_{SP2}. The resultant error is put through a PID compensation network and the output sent to the Permissive Controller >0 comparator. This Comparator ensures that the Output from the controller is zero if the process variable (Steam Pressure) is less than the Setpoint value. The Comparator is a bistable that is triggered by the Permissive Controller and produces a binary Permissive Signal. The binary Permissive Signal is supplied to the valve *printed circuit boards* which serve as the valve logic circuits. The Permissive Controller is an integral part of the Permissive Calculator and has no Operator interface.

2.6.4 Permissive Switches

Permissive switches are supplied for each SDBCS valve and are located on 2C02 near the valve HICs. These Permissive switches are 3-position switches. The positions available are Off, Auto, and Manual. When the switch is in OFF, a Permissive signal is prevented from reaching the valve's Permissive Solenoid. This will prevent any operation of that valve. In AUTO, the Permissive signal is sent to the valve control circuit as determined by the SDBCS logic. In MANUAL the Permissive Solenoid is open all the time unless the *Emergency Off Push-button* is depressed or, for the Bypass valves only, the *Condenser Interlock* is present.

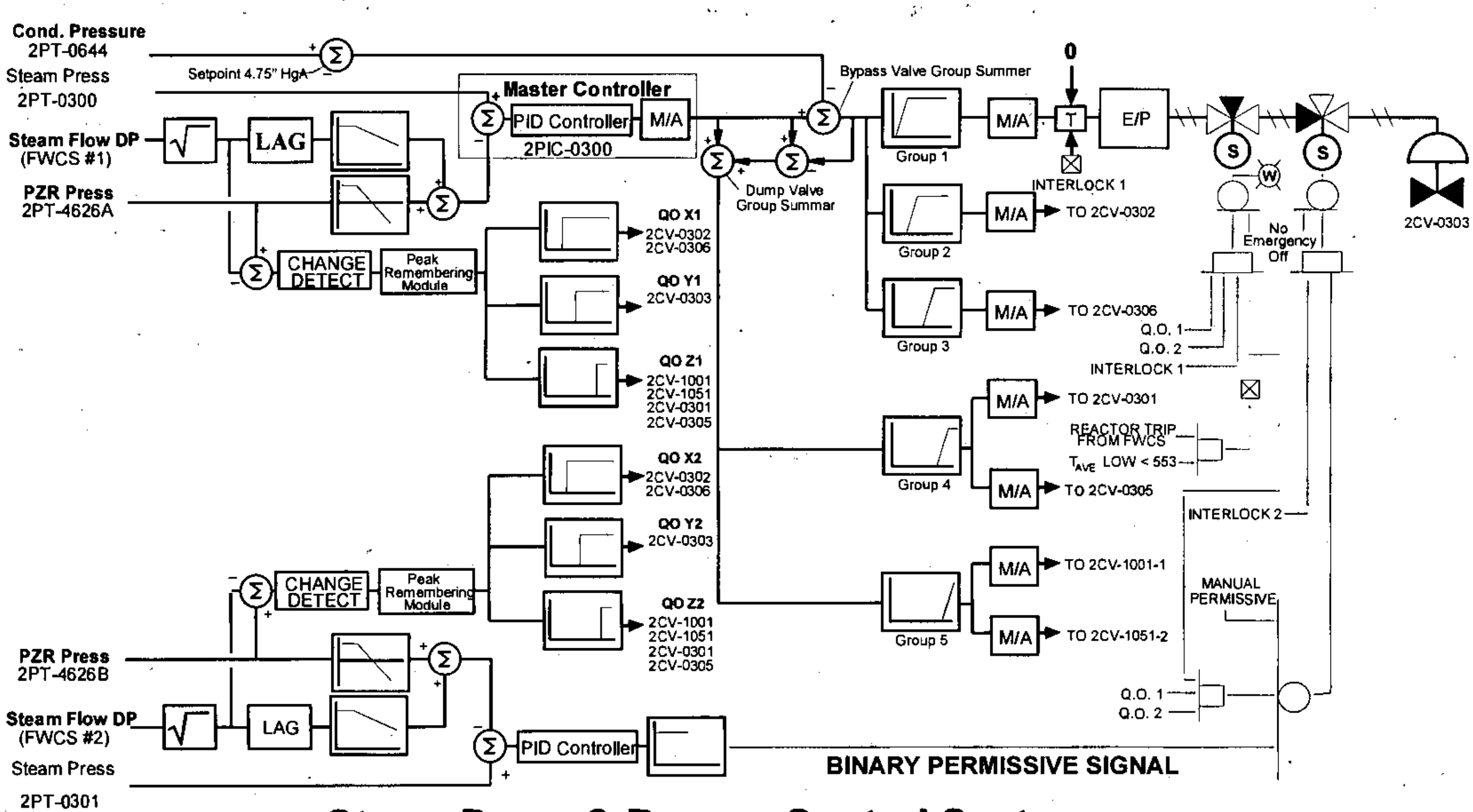
2.7 Condenser Interlock

A Condenser Interlock is provided within the SDBCS to prevent opening the SDBCS Bypass valves if Condenser vacuum is degraded. Further input of high energy, high enthalpy steam would cause a more rapid reduction in Condenser vacuum. Two Condenser pressure switches send signals to the SDBCS. 2PS-0655 and 2PS-0659 will actuate the Condenser Interlock if <u>either</u> PT senses <u>Condenser back pressure is ≥ 5.75" HgA.</u> 2PS-0659 senses Condenser pressure in the Low Pressure Condenser while 2PS-0655 senses High Pressure Condenser pressure. The signal from 2PS-0659 inputs to the "Interlock 1" circuit which opens a contact which prevents the Open Demand signal from the HICs from reaching the E/P Transducer and the Quick Open signal from energizing the Quick Open Solenoid on the Bypass valves. 2PS-0655, likewise feeds the "Interlock 2" circuit disabling any signal from reaching the Permissive solenoid which prevents valve operation.

The Condenser Interlock signal will automatically reset when both Condenser pressure switches sense pressure has reduced below <u>5.15" HgA</u> only if the SDBCS Master Controller and the HIC's for Bypass valves are in AUTO <u>and</u> the respective Permissive Switches are not in OFF. If any of these conditions are not met then the Condenser Interlock can be manually reset using the "Emergency Off/Condenser Interlock Reset" Push-button located either on 2CO2, the SDBCS cabinet 2C29, or the Remote Shutdown Panel 2C80.

2.8 Emergency Off Push Button

An Emergency Off Push-button is provided for the SDBCS to prevent the Automatic or manual opening of ANY of the SDBCS valves. When the Emergency Off signal is present, the system is rendered incapable of positioning any of the SDBCS valves by preventing the energization of either the Quick Open or the Permissive solenoids on all of the valves. This circuit can be reset or



Steam Dump & Bypass Control System

Bank:	1864	**Rev:**	1	**Rev Date:**	6/27/2012 10:26:1	**QID #:**	43	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	059000A211	**10CFR55:**	41.5 / 41.10	**Safety Function**	4						
System Title:	Main Feedwater (MFW) System	**System Number**	059	**K/A**	A2.11						
Tier:	2	**Group:**	1	**RO Imp:**	3.0	**SRO Imp:**	3.3	**L. Plan:**	A2LP-RO-FWCD	**OBJ**	6, 13

Description: Ability to (a) predict the impacts of the following malfunctions or operations on the MFW System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: - Failure of feedwater control system

Question:

Consider the following:

- Unit 2 is operating at 60% power
- The Auto signal/demand on Hand Indicating Controller (2HIC- 0321), "A" Main Feed Pump (MFP) speed demand controller, fails high and the Hand Indicating Controller output ramps to 100%

With the above conditions, the "B" MFP speed should ________________ and per the ACA response, the CRS should direct ________________.

A. rise; manual control of "A" MFP speed

B. rise; tripping the "A" MFP

C. lower; manual control of "A" MFP speed

D. lower; tripping the "A" MFP

Answer:

D. Correct; with the "A" MFP speed demand at 100% Steam Generator levels will rise [causing a Level Deviation alarm] the FWCS will respond by lowering "B" MFP speed based on FLOW demand of the system [STM 2-69, section 2.5.3] the Master controllers for "A" and "B" FWCS will "see" Flow demand lower due to the excess feedwater being supplied by the "A" MFP and will adjust the Feed Reg Valves and "B" MFP speed to compensate for the higher differential pressure in the system. The ACA will direct taking manual control of components [i.e. MFP speed] and control SG levels. If SG levels can not be maintained, the ACA directs tripping the Reactor.

Notes:

A, B, and C are incorrect for reasons stated above

References:

STM 2-69, Feedwater Control System, Rev, 048, section 2.5.3 [page 23]
OP-2106.007, Main Feedwater Pump and FWCS Operations, Rev. 12, section 3.0 (description) [pages 4 and 5]
OP-2203.012-C ACA, Rev. 028, window H-3 [page 31]
EN-OP-115, Conduct of Operations, Re. 012,section 5.4[2] [page 22]
A2LP-RO-FWCD, Rev. 11, Obj. 6, Describe the interlocks and automatic actuations of the following components: Condensate pumps, condensate pump recirculation valves, and Obj. 12, Describe the location, indication, alarm and control functions of: Mainfeedwater Flow Elements, Main Feedwater Pressure Switches.

Historical Comments:

New Question
Rev. 1: added Hand Indicating Controller (spelled out) and procedure number (ACA) to stem

Feedwater Pump Lube Oil System

Both Main Feedwater pumps and Turbines are serviced by a common Lube Oil System. This system consists of a Lube Oil Reservoir, two AC powered Main Oil pumps (2P-26/27), a DC powered Emergency Oil pump (2P-28), two Lube Oil Filters, two Lube Oil coolers, and Lube Oil Vapor Extractor (2C-17).

The Lube Oil Reservoir provides sufficient storage capacity of lube oil for both Main Feedwater Pump Units. Mounted on the reservoir are three oil pump motors. Inside the reservoir is a selector valve for porting oil through the coolers. The two Main Oil pumps are constant pressure centrifugal pumps. Either oil pump can supply full pressure to the Main Feedwater pumps. During normal operations, one oil pump is operating and the other pump is in standby. Should oil pressure lower to 65 psig, standby pump will auto start. The Emergency Oil pump is identical to other oil pumps with the exception of its driver. The Emergency Oil pump will automatically start if oil supply pressure drops to 47 psig.

The Main Feedwater Pump Lube Oil coolers (2E-22A and 2E-22B) are tube and shell design with lube oil on the shell side and Component Cooling Water on the tube side. During normal operations, only one cooler is in service. Located on the common cooling water outlet line is a Control valve (2CV-5283) which controls CCW flow through the coolers to maintain lube oil temperature.

The Lube Oil Filters (2F-297A and 2F-297B) are stacked disc construction. Each disc is made of a fine screen material. Three way selector valves on the filter inlet and outlet line determine which filter is in service.
Lube Oil Vapor Extractor (2C-17) maintains a slight negative pressure in the Lube Oil Reservoir to remove moisture and air. An Oil Separator on the suction of the Vapor Extractor removes any oil present in the vapor.
A bypass valve (2LO-47) around the Vapor Extractor is provided to adjust reservoir vacuum.

Feedwater Control System

The Feedwater Control System (FWCS) maintains Steam Generator downcomer water level by controlling feedwater flow rate. This is achieved through simultaneous adjustment of Main Feed Reg valve (MFRV), MFRV Bypass valve and Feedwater Pump speed. This can be performed in either automatic or manual mode. Normal Automatic Mode allows three element control system and digital programs to automatically control level. When in this mode, the individual manual/auto stations and the Master controller are in automatic. This mode is used when automatic S/G level control is desired.

There are three modes of manual operation. In Preferred Manual, the Master controller is in manual and the individual manual/auto stations are in automatic. In this mode, the Operator manually adjusts the Master controller to provide simultaneous manual control of MFRV position, MFRV Bypass valve position, and Feedwater Pump speed. This mode is used when the manual control of valves and pump speed is desired from one station.

In Partial Manual mode, the Master controller is in automatic with one or more individual manual/auto stations in manual. In this mode, the Operator manually adjusts the individual manual/auto stations in manual to control S/G level.

The Master controller (2FIC-1029/2FIC-1129) for each FWCS is on 2C02. The compensated level signal from the FWCS is the process variable input to the Master controller. The controller has a Manual/Automatic Transfer Button for mode selection. During automatic operation, the DPU compares level input signal to level setpoint signal and generates a flow demand output signal. In manual, push buttons are used to control the output.

Flow demand output signal from each Master controller is supplied to both FWCSs. The higher of the two flow demand signals is supplied to the pump speed program. The flow demand output signal is also supplied to the valve position programs of the MFRV and Bypass valve controlled by that FWCS.

Each FWCS is equipped with a Reactor Trip Override (RTO) feature. The purpose of RTO is to prevent abnormal Pressurizer level drops due to overcooling of the RCS by limiting the feedwater flow rates after a reactor trip thus limiting the amount of cold water added to the Steam Generators.

CEDMCS undervoltage coils 1 and 2 supply the reactor trip signal to FWCS 1 and undervoltage coils 3 and 4 supply the signal to FWCS 2. Each FWCS also supplies the signals that it receives to the other FWCS and to the SDBCS.

The RTO signal causes the Feedwater Pump speeds to be reduced to the minimum automatic setpoint (3150 rpm) and the Main Feed Reg valves to ramp closed at 1.4% per second. The MFRV Bypass valves will cycle based on RCS Tave. Tave of 548.24°F will result in 2.24% flow demand and 19% valve position. Tave of 552°F will result in 6% flow demand and 50.7% valve position. The FWCS will slowly return the Steam Generators to their normal level. When S/G level > 55% and > 60 sec from TRIP, the RTO signals are automatically removed.

If the FWCSs are being operated with Master controllers in manual, the RTO signals will still perform their functions, but when RTO clears the flow demand will return to the Master controller value. If individual manual/auto stations are in manual, the RTO signals can NOT perform their function and the operator must manually control pump speed and valve position to minimize RCS cooldown.

A High Level Override (HLO) feature is provided in each FWCS to aid in preventing moisture carryover from the S/G to the Main Turbine. HLO actuates ≥ 82% and clears ≤ 80%. This HLO signal causes the affected MFRV and Bypass valve to close. Both MFWPs will still be controlled by the higher flow demand signal from the two FWCS. If the individual manual/auto stations are in manual, the HLO signals can NOT perform their function and the operator must manually control pump speed and valve position to minimize moisture carryover.

Main Feedwater Regulating valves (MFRV)

The MFRVs are air operated valves that, in conjunction with other components, maintain S/G level within the proper band. These valves receive a close signal on RTO and HLO. They can be operated in auto by the FWCS, in manual with the controller, or by insertion of the locking pin to allow valve operation with the handwheel.

match the stroke speed of the Bypass valve. This prevents inadvertent actuation of the Valve Position Deviation circuit (which compares the valve position demand with the measured valve position signal) when the Bypass valve is controlling.

If the FWCS is in the Low Power mode and the Bypass valve is being manually controlled, using the FWCS Master controller, the Auto Position Demand signal tracks (follows) the Manual valve position demand signal. In this manner, the Automatic position demand is matched to the Manual position demand until such time that Auto control is selected again.

2.5.2 Main Feedwater Control Valve Demand Signals

The flow demand signal from the PID control passes through a signal characterizer circuit which allows linearization of the change in valve flow as a function of flow demand. This accounts for non-linearity in the valve position versus valve flow characteristics.

This characterized signal then passes through a ramp generator used to ramp the valve slowly open or closed. During transfers between the Regulating valve and the Bypass valve, the multiplier is ramped up or down, as appropriate, to open or close the appropriate Feedwater Regulating valve. The resulting signal is the Regulating valve position demand signal. This demand signal is rate limited to match the stroke speed of the valve and thus prevent inadvertent actuation of the valve position versus valve demand validation logic when the Regulating valve is controlling.

Another feature is the step open feature for the Main Regulating Valve. When the Bypass Regulating Valve is approximately 50% - 60% open the Main Regulating Valve will be stepped open 1.5%. This will cause the Bypass Regulating valve to close approximately 12%. When the Bypass Regulating valve returns to 50% - 60% open the Main Regulating Valve will begin to modulate open. The hysteresis in the Main Regulating Valve step open signal will prevent this valve from stepping in the close direction from 1.5% to 0%.

This feature prevents the Main Regulating Valve from modulating open and then back to its closed seat causing instability in feedwater flow to the Steam Generators and thus erratic Steam Generator levels at low power levels.

The step open feature also prevents excessive wear of the disc and valve seat.

2.5.3 Main Feedwater Pump Speed Demand Signal

The Flow Demand signal from the PID control of the FWCS is supplied to a high select circuit along with the Flow Demand signal from the other FWCS. Selecting the higher of the two Flow Demand signals ensures that the speed of the Main Feedwater pumps are controlled by the Steam Generator requiring the higher Feedwater flow rate.

The selected Flow Demand signal then passes through a signal characterizer circuit which programs the Feedwater pump Turbine speed as a function of Flow Demand. In the Low Power mode, the Feedwater Pump Turbine speed is set to a minimum setpoint of 3150

ANNUNCIATOR 2K03

H-3

LEVEL DEVIATION

1.0 CAUSES

1.1 Deviation of > 5.0% between A S/G (2E-24A) Selected Narrow Range Level and A S/G (2E-24A) Level Setpoint.

2.0 ACTION REQUIRED

2.1 IF alarm due to plant transient,
THEN verify FWCS responding to restore level to setpoint.

2.2 IF deviation caused by faulty MFRV or MFRVBV,
THEN perform ANY of the following to maintain/restore S/G level:

2.2.1 Place affected valve controller in MANUAL to control valve position.

2.2.2 Match affected A S/G valve position with unaffected B S/G valve position.

A. Take manual control of other FWCS components to control A S/G (2E-24A) level.

2.3 IF Steam Generator level uncontrollable,
THEN trip reactor and **GO TO** Standard Post Trip Actions (2202.001).

2.4 IF necessary to control Steam Generator level,
THEN perform the following per Main Feedwater Pump and FWCS Operation (2106.007):

2.4.1 Place FWCS in manual.

2.4.2 Restore S/G level to setpoint.

2.5 Investigate cause of alarm using EWS.

3.0 TO CLEAR ALARM

3.1 Reduce deviation to < 4.5%.

4.0 REFERENCES

4.1 E-2453-1

4.2 DCP 94-2008

5.4 MANUAL CONTROL OF AUTOMATIC SYSTEMS

[1] Do not override an automatic initiation of a safety function unless one of the following conditions exists:

- Adequate core cooling is assured by at least two independent indications.
- Mis-operation in automatic mode is confirmed by at least two independent indications.
- Required by procedures.

[2] If an automatic control malfunctions, immediately place that control in manual.

[3] If an operator cannot be dedicated to monitor systems placed in the manual mode, frequently check the system for proper operation and system response.

[4] When manual operation is no longer required, return systems to automatic or standby mode.

[5] When practicable, before placing controls in manual for activities which require manual control, review system response and actions to be taken during potential off-normal events.

REV 0

Data for 2012 NRC RO/SRO Exam

27-Jun-12

Bank:	1864	**Rev:**	0	**Rev Date:**	5/10/2012 8:35:11	**QID #:**	43	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	059000A211	**10CFR55:**	41.5 / 41.10	**Safety Function**	4						
System Title:	Main Feedwater (MFW) System	**System Number**	059	**K/A**	A2.11						
Tier:	2	**Group:**	1	**RO Imp:**	3.0	**SRO Imp:**	3.3	**L. Plan:**	A2LP-RO-FWCD	**OBJ**	6, 13

Description: Ability to (a) predict the impacts of the following malfunctions or operations on the MFW System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: - Failure of feedwater control system

Question:

Consider the following:

- Unit 2 is operating at 60% power
- The Auto signal/demand on 2HIC- 0321, "A" Main Feed Pump (MFP) speed demand controller, fails high and the HIC output ramps to 100%

With the above conditions, the "B" MFP speed would ______________ and the CRS would direct ______________.

A. rise; manual control of "A" MFP speed

B. rise; tripping the "A" MFP

C. lower; manual control of "A" MFP speed

D. lower; tripping the "A" MFP

QID use History

	RO	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☑	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

Answer:

D. Correct; with the "A" MFP speed demand at 100% Steam Generator levels will rise [causing a Level Deviation alarm] the FWCS will respond by lowering "B" MFP speed based on FLOW demand of the system [STM 2-69, section 2.5.3] the Master controllers for "A" and "B" FWCS will "see" Flow demand lower due to the excess feedwater being supplied by the "A" MFP and will adjust the Feed Reg Valves and "B" MFP speed to compensate for the higher differential pressure in the system. The ACA will direct taking manual control of components [i.e. MFP speed] and control SG levels. If SG levels can not be maintained, the ACA directs tripping the Reactor

Notes:

A, B, and C are incorrect for reasons stated above

References:

STM 2-69, Feedwater Control System, Rev, 048, section 2.5.3 [page 23]
OP-2106.007, Main Feedwater Pump and FWCS Operations, Rev. 12, section 3.0 (description) [pages 4 and 5]
OP-2203.012-C ACA, Rev. 028, window H-3 [page 31]
EN-OP-115, Conduct of Operations, Re. 012,section 5.4[2] [page 22]
A2LP-RO-FWCD, Rev. 11, Obj. 6, Describe the interlocks and automatic actuations of the following components: Condensate pumps, condensate pump recirculation valves, and Obj. 12, Describe the location, indication, alarm and control functions of: Mainfeedwater Flow Elements, Main Feedwater Pressure Switches.

Historical Comments:

New Question

Bank:	1865	**Rev:**	0	**Rev Date:**	4/24/2012 4:09:43	**QID #:**	44	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	Modified NRC bank 1755		
Search	061000K602	**10CFR55:**	41.7	**Safety Function**	4				
System Title:	Auxiliary / Emergency Feedwater (AFW) Syste	**System Number**	061	**K/A**	K6.02				
Tier:	2	**Group:**	1	**RO Imp:**	2.6	**SRO Imp:**	2.7	**L. Plan:**	A2LP-RO-DEFAS
OBJ	14								

Description: Knowledge of the effect of a loss or malfunction of the following will have on the AFW System components: - Pumps

Question:

Consider the following:

- Unit 2 is operating at 100% power
- "A" Stator Water Cooling pump trips and the standby pump did not start
- Main Turbine Runback is in progress
- RCS pressure is 2450 psia and the Reactor automatically trips
- "A" and "B" Steam Generator levels are 19% and trending down
- EFAS 1 and EFAS 2 have failed to actuated
- NO operator action is taken

The Automatic Reactor Scram was caused by ______________ and the Emergency Feedwater Pumps _______ automatically start on a DEFAS signal.

A. CPC Auxiliary trip; will

B. CPC Auxiliary trip; will not

C. DSS trip; will

D. DSS trip; will not

Answer:

C. Correct, DSS trip will occur at a RCS pressure of 2450 psia these transmitter and trip path are separate from the RPS system and protect from a ATWS; EFW will automatically Start on a DEFAS signal (Automatic DSS without EFAS actuation and SG level <15%)

Notes:

A. Incorrect, CPC Auxiliary trip setpoint is 2375 psia
B. Incorrect, CPC Auxiliary trip setpoint is 2375 psia and EFW will automatically start and feed SGs due to a DEFAS signal
D. Incorrect, EFW will automatically start and feed SGs due to a DEFAS signal

References:

STM 2-70-1, Diverse Emergency Feedwater Actuation System, Rev. 6, section 2.2 (DEFAS Actuation Logic) [page 3]
STM 2-63-1, Diverse Scram System, Rev. 2, section 2.0 (describes the trip on high RCS pressure and setpoint of 2450 psia) [page 3]
STM 2-65-1, Core Protection Calculator System, Rev. 16, section 2.4.6 (Aux Trips) [page 15]
A2LP-RO-DEFAS, Rev. 3, Obj. 14, Describe the enabling function of DSS with respect to DEFAS

Historical Comments:

Modified NRC bank question 1755, used on NRC RO/SRO 2011 Exam

2.0 Detailed System Description

The Diverse Scram System, or DSS, is diverse and independent from the existing Reactor Protection System (RPS) from the process transmitter output to the interruption of power to the Control Element Drive Mechanism Control System (CEDMCS) buses. This reduces the risk of an ATWS. The DSS is designed to be a highly reliable system to avoid spurious Reactor trips. The DSS is an "energized to actuate" system while the RPS is a "de-energize to actuate" system. The DSS is not credited for design basis accident protective action, and will not prevent the Engineered Safety Features Actuation System from performing its mitigating function. Some microprocessor failures however, may result in one Contactor opening. This would be similar to a RPS "half-leg trip".

The degree of diversity of the DSS is accomplished by employing four Pressurizer pressure loops unique only to DSS. A trip condition is satisfied when any two-out-of-four process channels reaching 2450 psia. The trip function is accomplished by removing CEDM power by opening Contactors which are downstream of the CEDM Motor-Generator Sets, yet upstream of the Reactor Trip Switchgear.

During a plant heatup, DSS in placed in service when the Shutdown bank CEAs are withdrawn to establish cocked rod protection. During a plant shutdown, after the Reactor Trip Breakers are opened the DSS system is placed in bypass if a cooldown is required.

Although the Diverse Scram System serves no safety related functions, ANO has committed to the NRC to maintain DSS operable whenever the plant is in Mode 1. In order to assess system operability, Operations is required to perform daily channel checks on DSS pressurizer pressure instruments, monthly matrix testing, bi-monthly battery checks (performed every other month during matrix testing), and system functional checks prior to criticality.

2.1 DSS Trip Signal Generation

The DSS is a 2/4 logic system designed to trip the Reactor if Pressurizer pressure reaches or exceeds a preset trip setpoint on any 2 of its dedicated pressure channels. Four Pressurizer pressure transmitters, 2PT4600-1 through 4, provide this input to the DSS. The 2/4 logic function is provided by a four separate Foxboro Spec 200 Micro controller systems. These software based micro processors are housed in the DSS Logic cabinet, 2C409; located in the CEDMCS room near the Remote Shutdown Panel. The four micro controllers are used to perform the necessary alarming and the 2-of-4 logic functions for each independent channel.

Each channel of the Diverse Scram System, or DSS, uses a current-to-voltage input converter to convert a 4-10mA input from the pressure transmitters into a 0-10 Vdc signal for the Spec 200 Micro controller input. Four Spec 200 Micro controllers, located on the DSS Logic Cabinet 2C409, are used to perform the necessary alarming and the 2-of-4 logic functions for each independent channel.

2.0 DEFAS Detailed Description

2.1 DEFAS

The figure on page 15 depicts an overview of the electrical integration between the Emergency Safety Features Actuation System (ESFAS) and the Reactor Protection System (RPS). Also shown on this figure is the electrical supplies to both the Diverse Scram System (DSS) and the Diverse Emergency Feedwater Actuation System (DEFAS).

The Diverse Emergency Feedwater Actuation System (DEFAS) is a separate and partially independent system from the existing Plant Protection System (PPS) and the Engineered Safety Features Actuations System (ESFAS). It is completely independent from PPS and ESFAS from the output of the Steam Generator level detector to the final actuation device.

Other differences between DEFAS and PPS or ESFAS are:

- The DEFAS is an "energize-to-actuate" system, while PPS and ESFAS are "de-energize-to-actuate" systems.
- The DEFAS uses a micro-computer with solid state I/O (input/output) modules in contrast to the PPS, which uses analog bistable trip units.
- DEFAS is physically different than PPS. The supporting cabinet, 2C410, is located in the Lower South Electrical Penetration Room, whereas the PPS cabinet, 2C23, is located in the Control Room.

Arkansas Nuclear One has committed to the NRC to maintain DEFAS operable whenever the Unit is in Mode 1 (on line). In order to assess system operability, Operations is required to perform daily channel checks on DEFAS steam generator level instruments, monthly matrix testing, bi-monthly battery checks (performed every other month during matrix testing), and system functional checks prior to criticality.

2.2 DEFAS Actuation Logic

As discussed previously, DEFAS is designed to mitigate the consequences of an ATWS and a loss of the Steam Generator heat sink by actuating the Emergency Feedwater (EFW) system. In addition, the system is designed to actuate EFW components needed to supply water to either Steam Generator when all of the following conditions exist:

- the respective Steam Generator's indicated water level reaches a low-low level setpoint of < 15% NR,
- the Diverse Scram System (DSS) has actuated, and
- the logic circuit confirms that an MSIS (Main Steam Isolation Signal) or an EFAS (Emergency Feedwater Actuation System) have **NOT** been initiated by ESFAS.

Once DEFAS actuates, it will feed the affected Steam Generator until any of the following occur:

- the Steam Generator level increases to 80% indicated level or,

- Quality Margin ≤ 0.05
  - These conditions will cause a Pre-Trip alarm on 2K04 and a CEA Withdrawal Prohibit (CWP)

2.4.3 CEA Withdrawal Prohibit (CWP)

A CEA Withdrawal Prohibit (CWP) prevents the outward motion of CEAs in all modes except Manual Individual. A CWP is initiated when ANY of the following conditions exist on 2 out of 4 channels:

- DNBR Pre-Trip
- LPD Pre-Trip
- Either CEAC detects an outward or inward CEA deviation of 5 inches.
- CEA Subgroup deviation ≥ 4.95 inches
- CEA Regulating Group Out Of Sequence (sequential subgroups get within 7.5 inches of each other)
- High Pressurizer Pressure Pre-Trip (from RPS)

2.4.4 LPD Trip

If conditions continue to degrade following the Pre-Trip setpoint, the following condition will cause an LPD Trip:

- LPD ≥ 21 kw/ft

2.4.5 DNBR Trip

If conditions continue to degrade following the Pre-Trip setpoint, the following conditions will cause a DNBR Trip:

- DNBR < 1.25
- Quality Margin ≤ 0

2.4.6 Aux Trips

In addition, there are conditions that will cause a DNBR and an LPD Trip without initiating a Pre-Trip. These conditions are referred to as Aux Trips and will cause the above trips if particular parameters are outside the "design space" for CPCs. These trips do not mean that an actual DNBR or LPD limit have been exceeded, they just indicate the parameters are outside the design limits for the CPC calculations. They are:

2.4.6.1 JTRP

JTRP (PID 189) is the trip flag which is set when the plant is operating outside of the design space for CPCs. The conditions that will set the JTRP flag are:

- **Tcold out of range** (< 495 °F or ≥ 580 °F). This sets JTRP to 1.
- **Pressurizer Pressure out of range** (< 1860 psia OR ≥ 2375 psia). This sets JTRP to 1
- **QASI (Hot Pin Axial Shape Index) out of range** (< -0.48 OR ≥ +0.48). This sets JTRP to 1
  - This trip uses a "static" value below 17% power and shifts to a live value at 17% on an up power. On a down power, the value shifts back to a "static" value at 14.5% power.
- **One Pin Peaking factor out of range** (< 1.28 OR ≥ 7.00). This sets JTRP to 1
- **Asymmetric Steam Generator Transient (ASGT).** This sets JTRP to 20.

QID:	1755	**Rev:**	1	**Rev Date:**	12/17/2010	**RO Select:**		**SRO Select:**		**Points:**	
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	IH Bank OPSUNIT	**Originator:**	Coble		
10CFR55_41:		**10CFR55_43:**		**Section:**		**Type:**					
System Title:	Auxiliary / Emergency Feedwater (AFW) Syst	**System Number**	061	**K/A:**	K6.02						
RO Tier:	2	**RO Group:**	1	**RO Imp:**	2.6	**SRO Tier:**		**SRO Group:**	1	**SRO Imp:**	2.7

Description: Knowledge of the effect of a loss or malfunction of the following will have on the AFW System components: - Pumps

PARENT

Question:

Given the following at full power:

* The Main Turbine trips.
* Offsite power fails to energize electrical buses 2A1 or 2A2.
* The Reactor trips due to a Diverse Scram Signal (DSS).
* Both Steam Generator levels are 20% Narrow Range and lowering.
* Steam Generator Pressures are 1080 psia and stable.
* EFAS 1 and EFAS 2 have not automatically actuated.
* No operator action is taken.

Based on the above conditions, the Emergency Feedwater Pumps will initially receive a backup signal to automatically start at _______% Narrow Range Steam Generator Level and raise Steam Generator levels to a maximum of _______%.

A. 10, 25

B. 10, 80

C. 15, 25

D. 15, 80

Answer:

D: 15, 80

Notes:

A Diversified Emergency Feed Actuation Signal (DEFAS) (Backup to EFAS) will be generated if a valid Diversified Scram Signal (DSS) at 2450 psia has been generate with no MSIS or EFAS and SG Narrow Range (NR) level drops to 15%. Once a DEFAS signal has been generated, the SGs will be fed up to 80% NR instead of the normal EFAS reset level of 25%. Distracter A and B are incorrect because the DEFAS signal comes in at 15% instead of 10%. Distracters A and C are incorrect because the level will rise to 80% after a DEFAS has been generated.

References:

STM 2-70-1, DEFAS, Revision 6, Section 2.2

Historical Comments:

Bank: 1866	**Rev:** 0	**Rev Date:** 5/1/2012 3:11:52		**QID #:** 45		**Author:** Foster			
Lic Level: R	**Difficulty:** 3	**Taxonomy:** H		**Source:** Modified NRC bank 0491					
Search 062000A407	**10CFR55:** 41.7 / 41.10			**Safety Function** 6					
System Title: A.C. Electrical Distribution System				**System Number** 062		**K/A** A4.07			
Tier: 2	**Group:** 1	**RO Imp:** 3.1	**SRO Imp:** 3.1	**L. Plan:** A2LP-RO-EDG		**OBJ** 11.a			

Description: Ability to manually operate and/or monitor in the control room: - Synchronizing and paralleling of different ac supplies

Question:

Consider the following:

- Unit 2 is operating at 100% power
- #2 Emergency Diesel Generator (EDG) monthly surveillance, OP-2104.036, Emergency Diesel Generator Operations, Supplement 2A, is in progress
- #2 EDG is being unloaded in preparation for securing

When preparing to divorce the #2 EDG from offsite power (opening #2 EDG output breaker 2A408), the EDG Kilowatt output is lowered to approximately _________ kW and 2A408 is opened promptly to prevent a(n) ________________ trip of the EDG.

A. 700; Anti-Motoring

B. 700; Overspeed

C. 100; Anti-Motoring

D. 100; Overspeed

Answer:

C. Correct, caution in supplement 2A before step 4.4 and step 4.4 list kW (~100) prior to divorcing the #2EDG from the Grid.

Notes:

A. Incorrect, the EDG is unloaded in 700 kw increments not secured at 700 kW .
B. Incorrect, the EDG is unloaded in 700 kw increments not secured at 700 kW; EDG is designed not to overspeed trip with a full load rejection (tested every 18 months)
D. Incorrect: 100 kW is correct the . EDG is designed not to overspeed trip with a full load rejection (tested every 18 months)

References:

OP-2104.036, Emergency Diesel Generator Operations, Rev. 080, Supplement 2A (2DG2 Monthly Test with 2T31D aligned [slow start] section 4.0 (page 187) CAUTION before step 4.4
OP-2305.049, EDG Periodic Tests, Rev. 024, Supplement 2B.(2DG2 2DG2 Operational Test Without 24 Hour Run) [pages 36, 49, and 51]
A2LP-RO-EDG, Rev. 10, Obj. 11, Explain the operation of the Emergency Diesel Generators for the following scenarios: Paralleling with off site power

Historical Comments:

Modified NRC bank question 0491, used on NRC RO and SRO 2005 Exam

4.0 EDG SHUTDOWN AND RESTORATION

4.1 Verify the following completed as needed:

- Jacket Cooling System chemical addition
- Jacket Cooling sampling

4.2 WHEN 2DG2 has operated at least one hour loaded between 2750 and 2850 KW,
AND oil and water temperatures have stabilized,
THEN record OPERATING TIME in Section 5.0.

4.3 Unload 2DG2 in ~ 700 KW increments with ~ 5 minute at each increment until load is ~1400 KW.

CAUTION

EDG may trip due to anti-motoring if opening 2A-408 is delayed at 100 KW load.

CRITICAL STEP

4.4 WHEN 5 minutes time has elapsed at 1400 KW,
THEN reduce load to ~100 KW,
AND open 2DG2 Output Breaker (2A-408). Time ______

4.5 Adjust voltage to 4160 VAC using Voltage Regulator switch (CS 3).

4.6 Adjust frequency to 60 Hz using Governor Control switch (CS 4).

4.7 Perform the following administrative actions:

4.7.1 Verify Unit 1 has taken appropriate actions as identified in Attachment B of Control Room Emergency Air Conditioning and Ventilation (2104.007).

4.7.2 Verify entry into TS 3.8.1.1, 3.8.1.2 AND 3.4.4 as applicable.

4.7.3 Declare Diesel Engine inoperable due to Engine Start switch in STOP [energizes Shutdown (5) relay for 60 seconds which blocks Engine autostart].

SUPPLEMENT 2B

2DG2 OPERATIONAL TEST WITHOUT 24 HOUR RUN

The purpose of this test is to complete those portions of 18-month TS surveillance requirements not performed by Integrated ESF Test (2305.001) or ESF Response Time Test (2305.003). This test satisfies TS surveillances 4.3.2.1.1 Table 4.3-2.7.a, 4.8.1.1.2.C [parts 3, 4, 5, 8a (simulated SIAS loads)] and 4.8.1.2.

It also demonstrates the ability of Service Water pumps 2P-4B and 2P-4C to auto start on loss of offsite power.

The sequence of events for this supplement is as follows:

1. 2DG2 Auto Start on Undervoltage from Ambient Conditions.
2. 2850 KW Load Rejection.
3. 2DG2 Auto Start on Undervoltage.
4. ≥ 637 KW Load Rejection.

1.0 INITIAL CONDITIONS (STEPS MAY BE PERFORMED IN ANY ORDER.)

1.1 Plant in Mode 5, 6 or defueled. (2CNA120101)

1.2 Currently calibrated, high-speed brush recorder connected to monitor 2DG2 speed AND voltage.

Serial Number ______________

1.3 2DG2 aligned per Section 8.0, Emergency Diesel Generator Operations (2104.036).

1.4 2DG1 NOT loaded for testing.

1.5 WR/WOs issued to the following shops for support:

- Electrical
- I&C

1.6 Contact Dispatcher to determine if any potential grid disturbances exist that prevent tying Diesel to grid.

1.7 2A3 and 2A4 powered from same Transformer.

1.8 2DG2 Output breaker (2A-408) open.

1.9 SDC Train B NOT in service.

1.10 Condensate pumps (2P-2B and 2P-2D) secured.

1.11 Main chiller (2VCH-1B) secured.

1.12 Select ONE of the following as lead Charging pump. (Circle pump selected)

2P-36B 2P-36C

NOTE

Steps 3.41 and 3.42 may be performed in conjunction with Step 3.38.

3.38 WHEN load has been 1400 KW for 10 minutes, THEN load 2DG2 to between 2750 and 2850 KW in ~ 700 KW increments with ~ 5 minute wait at each increment.

3.39 Record date and time 2DG2 fully loaded. Date ________ Time ________

3.40 Maintain 2DG2 fully loaded until load rejection.

3.41 IAW Pressurizer Operations (2103.005), return all Backup Charging Pump Stop Interlocks to normal.

3.42 Perform the following steps in any order:

3.42.1 IF Charging pump (2P-36B) overload heaters removed
OR no further testing required,
THEN perform the following:

A. Install overload heaters in 2P-36B breaker (2B62-A5).

(Relay) Performed: ____________________

B. Independently verify overload heaters installed in 2P-36B breaker (2B62-A5).

(Relay) Performed: ____________________

3.42.2 IF Charging pump (2P-36C) overload heaters removed
OR no further testing required,
THEN perform the following:

A. Install overload heaters in 2P-36C breaker (2B64-A4).

(Relay) Performed: ____________________

B. Independently verify overload heaters installed in 2P-36C breaker (2B64-A4).

(Relay) Performed: ____________________

3.42.3 IF initial test performed with Service Water pump (2P-4C) supplying Loop 2 SW
AND Service Water pump (2P-4B) available to supply Loop 2 SW,
THEN align pumps as follows:

A. Verify 2P-4B supplying Loop 2 SW.

B. Place 2P-4C handswitch (2HS-1440-2) in PULL TO LOCK.

4.0 LOAD REJECTION AND UNDERVOLTAGE RESTART

4.1 Verify applicable conditions from Sections 1.0 and 2.0 of this Supplement remain satisfied.

4.2 IF Turbine Building elevator energized and NOT in use, THEN open Turb Bldg Elev 2M-51 breaker (2B62-L1).

4.3 Verify Ops Manager or designee on Site during UV start of 2DG2.

4.4 Verify Emergency Diesel Generator (2ED2) loaded to 2850 KW.

4.5 Start 2DG2 brush recorder.

CAUTION

- Unloaded or light load engine operations should be minimized to reduce possibility of exhaust manifold fires; therefore, minimize the time loading and unloading an EDG.
- Load on an EDG of less than 1400 kw for long periods of time (> 10 minutes) can cause fuel and oil to build in the exhaust manifold which could cause fires in the exhaust manifold during low load operation or future EDG starts.

4.6 Open 2DG2 Output breaker (2A-408). Date ________ Time ________

4.7 Check engine does NOT trip on overspeed.

4.8 Record speed in Section 6.0.

4.9 Stop recorder AND retain chart.

4.10 Adjust 2DG2 frequency to 60 Hz and voltage to 4160 V.

4.11 Stop 2DG2. Date __________ Time __________

4.12 Verify 2DG2 NOT AVAILABLE alarm (2K09-F1) clear.

4.13 Make the following announcement over plant page:

"ATTENTION ALL PERSONNEL. THERE WILL BE A PARTIAL LOSS OF POWER IN UNIT 2 DUE TO EMERGENCY DIESEL GENERATOR TESTING."

4.14 Notify local operator to perform post start checks IAW Exhibit 4, Emergency Diesel Generator Operations (2104.036) when EDG starts.

QID: 0491 **Rev:** 0 **Rev Date:** 10/27/2004 **RO Select:** **SRO Select:** **Points:** 1.00

Lic Level: RS **Difficulty:** 3 **Taxonomy:** A **Source:** NEW **Originator:** COBLE

10CFR55_41: 41.7 **10CFR55_43:** NA **Section:** 3.6 **Type:** ELECTRICAL

System Title: EMERGENCY DIESEL GENERATOR **System Number** 064 **K/A:** A4.07

RO Tier: 2 **RO Group:** 1 **RO Imp:** 3.4 **SRO Tier:** 2 **SRO Group:** 1 **SRO Imp:** 3.4

Description: Ability to manually operate and/or monitor in the control room: Transfer ED/G (with load) to grid.

Question:

Given the following:

* The plant is at full power
* A monthly surveillance on Emergency Diesel Generator 2DG1 is in progress.
* Electrical load is being transferred back to the grid to unload 2DG1 in preparation for securing.

The 2DG1 Output Breaker, 2A-308) should be opened when electrical load has dropped to ______ to prevent a(n) ________________ trip:

A. 50 kW; Anti-Motoring

B. 100 kW; Loss of Field

C. 50 kW; Loss of Field

D. 100 kW; Anti-Motoring

Answer:

D. 100 kW; Anti-Motoring

Notes:

The Caution in Operating Procedure States: "EDG may trip due to anti-motoring if opening 2A-308 is delayed at 100 kW load" and this trip has been experienced on this unit.

Distracters A is incorrect because it is less than the 100kW guidance in the procedure.

Distracter B is incorrect because this condition will not cause a loss of field trip.

Distracter C is incorrect because it is less than the procedure guidance and the EDG will not trip on Loss of Field under these conditions.

References:

NOP 2104.036, EDG Operations, Step 13.4.2 and Caution above this step.
A2LP-RO-EDG OBJ. 9, Explain the Limits and Precautions associated with the Emergency Diesel Generators.

Historical Comments:

This question has not been used on any previous NRC exams. BNC 10/27/2004.

Bank: 1867	**Rev:** 0	**Rev Date:** 5/10/2012 9:55:28		**QID #:** 46		**Author:** Foster			
Lic Level: R	**Difficulty:** 4	**Taxonomy:** H		**Source:** Modified ANO-OPS2-11993					
Search 063000A101		**10CFR55:** 41.5		**Safety Function** 6					
System Title: D.C. Electrical Distribution System				**System Number** 063		**K/A** A1.01			
Tier: 2	**Group:** 1	**RO Imp:** 2.5	**SRO Imp:** 3.3	**L. Plan:** A2LP-RO-ED125		**OBJ** 7			

Description: Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the D.C. Electrical System controls including: - Battery capacity as it is affected by discharge rate

Question:

Consider the following:

- Unit 2 is operating at 100% power
- A Loss of Offsite Power occurs
- Neither EDG starts
- The AACDG is unavailable
- ATC reports CEA #3 not fully inserted
- Reactor power is lowering
- all other plant components operate as designed

When the appropriate EOP is entered, the ________________ safety function is the greatest concern because ________________.

A. Reactivity; there is no means to Emergency Borate

B. Maintenance of Vital Auxiliaries; of the discharge rate on the vital batteries

C. RCS Heat Removal; the Steam Generator safeties are lifting

D. Core Heat Removal; there are no Reactor Coolant Pumps running

Answer:

B. Correct; Functional Recovery EOP will be entered due to a Site Blackout with a stuck out CEA Station Blackout. The Reactivity Safety function will be satisfied due to just 1 CEA not fully inserted and reactor power lowering, Maintenance of Vital Auxiliaries safety function will be jeopardized due to no Vital AC bus being energized, Core Heat Removal is satisfied by Natural Circulation and RCS Heat Removal will be satisfied by SG Safeties lifting and the SGs being feed with the steam driven Emergency Feedwater Pump [2P-7A]. The vital batteries will be the only source of power during the site blackout and battery capacity will be affected due to the high discharge rate.

Notes:

A, C, and D, due to reasons as stated above

References:

OP-2202.001, Standard Post Trip Actions, Rev. 013, step 3.B contingency column 3.B [page 3]
OP-2202.010, Standard Attachments, Rev. 19, Exhibit 8 [page 166]
OP-2202.009, Functional Recovery EOP, Rev. 013, entry section step 6.E contingency 6.E [page 6] step 9 [page 9] step 11.A [page 10] step 11.D [page 10] step 11.F.1), 2), and 4) [page 12]
EOP-2202.009, Functional Recovery EOP Tech Guide, Rev. 12, step 10 [pages 17 and 18]
A2LP-RO-ED125, Rev. 7, Obj. 7, Describe the operation and ratings of the following: Batteries 2D11 and 2D12, Battery Disconnect and Fuses for 2D01 and 2D02

Historical Comments:

Modified ANO-OPS2-11993 last used on Exam A2WEX-RO-EXAM11-7A AND A2WEX-SRO-EXAM11-7A, 11/05/2010

INSTRUCTIONS	CONTINGENCY ACTIONS
3. **Check Reactivity Control established as follows:**	
_____A. Reactor power lowering.	A. Perform the following: 1) Perform the following as needed to manually trip CEAs: • Depress BOTH Reactor Trip pushbuttons on 2C03. • Depress DSS Emergency Reactor Trip pushbutton on 2C03. • Depress BOTH Manual Reactor Trip pushbuttons on 2C14. 2) IF reactor power NOT lowering, THEN perform the following: a) Open the following breakers on 2C10 to de-energize BOTH MG sets: • 2B712 • 2B812 b) WHEN breakers have been open 10 seconds, THEN close 2B712 and 2B812.
_____B. ALL CEAs fully inserted by observing ANY of the following: (1) CEA Rod bottom lights illuminated. (2) CEAC 1 indicates ALL CEAs fully inserted. (3) CEAC 2 indicates ALL CEAs fully inserted.	_____B. Verify emergency boration in progress using Exhibit 1, Emergency Boration.

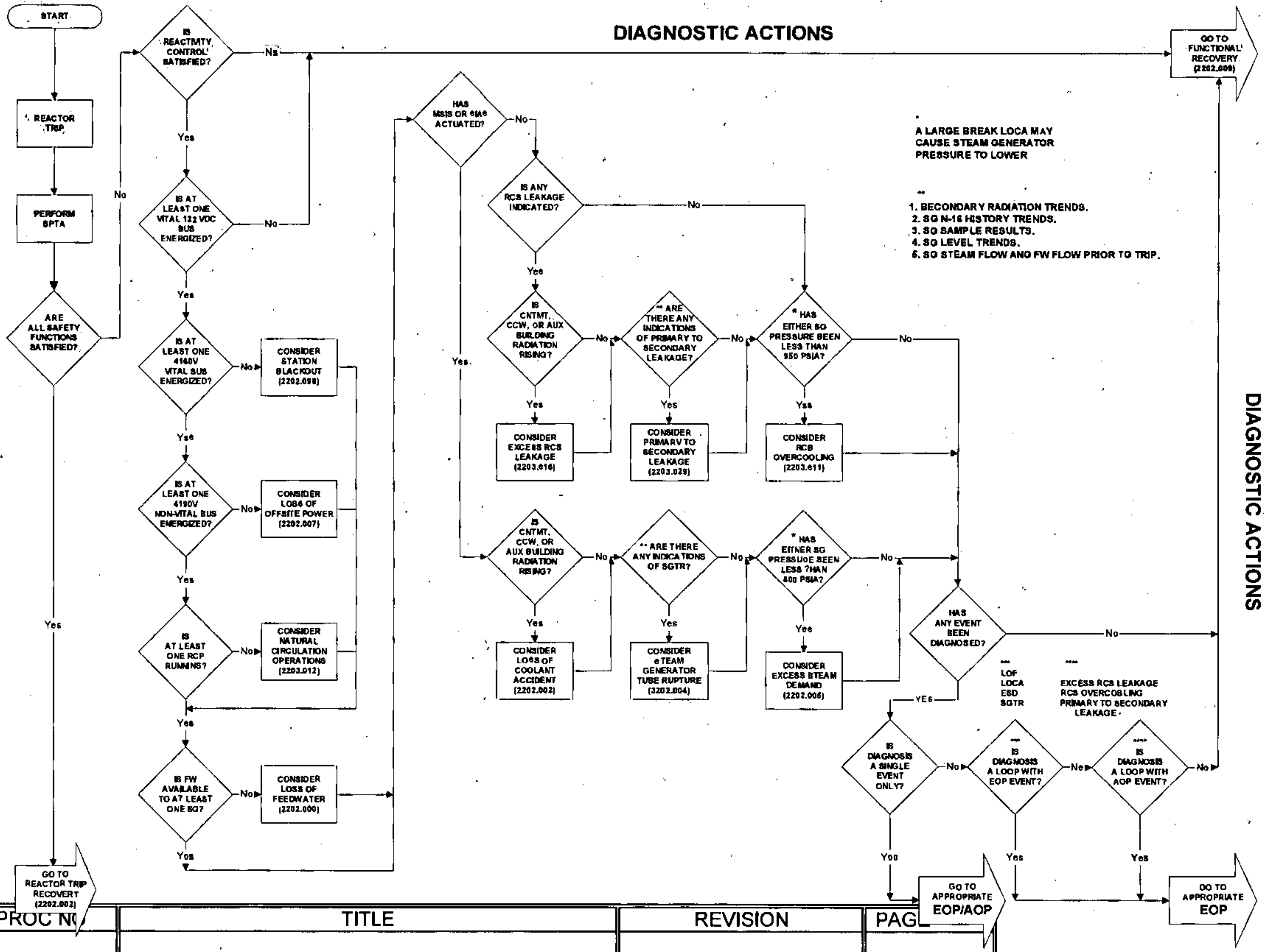
INSTRUCTIONS	CONTINGENCY ACTIONS
4. Check Maintenance of Vital Auxiliaries satisfied:	
A. Check Main Turbine tripped by BOTH of the following: • ALL Main Stop Valves closed. • Generator megawatts indicate zero.	A. Perform the following: 1) Manually trip Main Turbine at 2C01. 2) <u>IF</u> Main Turbine does <u>NOT</u> trip, <u>THEN</u> close MSIVs: • 2CV-1010-1 • 2CV-1060-2
B. Generator Output breakers open.	B. Open Generator Output breakers: • 5130 • 5134
C. Exciter Field breaker open.	C. <u>IF</u> Generator Output breakers open, <u>THEN</u> open Exciter Field breaker.
D. Check the following valves closed: • MSR 2E-12A Steam Supply From SG A (2CV-0400) • MSR 2E-12B Steam Supply From SG B (2CV-0460)	D. Close MSIVs: • 2CV-1010-1 • 2CV-1060-2

(Step 4 continued on next page)

INSTRUCTIONS	CONTINGENCY ACTIONS
4. (continued)	
____ E. At least ONE 6900v AC bus energized.	
____ F. At least ONE 4160v Non-vital AC bus energized.	
____ G. BOTH 4160v Vital AC buses energized.	G. Perform the following: 1) IF de-energized 4160v Vital AC bus available AND associated EDG available, THEN verify associated EDG supplying bus. 2) IF NEITHER DG available, THEN start AACG AND align to associated 4160v Vital bus using 2104.037, Alternate AC Diesel Generator Operations, Attachment E. ____ 3) Check at least ONE 4160v and 480v Vital AC bus energized.
H. BOTH DGs secured.	H. IF ANY DG running AND SW NOT aligned, THEN locally stop DG by unlocking and placing "ENGINE CONTROL" handswitch in LOCKOUT: • 2E11 • 2E21
____ I. At least ONE 125v Vital DC bus energized: • 2D01 - SPDS point E2D01 • 2D02 - SPDS point E2D02	

2202.010
Revised 07/18/05

EXHIBIT 8



INSTRUCTIONS	CONTINGENCY ACTIONS
6. (continued)	
D. Verify SW pump suction aligned to Lake.	D. IF SW pump suction can NOT be aligned to Lake, THEN perform the following: 1) Verify SW Return headers aligned to ECP. 2) Verify SW to CCW and ACW isolated. 3) Verify CCW/ACW Return valves closed: • 2CV-1543-1 • 2CV-1542-2 4) Secure CCW and ACW using 2202.010 Attachment 6, Securing CCW and ACW. 5) **GO TO** Step 7.
E. Check 4160v Non-vital bus 2A1 OR 2A2 energized from offsite power.	E. **GO TO** Step 7.

(Step 6 continued on next page)

INSTRUCTIONS	CONTINGENCY ACTIONS
7. IF CCW in service to provide SG Sample Cooler cooling, THEN perform the following: A. IF SG "A" has indicated water level, THEN verify the following SG 'A' Sample Valves open: • 2CV-5850 • 2CV-5852-2 B. IF SG "B" has indicated water level, THEN verify the following SG 'B' Sample Valves open: • 2CV-5858 • 2CV-5859-2 C. Notify Chemistry to sample available SGs for activity.	
8. Check ALL available Hydrogen Analyzers in service using 2104.044, Containment Hydrogen Control Operations.	**8. Verify all available Hydrogen Analyzers in service within 70 minutes from start of event.** • Record time from Entry Section step 2: Time______________
9. Open Functional Recovery Success Path Tracking page.	
10. Notify Control Board Operators to perform the following: A. Monitor floating steps. B. Verify actuated ESFAS components using 2202.010 Exhibit 9, ESFAS Actuation.	

INSTRUCTIONS | **CONTINGENCY ACTIONS**

11. **Determine safety function status as follows:**

A. Check **Reactivity Control** satisfied by EITHER of the following:

- Maximum of ONE CEA NOT fully inserted and Reactor power lowering.
- Reactor power less than 10^{-1}% and stable or lowering.

B. Check **Vital DC Auxiliaries** satisfied:

1) At least ONE 125v Vital DC bus energized:

- 2D01-SPDS point E2D01
- 2D02-SPDS point E2D02

2) At least ONE 120v Vital AC bus energized:

- 2RS1 - SPDS point E2RS1 or E2RS1RS3
- 2RS2 - SPDS point E2RS2 or E2RS2RS4
- 2RS3 - SPDS point E2RS3 or E2RS1RS3
- 2RS4 - SPDS point E2RS4 or E2RS2RS4

C. Check **Vital AC Auxiliaries** satisfied:

1) At least ONE 4160v Vital AC bus (2A3/2A4) energized.

(Step 11 continued on next page)

INSTRUCTIONS | CONTINGENCY ACTIONS

11. (continued)

F. Check **RCS and Core Heat Removal** satisfied:

1) At least ONE intact SG available for Heat Removal by EITHER of the following:

- Level 10% to 90% [20% to 90%] AND FW available.
- Level being restored AND total FW flow of 485 gpm or greater.

2) Uncontrolled SG depressurization NOT in progress.

3) IF ANY RCP operating, THEN RCS ΔT less than 10°F and NOT rising.

4) IF ALL RCPs secured, THEN RCS ΔT less than 50°F and NOT rising.

5) RCS T_C less than 555°F and NOT rising.

6) RCS MTS 30°F or greater.

7) RVLMS LVL 01 indicates WET.

(Step 11 continued on next page)

FRP STEP:

10. **Determine safety function status as follows:**

EPG STEP:

*8.

DEVIATION? Yes

BASIS FOR DEVIATION:

EOP Step 1 provides instructions to perform the SFSC every fifteen minutes. This duty is carried out by the Shift Technical Advisor (SE). The STA utilizes control board instrumentation as well as instrumentation in other parts of the control room. The projected time to fully complete the SFSC is less than 15 minutes.

EOP Step 11 provides instructions for determining safety function status. This step is intended for the control board operators using control board instrumentation only, resulting in an expeditious assessment of all safety functions.

This step uses the lowest numbered success path acceptance criteria of each safety function. The acceptance criteria from these success paths are the most readily achievable of all the success paths and allow the operator to identify a safety function which might be in jeopardy. The bases for each of the acceptance criteria is found in the Technical Guideline for the individual success paths.

1. The EOP, as does the EPG, requires that reactor power be lowering or less than 10^{-1}% (14), and that a maximum of one CEA be not fully inserted or that the RCS be borated per Technical Specifications. The EOP does not utilize the EPG step checking for a "negative startup rate" as an indication of establishing reactivity control. Past experience has shown that the SUR indication fluctuates too widely to provide a reliable indication of reactor power trends. Additionally, the SUR meter can not be used to accurately determine negative startup rates. The meter's scale was designed to show positive startup rates, and was intended for use primarily during startups.

2. No deviation.

3. The EOP RCS inventory control SFSC is structured similarly to the EPG, while using plant specific levels. The criteria which is applicable for isolated LOCA ensures that level is within the indicating band while avoiding solid water operation (1). The EOP uses the ANO-2 specific RVLMS & MTS values (2) and harsh containment values for PZR level (13).

4. The EOP RCS pressure control SFSC is structured similarly to the EPG, while using plant specific curves. The preferred P-T operating area ensures that pressure sufficient MTS is maintained to provide RCS cooling while avoiding PTS concerns (3).

5. The EOP, as is the EPG, is designed to check that at least one SG is available for removing heat from the RCS. The EOP is consistent with the EPG in that it requires SG level to be above a certain minimum value or feed flow adequate for heat removal (5) and that RCS temperature be controlled. A harsh CNTMT value for low SG level has been added (5). The plant specific values used in this criteria for Core Heat Removal with or without RCPs are consistent with the EPG and are detailed in the EOP setpoint file (4). A check for uncontrolled SG depressurization is also performed to monitor for excessive cooldown.

6. The EOP Containment Isolation acceptance criteria is consistent with the EPG in that it requires primary and secondary radiation alarms to be clear, and that containment pressure be below the CIAS setpoint or CIAS actuated (6). The EOP also requires that containment radiation and secondary systems radiation show no unexplained rise.
A note informs the operator that loss of 2Y1 will disable 2RR-1057 and 2K11-A10 (18)

7. CNTMT Temperature and Pressure Control is verified if CNTMT temperature and pressure are within the acceptance criteria (16).

SOURCE DOCUMENTS:

1. ANO-2 EOP Setpoint Document, setpoints D.2, D.4, D.5 & D.6.
2. ANO-2 EOP Setpoint Document, setpoint M.1, R.2 & R.3.
3. ANO-2 EOP Setpoint Document, setpoints P.1 & P.2,
   2202.010, Standard Attachments, Attachment 1, P-T Limits.
4. ANO-2 EOP Setpoint Document, setpoints M.1, B.3, B.8, B.9, R.1
5. ANO-2 EOP Setpoint Document, setpoints G.5, G.6, G.7, G.8 & F.3.
6. ANO-2 EOP Setpoint Document, setpoint C.1
7. Not used
8. Not used
9. ANO-2 EOP Setpoint Document, setpoints C.11,C.12.
10. Not used
11. Not used
12. Not used
13. ANO-2 EOP Setpoint Document, setpoints D.1, D.2, D.3 & D.4.
14. ANO-2 EOP Setpoint Document, Setpoint U.11.
15. 2202.010. Standard Attachments, Exhibit 2, HPSI Flow Curve
    2202.010. Standard Attachments, Exhibit 3, LPSI Flow Curve
    2202.010, Standard Attachments, Exhibit 10, HPSI Termination/Throttling Criteria
16. ANO-2 EOP Setpoint Document, Setpoints C.3, C.16..
17. P16180, Proposed Change to Requirements Regarding Containment Hydrogen Monitors
    ANO-2 EOP Setpoint Document, Setpoint H.7.
18. Electrical Schemes E-2433-2 and 2737-3

 ANO-OPS2-11993

Consider the following:

- Unit 2 is at full power.
- 2DG1 is out of service for maintenance.
- The AACG is out of service due to a leak in the JCW system.
- The Main Turbine trips.
- SU Transformer #3 voltage regulator locks out.
- SU Transformer #2 voltage regulator locks out.
- 2DG2 did not start and has no more starting air.
- All CEAs are fully inserted.

At the time the appropriate EOP is diagnosed, the ____________ safety function is the greatest concern because ____________.

A. Reactivity, there are no means to Emergency Borate

B. Maintenance Of Vital Auxiliaries; of the discharge rate on the vital batteries

C. RCS Heat Removal; the SG safeties are lifting

D. Core Heat Removal; no RCPs are running

PARENT

Answer: B
Question Comments:
Image Reference: None
QuestionID: ANO-OPS2-11993
Objectives:
1. CourseID: A2LP-RO-ESBO Objective: 4
2. CourseID: A2LP-RO-ESPTA Objective: 12
3. CourseID: A2LPLOR85SBO Objective: 2

KA References:
References:
1. 2202.008

 ANO-OPS2-11993

Training Programs:

1. Licensed Operator Requalification
2. Reactor Operator
3. Senior Reactor Operator

Categories:

Systems:

Task References:

Cognitive Level: 2: Comprehension or Analysis

Point Value: 1.0

Exam Bank: OpsUnit2

Review Status: Reviewed

Comments:

Bank: 1868	**Rev:** 0	**Rev Date:** 5/9/2012 1:46:14	**QID #:** 47	**Author:** Foster					
Lic Level: R	**Difficulty:** 2	**Taxonomy:** H	**Source:** Modified NRC bank 1657						
Search 063000A301	**10CFR55:** 41.7	**Safety Function** 6							
System Title: D.C. Electrical Distribution System	**System Number** 063	**K/A** A3.01							
Tier: 2	**Group:** 1	**RO Imp:** 2.7	**SRO Imp:** 3.1	**L. Plan:** A2LP-RO-ED125	**OBJ** 6, 7				

Description: Ability to monitor automatic operation of the D.C. Electrical System, including: - Meters, annunciators, dials, recorders, and indicating lights

Question:

Consider the following:

- Unit 2 is operating at 70% power
- The 2D01 Battery fuses, in cabinet 2D-41, have blown due to degradation

The ________________ Annunciator should come into alarm and the battery charger output supplying 2D01 should ____________________.

A. Battery NOT Available; rise significantly

B. Battery NOT Available; stay approximately the same

C. 2D01 undervoltage; rise significantly

D. 2D01 undervoltage; stay approximately the same

Answer:

B. Correct; ACA 2K01 D-10 step 1.2 [page 118] Battery NOT Available alarm; stay approximately the same Normal lineup is the battery charger supplying the bus (carrying the loads) and the battery in "backup"

Notes:

A. Incorrect; Battery NOT Available alarm will come into alarm; but the charger output will stay approximately the same. Normal lineup is the battery charger supplying the bus (carrying the loads) and the battery in "backup"

C. Incorrect; the battery charger is still supplying 2D01 bus therefore there would not be an undervoltage condition; Normal lineup is the battery charger supplying the bus (carrying the loads) and the battery in "backup" therefore there will be no significant change in charger output.

D. Incorrect; the battery charger is still supplying 2D01 bus therefore there would not be an undervoltage condition

References:

OP-2203.012-A, ACA, Rev. 041, window 2K01 A-10, step 1.1 [page 115]
OP-2203.012-A, ACA, Rev. 041, window 2K01 D-10, step 1.2 [page 118]
STM 2-32-5, 125 VDC Electrical Distribution, Rev. 17, sections 2.3 [page 9], 2.4 [12], and 3.0 [page 30]
A2LP-RO-ED125, Rev. 7, Obj. 6, Describe the operation of the following Battery Chargers: The battery Charger associated with 2D01 and 2D02 and Obj. 7, Describe the operation and ratings of the following: Batteries 2D11 and 2D12, Battery Disconnect and Fuses for 2D01 and 2D02

Historical Comments:

Modified NRC bank question 1657, used on RO/SRO 2009 NRC Exam

ANNUNCIATOR 2K01

A-10

CONT CENTER 2D01 UNDERVOLT

1.0 CAUSES

1.1 2D01 Bus voltage ≤ 110 VDC (relay 27-2D01).

2.0 ACTION REQUIRED

2.1 Check 2D01 voltage on Computer point (E2D01).

2.2 Check the following for Battery bank (2D-11) on Fuse and Relay Cabinet (2D-41):

- Amperage (nominal -10 to +10 amps)
- Voltage (nominal 125 to 135 volts)

2.3 Check the following for 2D-11 Battery charger (2D-31A or 2D-31B):

- A301 DC Output Current (nominal 100 to 150 amps)
- V301 DC Output Voltage (nominal 120 to 140 volts)

2.4 IF Battery Charger amps high (current limited to 400 amps)
AND 2D-11 is discharging,
THEN secure unnecessary 2D01 loads.

2.5 Refer to Loss of 125 VDC (2203.037).

2.6 Check for overloads or multiple grounds (both positive and negative) on Fuse and Relay Cabinet (2D-41).

2.7 Refer to Tech Specs 3.8.2.3 and 3.8.2.4.

3.0 TO CLEAR ALARM

3.1 Raise bus 2D01 voltage above setpoint.

4.0 REFERENCES

4.1 E-2451-2A

ANNUNCIATOR 2K01

D-10

BATTERY 2D11 NOT AVAIL

1.0 CAUSES

1.1 2D-11 Battery disconnect (2D-51) open.

1.2 Battery fuse in Fuse and Relay Cabinet (2D-41) blown or removed.

2.0 ACTION REQUIRED

2.1 IF Battery NOT connected to bus (i.e. disconnect open or fuse blown), THEN perform the following:

2.1.1 Declare Emergency Diesel Generator (2DG1) inoperable. (CR-ANO-C-2003-00877)

- Refer to Tech Specs 3.8.1.1, 3.8.1.2, and 3.4.4.
- Notify Unit 1 to refer to appropriate Tech Specs.

2.1.2 Enter 24 AOT for Inverter 2Y11/13/1113 operation without battery backup. Refer to Supplement 4 of Electrical System Operations (2107.001).

2.2 IF Battery Disconnect open, THEN perform the following:

2.2.1 Determine reason for Disconnect switch being open.

2.2.2 WHEN appropriate, THEN close disconnect.

2.3 IF fuse blown or removed, THEN perform the following:

2.3.1 Determine cause of blown fuses.

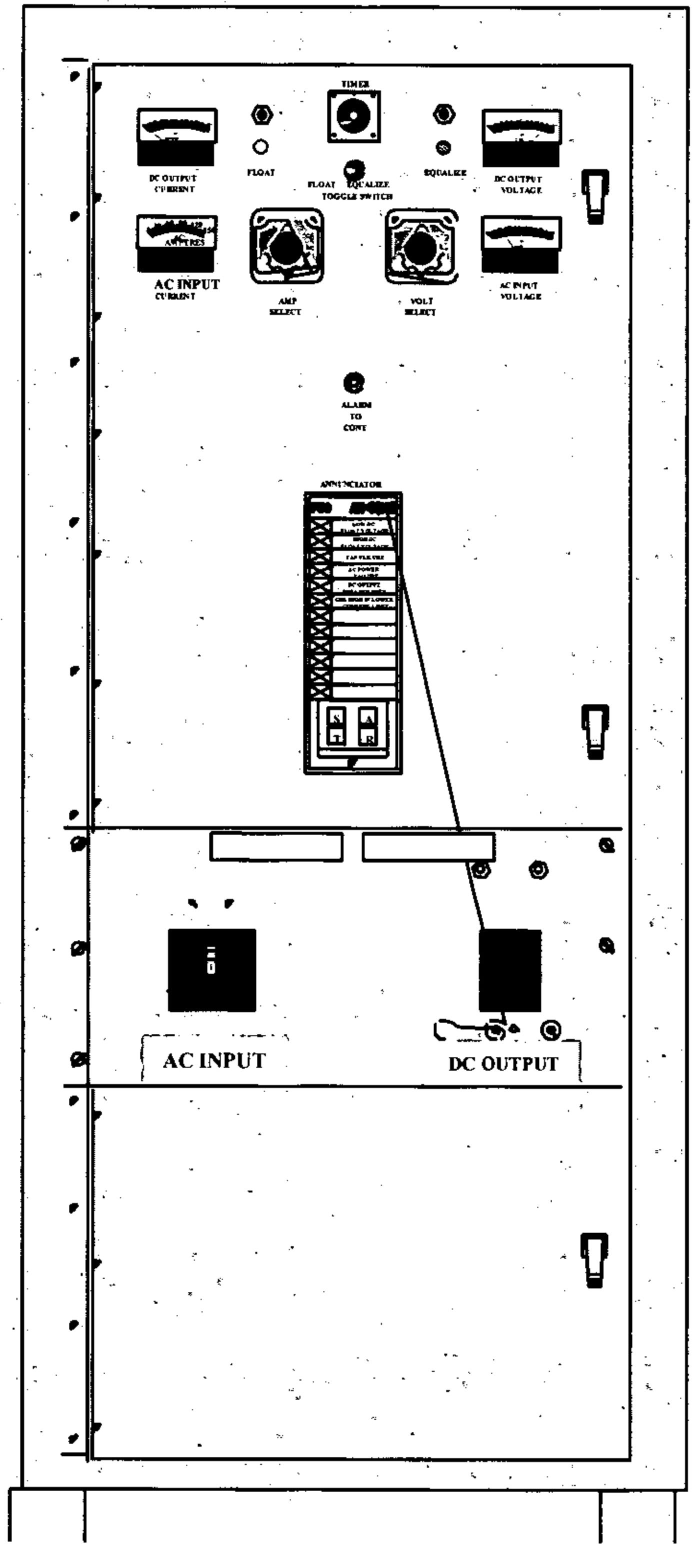
2.3.2 WHEN cause repaired or isolated, THEN replace fuses in Fuse and Relay Cabinet (2D-41).

2.4 Refer to Tech Specs 3.8.1.1, 3.8.1.2, 3.8.2.3, and 3.8.2.4.

2.5 Refer to Control Room Emergency Air Conditioning and Ventilation, 2104.007, Attachment B (Component/Tech Spec Cross-Reference) for Unit 1 and Unit 2 CREVS/CREACS TS/TRM applicability.

(D-10 Continued on next page)

2.3 Vital Battery Chargers



2D31A, 2D31B, 2D32A, and 2D32B are the Vital bus battery chargers. 2D33 is the Non-Vital battery charger.

2D31A is the normal supply to bus 2D01, and 2D32A is the normal supply to bus 2D02. 2D31B and 2D32B are the Red and Green backup battery chargers respectively.

The function of the battery chargers is as follows.

- Supply bus loads under normal operating conditions.
- Maintain a float charge on the associated battery.
- Maintain an equalizing charge on the respective battery.
- Supply bus loads under emergency operating conditions.

The DC output is regulated at the normal voltage of 128 VDC or the equalize voltage of 140 VDC. The vital chargers (2D31A, 2D31B, 2D32A, and 2D32B) are rated at **400 DC amps** and **have a current limiter for the DC output to limit current to 400 amps.** The battery charger is a voltage control machine with small capacity compared to the battery. Therefore when a charger is placed in service on a bus with a battery whose voltage is lower than normal the charger will try to correct voltage to 128 VDC until it hits the current limit of 400 amps. The voltage will then begin to increase as the battery is "charged" and the amperage will decrease to a normal float value. If it were not for the current limiter the charger would increase current beyond its capacity and cause breakers to trip.

The current limiter for all five battery chargers is 400 DC amps. If a vital battery experienced an emergency duty cycle discharge it would take approximately 6 hours to recharge with a 400 amp charger.

2.4 Vital Batteries

The vital batteries for 2D01 and 2D02 are 2D11 and 2D12 respectively. The non-vital bus 2D03 is connected to battery 2D13.

The station batteries are constructed as follows.

- They are lead acid batteries with lead calcium grid construction.
- The electrolyte (liquid chemical) is Sulfuric Acid H_2SO_4.
- There are 58 cells in each of the Q (vital) batteries 2D11 and 2D12. Each cell is rated at approximately 2.2 VDC each. The Black (non-vital) battery has 60 cells rated at approximately 2.13 VDC each.
- The electrolyte and grid structure are encased in shock resisting, polycarbonate, noncombustible casings or "jars".

The vital batteries (2D11 and 2D12) are each rated as follows.

- 2064 amp hours over an eight hour discharge.
- This rating is designed to last for 8 hours during a discharge to 105 VDC.
- The ratings are at a nominal cell temperature of 77 ^{0}F.

The batteries are connected to their respective bus via a set of fuses rated at 1800 amps and a 1200 amp disconnect.

The discharge rate of the battery due to a design base fault on 2D01 or 2D02 respectively is 6000 amps. This is the maximum amperage that the battery can deliver to a dead positive to negative short. The 1800 amp fuse would blow in approximately **45 seconds** under this faulted condition. This scenario is the basic design base Loss Of DC Scenario.

The non-vital battery (2D13) is rated as follows.

- 2175 amp hours over eight hours
- Terminal discharge voltage is 105 VDC

2.4.1 Battery Disconnect

The battery disconnect is a non-automatic circuit breaker rated at 1200 DC amps. The purpose of the disconnect is to provide a safe/easy way to disconnect the battery from its respective bus for maintenance and testing. The disconnects are locked in the closed position during normal operation. Refer to the figure on page 27.

2.4.2 Fuse/Relay Panel

The Fuse and Relay Panel houses the 1800 DC amp battery fuses and the following instrumentation.

- Positive voltage indication (V1).
- Negative voltage indication (V2).
- Total DC voltage
- DC amps.

Refer to the picture on page 28.

The positive and negative voltage indications can be used to determine if a ground exists on the respective DC bus. A ground is indicated by a voltage difference between the two ground referencing

3.0 Associated Alarms

The following Table will list all of the alarms, setpoints and any remarks necessary for those alarms associated with the 125 VDC Distribution system.

Window	Alarm	Setpoint	Remarks
2K01-A10	CONT CENTER 2D01 UNDERVOLT	2D01 bus voltage ≤ 110 VDC	Refer to T.S. 3.8.2.3 & 3.8.2.4
2K01-A11	CONT CENTER 2D02 UNDERVOLT	2D02 bus voltage ≤ 110 VDC	Refer to T.S. 3.8.2.3 & 3.8.2.4
2K01-A12	CONT CENTER 2D03 UNDERVOLT	2D03 bus voltage ≤ 114 VDC	
2K01-B10	ESF PANEL 2RA1 BUS UNDERVOLT	2RA1 bus voltage ≤ 110 VDC	Refer to T.S. 3.3.2.1
2K01-B11	ESF PANEL 2RA2 BUS UNDERVOLT	2RA2 bus voltage ≤ 110 VDC	Refer to T.S. 3.3.2.1
2K01-D10	BATTERY 2D11 NOT AVAIL	1) Battery Disconnect open 2) Battery fuse blown or removed	Refer to T.S. 3.8.2.3 & 3.8.2.4
2K01-D11	BATTERY 2D12 NOT AVAIL	1) Battery Disconnect open 2) Battery fuse blown or removed	Refer to T.S. 3.8.2.3 & 3.8.2.4
2K01-D12	BATTERY 2D13 NOT AVAIL	1) Battery Disconnect open 2) Battery fuse blown or removed	
2K01-E10	BUS 2D01 CHARGER TROUBLE	Any of the following for a Red Battery Charger. • Low DC Float Voltage • High DC Float Voltage • Fan Failure • AC Power Failure • DC Output Breaker Open • Charger in Lower Current Limit	Refer to T.S. 3.8.2.3 & 3.8.2.4

QID: 1657 Rev: 1 Rev Date: 7/24/2009 3: RO Select: SRO Select: Points:

Lic Level: R Difficulty: 2 Taxonomy: H Source: Exam Bank OPS2-6 Originator: Coble

10CFR55_41: 10CFR55_43: Section: Type:

System Title: D.C. Electrical Distribution System System Number 063 K/A: A3.01

RO Tier: 2 RO Group: 1 RO Imp: 2.7 SRO Tier: SRO Group: 1 SRO Imp: 3.1

Description: Ability to monitor automatic operation of the D.C. Electrical System, including: - Meters, annunciators, dials, recorders, and indicating lights

Question:

Given the following:

* The plant is at full power
* Green Vital Electrical DC Bus 2D02 voltage is 130V DC
* Battery Charger 2D32A load is 135 amps
* The Green Vital Battery 2D12 Disconnect is now opened by maintenance personnel without informing the Control Room

Given these conditions, the ________________ alarm would annunciate in the Control Room and the Battery Charger load would ____________________.

A. 2D02 undervoltage; rise significantly

B. 2D02 undervoltage; stay approximately the same

C. Battery NOT Available; rise significantly

D. Battery NOT Available; stay approximately the same

Answer:

D. Battery NOT Available; stay approximately the same

Notes:

As long as the Battery charger has AC input, then the battery charger is supplying the loads on the Green DC busses and the battery is acting as a backup. Disconnecting the battery from the bus in this case would result in a "Not Available" alarm only and no change in amps/load.

References:

STM 2-32-5, 125 VDC Electrical Distribution, Rev. 15, sections 2.3, 2.4, and 3.0 and figure on page 22
Lesson plan A2LP-RO-ED125, 125 VDC Electrical Distribution, Rev. 6. Objective 6: Describe the operation of the following Battery Chargers: The Battery Chargers associated with 2D01 and 2D02
and Objective 7 Describe the operation and ratings of the following: Battery Disconnect and Fuses for 2D01 and 2D02.

Historical Comments:

Never been used on a NRC Exam

Bank:	1869	**Rev:**	0	**Rev Date:**	5/11/2012 9:52:50	**QID #:**	48	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NEW				
Search	064000A101	**10CFR55:**	41.5	**Safety Function**	6						
System Title:	Emergency Diesel Generator (ED/G) System	**System Number**	064	**K/A**	A1.01						
Tier:	2	**Group:**	1	**RO Imp:**	3.0	**SRO Imp:**	3.1	**L. Plan:**	A2LP-RO-EDG	**OBJ**	9

Description: Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ED/G System controls including: - ED/G lube oil temperature and pressure

Question:

Considering OP-2104.036, Emergency Diesel Generator Operations procedure, Limit and Precaution 5.10:

Continuous Load rating for an EDG should __________ as Service Water temperature __________.

A. increase; increases

B. increase; decreases

C. decrease; increases

D. decrease; decreases

Answer:

C. Correct; limit and precaution 5.10 in the NOP states the lowering of EDG continuous load rating based on Service Water temperature.

Notes:

A. Incorrect; opposite of L&P
B. Incorrect; the max load rating only changes with above normal SW temperature [i.e. hotter than design] therefore as SW temperature lowers below design there is no change in the design rating [still 2850 Kw]
D. Incorrect; same reason as stated above

References:

OP-2104.036, Emergency Diesel Generator Operations, Rev. 080, section 3.0 [page 3] section 5.0 step 5.10 [page 8]
A2LP-RO-EDG, Rev. 10, Obj. 9, Explain the Limits and Precautions associated with the Emergency Diesel Generators.

Historical Comments:

New Question

1.0 PURPOSE

To provide a basic description and the necessary guidance for the proper operation of the Unit 2 Diesel Generators and their Auxiliary Systems.

2.0 SCOPE

This procedure includes a description of Unit 2 Emergency Diesel Generators and instructions for normal and abnormal operations. It also provides the required Tech Spec surveillances for the EDGs and their Auxiliary Systems. EDG Exhibits are posted locally for operator assistance.

3.0 DESCRIPTION

The Unit 2 Diesel Generator sets are comprised of a Fairbanks Morse, 12 cylinder, two cycle, opposed piston, turbo-charged engine with the necessary skid mounted auxiliaries and a 4160 VAC generator with a continuous rating of 2850 KW at 900 rpm.

The Jacket Coolant System removes the heat of combustion from the engine. The Jacket Coolant Pump is gear driven from the lower crankshaft. The Jacket Coolant Heat Exchanger rejects heat to service water. A temperature control valve maintains system temperature between 175 and 185°F.

The Air Cooler System removes heat from combustion air before it enters the engine. The Air Coolant Pump is gear driven from the lower crankshaft. The Air Coolant Heat Exchanger rejects heat to service water. A temperature control valve maintains temperature between 100 and 115°F. The Jacket Cooling Water and Air Cooler Systems share a common Expansion Tank.

The Lubricating Oil System supplies oil to the pistons and other surfaces that require lubrication and cooling. The Lube Oil Pump is a herringbone gear type pump gear driven from the lower crankshaft. The Lube Oil Heat Exchanger rejects heat to service water. A temperature control valve maintains temperature between 190 and 200°F. The Pre-Lube Pump is used for component lubrication prior to manual start and to fill the Lube Oil System external to the engine after maintenance.

The external Fuel Oil System provides a continuous supply of clean fuel oil for engine operation. The system consists of Storage Tanks, Transfer Pumps, Day Tanks, and connections for cross connecting the systems. The Storage Tanks are maintained full by gravity feed from the Bulk Diesel Oil Storage Tank (T-25). The Transfer Pumps take suction from the Storage Tank and transfer fuel oil to the Day Tank. If the Transfer Pump is out of service, the fuel oil systems can be cross-connected with each other or with Unit 1.

The Engine Fuel Oil Pump is a gear-type positive displacement pump gear driven by the engine off the same drive shaft that drives the governor. The pump takes suction from the Day Tank and discharges through a filter. A hand-operated pump is provided for priming after maintenance or initial system fill. The Fuel Injector Pumps (two per cylinder) receive fuel from the Engine Fuel Oil Pump. The amount of fuel injected is controlled by the Governor Assembly, which adjusts the Injector Pump stroke for varying loads.

The Starting Air System is designed to accelerate engine speed to 180 rpm in five seconds. The Starting Air Compressors maintain pressure in their respective Air Receivers between 220 and 245 psig. Each Air Receiver stores enough air to start the engine five times without the use of the compressors. Starting Air Solenoid valves automatically direct air through the Air Start distributors, a Pilot Air valve (one per cylinder) into the area between the pistons causing engine rotation.

4.0 REFERENCES

4.1 References Used in Procedure Preparation:

- Colt/Fairbanks Morse Technical Manual
- REG GUIDE (1.108) Periodic Testing of Diesel Generator Units Used as Site Electrical Power Systems at Nuclear Power Plants
- ANO Unit 2 Technical Specifications
- ANO Unit 2 SAR - Section 8.0
- IE Information Notice No. 85-32
- ANO-88-2-00471 Alarm Delay Circuit
- L82-1120 EDG Start Without Prelubing
- IST Program, ASME OM Code, 2004 Edition with no Addenda
- Emergency Diesel Generator Fuel Oil System (P&ID M-2217)
- Emergency Diesel Fuel Transfer Pumps (Schematic E-2109)
- L82-1603 Caution Against Air-Roll Without DC Control Power
- LER 50-368/91-015-00, Inadequate Vendor Analysis of coolant cross flow
- NRC Generic Letter 84-15
- Condition Report 2-91-0514, Action 3, minimum room temperature for EDG operability
- ANO-94-2-00425, Exhaust manifold oil leaks
- Condition Report 2-94-0338, Action 3, EDG Governor setting for low speed starts
- LIC-94-160, Tech Spec clarification with Fuel Oil Transfer System cross-connected
- PC 94-8013 EDG Jacket Cooling High Point Vent installation
- CR 2-95-0097, Action 2, EDG exhaust fumes in the Control Room during monthly surveillance
- PIE 93-0285-B, Operate Mechanical Trip Reset Lever twice to reset as per Coltec instructions
- ER974603P201, EDG Fuel Oil Day Tank Level switch Mod
- ANO-C-2000-0024, SOER-99-01, Running EDG at light loads during degraded or elevated off-site power
- ANO-2-1999-0535, CALC-91-D-2003-01, Load Limits on EDG with Elevated Scavenging Air Temperature
- CR-ANO-2-2000-0491 CA-4, Verification of Local Voltage Regulator
- ER003132N201, Provides Replacement for ITE Pneumatic Timing Relay
- CR-ANO-2-2000-0505, Degradation of EDG 5 relays causing EDG restart
- CR-ANO-2-2000-0740, Exciter not shutdown during a slow start
- CR-ANO-2-2000-0689, Check EDG Manual Voltage Regulator (43MAL)
- CR-ANO-2-2001-0158, #1EDG Voltage Regulator Erratic Operation
- ER010493E201, Remove valve handles from 2ED-1021A/B
- CR-ANO-2-2001-1076, Check EDG Manual Exciter Regulator
- ER-ANO-2-2000-2768-002, EDG Exhaust Fans Controls Modification
- OP-2402.002, 4-5 second wait prior to removing the dipstick to check oil

- NEI 99-02, CR-ANO-C-2001-0099, Availability of Equipment
- ER980912N202, 2CAN090101, setpoints for the degraded voltage (Millstone) relays
- CR-ANO-2-2001-0473-CA5, EDG Idle L.O. Sump Level High
- ER-ANO-2002-86-000, Idle EDG L.O. Sump Level Limits
- ER010838E201, Emergency Diesel Generator Cooling Water Crossflow
- ER010493E201, Rev 2-remove handles from 2ED-1020A/B
- CR-ANO-2-2002-0262, Valve Handle Removal
- ER-ANO-2002-1146-000, Alarm Delay Circuit time change
- ER-ANO-2002-1143-000, Isolation valves for 2PI-2920 and 2PI-2929
- CR-ANO-2-2004-0338, 2ED-2935 and 2ED-2920 valve lineup position wrong after installation per ER-ANO-2002-1143-000
- ER-ANO-2002-0086-002, Revise Unit 2 EDG oil sump levels
- Calc-85-S-00002-01, Emergency Diesel Generator Loading
- CR-ANO-C-2004-0526 CA41 & CR-ANO-2-2006-0533 CA1, Governor Oil Levels
- CR-ANO-2-2006-00728, Generator Lockout received due to anti-motoring relay when loading was delayed after DG Output breaker closed
- ER-ANO-2005-0149-004, Qualification of 800 gpm Service Water Flow to the ANO-2 EDG Heat Exchangers
- CR-ANO-2-2006-01908 2T-30 Day Tank overflow causing Fuel Oil spill
- CR-ANO-2-2007-0718 CA9, EDG Fluid Leak Identification and Eval Form
- CR-ANO-2-2007-1073 CA-13,25 response to exhaust manifold fires
- CR-ANO-2-2008-01634 CA30, Day Tank overflow due to level instrument calibration
- CR-ANO-2-2010-01830 CA-6, TS 3.4.4 more limiting to require a plant cooldown than TS 3.8.1.1
- EC-9120, EDG Day Tank Re-calculation
- CR-ANO-2-2010-02608, low battery flashing light was displayed on 2TI-2871 Pyrometer Temperature Indicator

4.2 References Used in Conjunction with this Procedure:

- ESF Electrical System Operation (2107.002)
- Electrical System Operations (2107.001)
- Inverter and 120 VAC Electrical System Operation (2107.003)
- DC Electrical System Operation (2107.004)
- Sampling EDG Cooling Water - Unit 2 (2618.011)
- Sampling Unit 2 Emergency Diesel Generators Lube Oil (2618.030)
- Sampling and Analyzing EDG Day Tanks (2618.027)
- Standard Attachments (2202.010)
- ANO Unit 2 Technical Requirements Manual
- UNIT 2 EDG 2K4A Instrumentation Calibration (2304.134)
- UNIT 2 EDG 2K4B Instrumentation Calibration (2304.135)
- Maintenance Surveillance On Unit 2 Emergency Diesel Generator 2K-4 (2306.005)
- Operability Determination Process (EN-OP-104)

5.0 LIMITS AND PRECAUTIONS

5.1 All EDG start attempts shall be logged in the Station log and recorded using EDG Start/Load/Run Information Sheet (Form 2104.036A).

5.2 If maintenance performed on Lube Oil System, then Pre-lube Pump should be run until all equipment filled and vented and oil flow is visually verified at the most remote bearing.

5.3 Operation with both EDGs tied to grid should be avoided.

5.4 During periods of offsite grid disturbance, NEITHER EDG should be tied to the grid. System Dispatcher should be contacted to determine any potential grid disturbances before starting the diesel.

During a grid disturbance, the EDG will run loaded with house loads (~ 700-800 KW). This light load is acceptable as exhaust vapor will reach lube oil vaporization temperature, burn and flow out of the stack. (ANO-C-2000-0024)

5.5 EDG should NOT be paralleled with the AAC Generator. The EDG governor would be operating in speed control and may overload or underload while attempting to control speed.

5.6 EDG should be shutdown during a test run if any cylinder exceeds a 300°F differential temperature limit in relation to other cylinders unless installed thermocouples are determined NOT VALID.

5.7 If EITHER EDG is run unloaded for greater than ten minutes OR multiple starts are performed, then engine should be operated at full load for one hour prior to securing. Requirement may be waived by system engineering if engine loaded prior to occurrence.

5.8 IF EITHER EDG is running AND EITHER of the following apply:

- Unloaded for greater than 20 minutes
- Less than 1400 KW for greater than 20 minutes,

THEN the engine should be loaded to 1400 KW for 30 minutes followed by the one hour full load run. However, loading may be as directed by System Engineering if following EDG maintenance.

5.9 Minimize the time loading and unloading an EDG; load on an EDG of less than 1400 KW for long periods of time can cause fuel and oil to build in the exhaust manifold which could cause fires in the exhaust manifold the next time the EDG is started. The time required to load an EDG to 1400 KW after starting it up should be limited to 10 minutes. However, loading may be as directed by System Engineering if following EDG maintenance.

5.10 EDG load limits (2DG1 and 2DG2) are as follows:

- 3135 KW for 2 hours out of any 24
- 2850 KW continuous with Scavenging Air temperature < 150°F

When Scavenging Air temperature (2TI-2930/2980) is ≥ 150°F, then EDG load should be reduced to maintain this temperature at < 150°F. Lube Oil Temperature (2TI-2919/2969) should also be monitored in this situation. The following continuous load limits are provided for guidance based on the temperature of Service Water being supplied to cooler:

- ≤ 2703 KW with SW temperature* > 106 but ≤ 118°F
- ≤ 2573 KW with SW temperature* > 118°F

* Service Water temperature can be determined from the operating SW Pump Discharge temperature (T1430/1436/1442).

(CALC-91-D-2003-01, ER-ANO-2005-0149-004) These limits are based on 800 gpm cooling flow, tube plugging allowances, and design fouling. When Scavenging Air temperature (2TI-2930/2980) is > 170°F, then EDG should be secured.

Bank:	1870	**Rev:**	0	**Rev Date:**	5/12/2012 12:32:5	**QID #:**	49	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	073000A201	**10CFR55:**	41.5 / 43.5	**Safety Function**	7						
System Title:	Process Radiation Monitoring (PRM) System	**System Number**	073	**K/A**	A2.01						
Tier:	2	**Group:**	1	**RO Imp:**	2.5	**SRO Imp:**	2.9	**L. Plan:**	A2LP-RO-RMON	**OBJ**	20

Description: Ability to (a) predict the impacts of the following malfunctions or operations on the PRM System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: - Erratic or failed

Question:

Consider the following:

- 2T-18C, Waste Gas Decay Tank, release is in progress
- Annunciator 2K11 D-10, Process Gas Radiation HI/LO, is in alarm
- Rad Monitor, 2RE-2429, is in alarm and trending up

The Waste Gas Decay Tank release has been terminated by ______________________________ and the release ______________________________ a new dump permit submitted.

A. 2CV-2428, waste gas decay tank discharge valve closing; will remain terminated until

B. 2CV-2428, waste gas decay tank discharge valve closing; may be re-established without

C. 2VEF-8A/B Auxiliary exhaust fans securing; may be re-established without

D. 2VEF-8A/B Auxiliary exhaust fans securing; will remain terminated until

Answer:

A. Correct; the ACA gives direction to verify the Waste Gas Tank discharge valve is closed and with radiation levels trending up, terminate the release and submit a new dump permit

Notes:

B. Incorrect; the release can not be continued without a new release permit be submitted, this is IAW ACA directions

C. Incorrect; method of securing is wrong. The discharge valve is interlocked with the Aux Building Exhaust fans, to secure the release if the exhaust fans were secured, not a high Rad Monitor input to secure the fans

D. Incorrect; the release can be continued without a new release permit IAW the ACA and the method of securing is wrong. The discharge valve is interlocked with the Aux Building Exhaust fans, to secure the release if the exhaust fans were secured, not a high Rad Monitor input to secure the fans

References:

OP-2104.022, Gaseous Radwaste System, Rev. 040, section 3.0 [page 2] and supplement 1, section 3.0 [page 49]
OP-2203.012-K ACA, Rev. 040, window D-10 actions 2.6.1 and 2.6.4 [pages 110 and 111]
STM 2-62, Radiation monitoring System, rev. 19, section 2.2.9 [pages 24 and 25]
A2LP-RO-RMON, Rev. 7, Obj. 15; Describe the function and location of the individual gaseous process monitors associated with the Radiation monitoring System.

Historical Comments:

New Question

1.0 PURPOSE

To provide instructions for operating the Gaseous Radwaste System.

2.0 SCOPE

This procedure provides a description of the Gaseous Radwaste System and instructions for startup and operation. It includes the Gaseous Release Permit for discharging radioactive gases.

This procedure, in conjunction with Waste Gas Sampling and Analyzer Operations (2607.018), satisfies the requirements of TS Surveillance 4.11.3 and Table 3.11-3.1 a and b Action 1; ODCM App 2, S2.2.1, Table 2.2-2.1 a and b (Channel Check and Source Check) and Table 2.2-1.1 a and b Actions 1 and 2.

3.0 DESCRIPTION

The Waste Gas System consists of the Gas Surge Header (GSH), Gas Collection Header (GCH), Containment Vent Header (CVH), Waste Gas Surge Tank, Waste Gas Compressors, Waste Gas Decay Tanks, Gaseous Radwaste Monitoring System and Waste Gas Analyzer. Gases are collected from various components of the Chemical and Volume Control, Liquid Radwaste, Boron Management and Fuel Pool Systems.
The CVH is aligned directly to the suction of the Waste Gas Compressors (2C-75A/B) via Containment isolation valves formerly used for QT sample. Gases vented from the Volume Control Tank (VCT) and Vacuum Degasifier also discharge to the Waste Gas Compressor suction header. When in service, the Vacuum Degasifier provides the bulk of the waste gases collected.

The CVH receives gas vented from the Reactor Drain Tank (RDT), Quench Tank (QT), Failed Fuel Detector and Regenerative Heat Exchanger. The gases flow to the Waste Gas Compressor suction header. The compressors are two stage reciprocating type and will move 10 scfm with suction pressure at 5 psig. Capacity will increase with rising suction pressure. Each compressor skid has a pre-cooler, inter-stage cooler and after cooler to cool the gas before entering the on-line Waste Decay Tank (2T-18A/B/C). When the on-line 2T-18 pressure reaches 250 psig, it is isolated for decay of short-lived radioactive isotopes. Normally this is at least 30 days, however if plant conditions warrant it can be released sooner if Tech Spec release limits are not exceeded. A Gaseous Release Permit is submitted for sampling and a Pre-release Report is generated based on sample results. It specifies the release flow rate and setpoint of the GRW Gas Decay Tank Vent Line Rad Monitor (2RITS-2429). The selected 2T-18 is discharged via GRW Release Hdr Pressure Control valve (2PCV-2417), WG Decay Tank Disch 2FIT-2430 Isol (2GZ-15), Rad Monitor (2RITS-2429, and Waste Gas Decay Tanks Discharge to Vent Plenum (2CV-2428). 2CV-2428 is interlocked with 2VEF-8A/B such that one fan must be in operation to open 2CV-2428 and valve will close if fan is secured. It is also interlocked with radiation monitor (2RITS-2429) and will close if adjustable setpoint of monitor is exceeded. The gas is discharges to the Auxiliary Building Radwaste Exhaust Fans (2VEF-8A/B) suction where it is diluted by low activity gases collected by the Gas Collection Header and then released to atmosphere via the Vent Plenum. The Vent Plenum is monitored by 2RITS-8542 and SPING 6 which alarm to indicate unexpected activity release.

A bypass line around the Waste Gas compressors to the Vent Plenum can be used to purge air or nitrogen from components directly to the Aux Building Ventilation. It shall not be used for VCT venting operations at power or purging operations during which activity is high. Samples shall be taken to determine activity before using this bypass line.

1.0 PURPOSE

To provide instructions for operating the Gaseous Radwaste System.

2.0 SCOPE

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ANNUNCIATOR 2K11

D-10

PROCESS GAS RADIATION HI/LO

NOTE

- *This alarm will reflash.*
- Setpoints in Radiation Monitoring and Evacuation Alarm System (2105.016).

1.0 CAUSES

1.1 ANY of the following Gas Monitors in alarm (High or Low):

- Fuel Handling Area Disch 2VEF-14A/B (2RITS-8540)
- Containment Purge Disch 2VEF-15 (2RITS-8233)
- Waste Gas Sys Disch 2T-18A/B/C (2RITS-2429)
- Control Room Supply Air 2VSF-8A/B (2RITS-8750-1A or 2RITS-8750-1B).
- Penetration Room Exh Disch 2VEF-38A (2RITS-8845-1)
- Penetration Room Exh Disch 2VEF-38B (2RITS-8846-2)
- Radwaste Area Disch 2VEF-8A/B (2RITS-8542)

1.2 *Loss of power to any of above monitors.*

1.3 Condenser Offgas Rad Monitor (2RITS-0645) failed low.

2.0 ACTION REQUIRED

2.1 IF RDACS EAL REPORT GENERATED alarm comes in,
THEN contact Chemistry to run an Emergency Class Report.

2.2 IF releasing via ventilation exhaust in alarm,
THEN notify chemistry to obtain grab sample of ventilation exhaust in alarm and analyze to aid in determining emergency action level.

2.3 IF Radwaste Area Monitor (2RITS-8542) or Fuel Handling Area Monitor (2RITS-8540) in High Alarm,
THEN notify Radiation Protection to sample to determine source.

2.4 IF Control Room Supply Air 2VSF-8A/B (2RITS-8750-1A or 2RITS-8750-1B) in High Alarm,
THEN perform the following:

2.4.1 IF Control Room already on recirc per Control Room Emergency Air Conditioning and Ventilation (2104.007),
AND alarm expected,
THEN no further action required.

2.4.2 Verify Control Room isolated and refer to Control Room Emergency Air Conditioning and Ventilation (2104.007).

(D-10 Continued on next page)

ANNUNCIATOR 2K11

D-10

PROCESS GAS RADIATION HI/LO
(Continued)

2.5 IF Penetration Room Exh Disch 2VEF-38A (2RITS-8845-1) or 2VEF-38B (2RITS-8846-2) in High Alarm
AND CIAS NOT actuated,
THEN secure 2VEF-38A and 2VEF-38B.

2.6 IF alarm on Waste Gas Sys Disch 2T-18A/B/C (2RITS-2429),
THEN perform the following:

2.6.1 Verify WG Decay Tanks to Vent Plenum 2CV-2428 (2HS-2428) closed and vent flow 0 scfm on 2FR-2431.

2.6.2 Check 2RE-2429 for proper setting and operation. Refer to Gaseous Radwaste System (2104.022).

2.6.3 IF alarm due to improper setting or spike,
THEN attempt to re-establish release.

2.6.4 IF alarm due to rising trend,
THEN tag out affected tank and submit new release permit.

(D-10 Continued on next page)

> 2X background during Containment Continuous Ventilation Operations.

The Containment Purge Radiation monitor, 2RITS-8233, is interlocked with 2CV-8283-1 (Containment Purge Supply Isolation Valve) and 2CV-8285-1 (Containment Purge Exhaust Isolation Valve). When the high setpoint is reached on 2RITS-8233, these valves will go closed thereby terminating the purge.

The Containment Purge shall also be secured if SPING #5 (for information on SPINGs and RDACS refer to page 37) becomes inoperable, exceeds expected peak value, or displays abnormal parameters. Consideration should be given to securing Containment Purge if an Emergency Action Level (EAL) Report is generated by RDACS.

2.2.7.4 High Range Auxiliary Building Stack Radiation Monitoring

The detector, 2RE-1275, was installed to provide high range monitoring capabilities for post accident dose assessment. This was directed by NUREG 0737. At the current time the system is abandoned because the SPING system (to be discussed later in this STM) is now performing the required functions. The calibration procedures, OP-1304.080 and OP-1304.87, have been deleted and PEARs submitted to remove the monitoring skid. The check source has been removed and disposed of as radioactive waste. PI&D 2237 sheet 6 still shows skid.

2.2.8 Auxiliary Building Extension Ventilation System Radiation Monitoring

The Auxiliary Building Extension ventilation is directed to the containment flute by 2VEF-51A and 2VEF-51B (Auxiliary Building Extension Exhaust Fans). The activity in the exhaust duct is monitored by 2RE-7828. 2P-7828 (2RE-7828 Sample Pump) provides the flow for 2RE-7828. The monitor, pump and associated equipment are housed on the Unit 2 Auxiliary Building Extension roof. The sample pump is energized by a local handswitch, located in the same housing. After activity detection has occurred the sample flow is returned to the exhaust duct.

The activity indication is read on 2RITS-7828 located on 2C32 in the back of Unit 2 Control Room. The activity level is permanently recorded on 2RR-7828, also located on 2C32. The high activity setpoint is set at 625 CPM. Upon exceeding the setpoint a High light will illuminate on the module and 2K11-E10 (AUX BLDG EXT VENT RAD HI) will actuate. A low alarm setpoint of 10 CPM is indicative of a circuit failure and will cause the module Low light to be energized and will also actuate 2K11-E10.

2.2.9 Gaseous Radioactive Waste System Radiation Monitoring

The Gaseous Radioactive Waste System Radiation Monitoring is provided to continuously monitor the gaseous activity levels released to the vent from the 2T-18's (Waste Gas Decay Tanks). The 2T18's contain potentially radioactive noble gases that are periodically released to the plant vent header that discharges into the suction of the Radwaste Area Exhaust Fans 2VEF-8A/B.

The activity is detected by 2RE-2429, which is located on the 354 elevation of the Auxiliary Building across from the Waste Gas

Panel just prior to entering the PASS Building. The monitor has an alarm and trip system that is operated by 2RITS-2429, located on 2C25 in the back of Unit 2 Control Room. 2RITS-2429 output is continuously recorded on 2RR-0645 on 2C25.

The low alarm setpoint is set for 10 CPM and will actuate the Low light on 2RITS-2429 and is indicative of a circuit failure. The low alarm setpoint will also actuate 2K11-D10 (PROCESS GAS RADIATION HI/LO) on 2C14.

The high alarm setpoint is set by operations personnel per the Unit 2 Gaseous Release Permit (OP-2104.022 Supp 1). The adjustment is accomplished by a potentiometer located on top of the 2RITS-2429 module. Care should be taken not to adjust potentiometer below 0.00 or above 10.0 or damage could occur to potentiometer causing actual setpoint setting to be unknown (CR-ANO-2-92-0017). When the high setpoint is exceeded, a High light is lit on module, annunciator 2K11-D10 is actuated and 2CV-2428 (Waste Gas Decay Tanks Discharge to Vent Plenum) closes.

The annunciator corrective action for receipt of high alarm is to verify that the release has terminated (OP-2203.012K) by verifying that 2CV-2428 is closed and that 2FR-2431, Waste Gas Decay Tank Discharge Flow Recorder, on 2C14 is indicating approximately 0 SCFM. If the alarm was due to improper setting of 2RITS-2429 setpoint or was caused by an electronic spike of the instrument, the release may be re-established. If the cause was caused by an actual rise in radiation level the release remains terminated and a new release permit must be submitted.

2.2.10 Penetration Room Ventilation System Radiation Monitoring

The Penetration Room Ventilation System is designed to collect and process potential containment penetration leakage during post Loss of Coolant Accident and to monitor the atmosphere of each of the ESF pump rooms. The Penetration Exhaust Fans (2VEF-38A/B) discharge to the Containment Building Vent and are monitored for activity by SPING #8 and/or if desired, 2RE-8845-1 (2VEF-38A) /2RE-8846-2 (2VEF-38B).

Penetration Room Exhaust Fan Sample Pumps, 2P-8845-1 and 2P-8846-2 provide sample flow for 2RE-8845-1 and 2RE-8846-2 respectively. These pumps are located next to the associated detector and are controlled by a local handswitch. These pumps are energized by the Waste Control Operator when the associated fan (2VEF-38A/B) is started, if desired.

The radiation monitors are located on 335 elevation in the Auxiliary Building just north of the elevator. The indication for these monitors is on 2RITS-8845-1 and 2RITS-8846-2 on 2C25 in the back of Unit 2 Control Room.

Both 2RITS-8845-1 and 2RITS- 8846-2 have the same high and low setpoints. The low setpoint is 10 CPM to indicate circuit failure. When indication drops below this setpoint a Low light will illuminate on the module and actuate 2K11-D10 (PROCESS GAS

Bank:	1871	**Rev:**	0	**Rev Date:**	5/11/2012 10:29:5	**QID #:**	50	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NRC bank 0383				
Search	073000K501	**10CFR55:**	41.5 / 45.7	**Safety Function**	7						
System Title:	Process Radiation Monitoring (PRM) System	**System Number**	073	**K/A**	K5.01						
Tier:	2	**Group:**	1	**RO Imp:**	2.5	**SRO Imp:**	3.0	**L. Plan:**	A2LP-RO-RMON	**OBJ**	11

Description: Knowledge of the operational implications of the following concepts as they apply to the PRM System: - Radiation theory, including sources, types, units, and effects

Question:

Consider the following:

- Unit 2 has just completed raising reactor power from 60% to 100% power in the last hour
- Chemistry reports a RCS crud burst has occurred

Control room Letdown rad monitior recorder, 2RR-4806 on 2C14, indications for RCS Gross Activity should ___________ and RCS Iodine 131 Activity should _______________.

A. stay the same; stay the same

B. increase; decrease

C. stay the same; increase

D. increase; stay the same

Answer:

D. Correct; an RCS crud burst will cause the RCS gross rad monitor to trend up (design purpose of the rad monitor) The Iodine rad monitor is calibrated for the specific energy of I-131 and, on a crud burst, will remain constant (could trend up slightly due to the extra activity in the RCS but is not part of the answer)

Notes:

A. Incorrect; crud burst will cause the RCS gross rad monitor to trend up
B. Incorrect; Iodine active will either stay the same or trend up slightly with a RCS crud burst
C. Incorrect; crud burst will cause the RCS gross rad monitor to trend up

References:

STM 2-62, Radiation Monitoring System, Rev. 19, section 2.2.1 [page 14]
A2LP-RO-RMON, Rev. 14, Obj. 11, Describe the use of the Radiation monitoring System in the Abnormal Operating Procedures.

Historical Comments:

NRC bank question 0383, used on 2006 RO and SRO NRC Exam

2.2.1 CVCS Process Radiation Monitor

A small portion of the Reactor Coolant system is diverted through the Chemical and Volume Control System (CVCS) via the Letdown header. This Letdown flow can be used to monitor the RCS coolant radioactivity. A rise in the radioactivity of RCS could be caused by crud released in the RCS or failure of the fuel cladding of the Reactor fuel assemblies. Crud is the result of activated corrosion products that settle out in low flow areas of the RCS. When flow is changed or when a chemical shock occurs these corrosion products are released back into the RCS resulting in a rise in the gross gamma activity.

The CVCS Process Radiation monitor, 2RE-4806 is located on the 335' elevation of the Auxiliary Building in the North - south hallway along the east wall. This process radiation monitor provides input to two separate monitoring circuits. One circuit provides the gross gamma activity while the other circuit provides specific fission product nuclide activity. The Gross gamma indication is read out on 2RITS-4806A while the specific activity level can be read on 2RITS-4806B.

The specific activity monitor 2RITS-4806B monitors the Letdown fluid for the presence of Iodine-131. Iodine-131 is a fission product that is released with relative ease from defective fuel assemblies and does not plate out on the system surfaces. As with all radionuclides, Iodine-131 emits a gamma particle with a specific energy level while undergoing radioactive decay. The 0.364 Mev gamma released by the decay of Iodine -131 can be readily monitored since its half-life of 8 days is longer than the sample lag time but short enough to provide indication of current fission product release into the RCS. A rise in the gross activity only would be an indication of a crud burst, but a rise in both gross and specific would be an indication of fuel failure.

The CVCS Process Radiation Monitor, 2RE-4806, is located in the CVCS Letdown line in parallel with the Purification filter but upstream of the Ion exchangers. This location provides for a continuous sample at relatively low temperature and pressure that can be conveniently obtained and the sample effluent can be returned to the CVCS without difficulty. This location also provides an optimum compromise between a minimum required sample lag time and the delay time required for the sample background radioactivity to decay. The time lag from the RCS to the CVCS Process monitor is sufficient to permit N-16 to decay to a sufficiently low level that will not interfere with monitor readings in any operating condition.

Process radiation Monitors, 2RITS-4806A and 2RITS-4806B, are located in the Unit 2 Control Room on 2C22.

Bank:	1872	**Rev:**	0	**Rev Date:**	5/15/2012 9:10:04	**QID #:**	51	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	076000K305	**10CFR55:**	41.7 / 41.10 / 43.5	**Safety Function**	4						
System Title:	Service Water System (SWS)	**System Number**	076	**K/A**	K3.05						
Tier:	2	**Group:**	1	**RO Imp:**	3.0	**SRO Imp:**	3.2	**L. Plan:**	A2LP-RO-SDC	**OBJ**	4

Description: Knowledge of the effect that a loss or malfunction of the SWS will have on the following: - RHR components, controls, sensors, indicators, and alarms, including rad monitors

Question:

Consider the following:

- Unit 2 is in mode 6
- The "A" LPSI pump (2P-60A) through the "A" SDC Heat Exchanger (2E35A) is in service
- RCS temperature is being maintained at 145°F
- Refueling is in progress
- Radmonitor 2RITS-1453, 2E35A Outlet Radiation monitor, is in alarm
- RCS level is trending down

The CRS should direct entry into the ______________________ AOP and after required actions of the AOP have been completed, ________________________ should be isolated to the "A" SDC Heat Exchanger [2E35A].

A. Loss of Shutdown Cooling; the Reactor Coolant System (RCS) AND Service Water (SW) supply

B. Loss of Shutdown Cooling; ONLY the Service Water (SW) supply

C. Excess RCS Leakage; the Reactor Coolant System (RCS) AND Service Water (SW) supply

D. Excess RCS Leakage; ONLY the Service Water (SW) supply

Answer:

A. Correct; indication of a RCS to SW leak (entry step 16) is an entry condition for the Loss of Shutdown Cooling AOP which will direct the isolation of both RCS and SW to the on line SDC Hx and placing the stby Hx on line. (step 8, contingency column 8.E)

Notes:

B. Incorrect; the Loss of Shutdown Cooling entry conditions have been met but only isolating SW is not directed by the AOP. Isolation of SW and RCS [shutdown cooling flow] is required

C, and D are Incorrect; entry conditions are not met for the Excess RCS Leakage AOP. There is indications of a RCS leak into SW which the student could think that the Excess RCS Leakage AOP could apply. Also, an Exit condition has been met [#6. plant cooldown]

References:

OP-2203.012- K ACA, Rev. 040, window C-10 step 2.5.3 [pages 105, 106, and 108]
OP-2203.029, Loss of Shutdown Cooling AOP, Rev.015, entry section [page 1] step 8.E [page 5]
A2LP-RO-SDC, Rev. 13, Obj. 4, Given a set of off-normal SDC parameters for selected evolutions: Determine potential causes AND actions necessary to correct, and Identify applicable annunciators AND required response for the alarms including entry to related AOPs and EOPs.

Historical Comments:

New Question

ANNUNCIATOR 2K11

C-10

PROC LIQUID RADIATION HI/LO

NOTE

- This alarm will reflash.
- Setpoints are in Radiation Monitoring and Evacuation Alarm System (2105.016).

1.0 CAUSES

1.1 ANY of the following Liquid Process Rad Monitors in HIGH or LOW alarm:

- CCW Sys Return Loop 1 (2RITS-5200)
- CCW Sys Return Loop 2 (2RITS-5202)
- SW from CNTMT Cooling Coils 2VCC-2C/D (2RITS-1513-2)
- SW from CNTMT Cooling Coils 2VCC-2A/B (2RITS-1519-1)
- SW from SDN Cooling HX (2E-35A) (2RITS-1453)
- SW from SDN Cooling HX (2E-35B) (2RITS-1456)
- SW from Fuel Pool HX (2RITS-1525)
- Liquid Rad Waste Disch to Flume (2RITS-2330)
- Turb Bldg Sump Effluents (2RITS-4301)

1.2 EITHER of the following Liquid Process Radiation Monitors failed LOW:

- SG Blowdown Sample from 2E-24A (2RITS-5854)
- SG Blowdown Sample from 2E-24B (2RITS-5864)

1.3 Loss of power to any of monitors listed in steps 1.1 and 1.2.

(C-10 Continued on next page)

ANNUNCIATOR 2K11

C-10

PROC LIQUID RADIATION HI/LO
(Continued)

2.0 ACTION REQUIRED

2.1 Check 2C25 and 2C336-2 for initiating alarm.

2.2 IF 2RITS-2330 in High Alarm,
THEN perform the following:

2.2.1 Verify Liquid Waste Discharge valves (2CV-2330A and 2CV-2330B) closed and discharge flow 0 gpm on 2FR-2331.

2.2.2 Check 2RE-2330 for proper setting and operation. Refer to LRW and BMS Operations (2104.014).

2.2.3 IF alarm due to improper setting or spike,
THEN attempt to re-establish release.

2.2.4 IF alarm due to rising trend,
THEN tag affected tank and submit new dump permit.
Refer to LRW and BMS Operations (2104.014).

2.3 IF CCW (2RITS-5200 or 2RITS-5202) in High Alarm,
THEN GO TO Excess RCS Leakage (2203.016).

(C-10 Continued on next page)

ANNUNCIATOR 2K11

C-10

PROC LIQUID RADIATION HI/LO
(Continued)

2.5 __ IF SW from SDC HX in High Alarm (2RITS-1453 or 2RITS-1456), THEN perform the following:

2.5.1 Request chemist obtain and analyze samples.

2.5.2 IF POST LOCA, THEN inform chemist that sample location is in LNPP at Loop II SW Return To Emerg Pond Drain (2SW-1540) and Loop I SW Return to Emerg Pond Drain (2SW-1541).

2.5.3 IF Shutdown Cooling in service with RCS level lowering, THEN GO TO Loss of Shutdown Cooling (2203.029).

2.5.4 IF both monitors trending up due to high background, THEN perform the following:

- Establish periodic trending.
- Based on sample results, consider shifting SDC Trains.

2.5.5 IF Shutdown Cooling in progress with RCS level stable, THEN perform the following:

- Shift SDC Trains per Shutdown Cooling System (2104.004).
- Perform leak rate on affected heat exchanger.

2.5.6 IF Spray pump NOT required to reduce CNTMT pressure, THEN secure affected CNTMT Spray header.

2.5.7 Initiate Condition Report to document SW contamination.

(C-10 Continued on next page)

LOSS OF SHUTDOWN COOLING

PURPOSE

This procedure provides operator actions for a loss of SDC due to pump trips, isolable leaks, Temperature/Flow controller malfunctions and pressure switch failures.

ENTRY CONDITIONS

ANY of the following conditions exist during SDC operations with fuel in the core:

1. "LOSS OF SDC SUCTION" annunciator (2K07-A7) in alarm.
2. "SDC FLOW HI/LO" annunciator (2K07-C8) in alarm.
3. "CET TEMP HI" annunciator (2K07-D8) in alarm.
4. "RCS LEVEL HI/LO" annunciator (2K07-A8) in alarm.
5. "SDC SUCTION PRESS HI" annunciator (2K07-D7) in alarm.
6. Indication of erratic SDC flow.
7. Unexplained lowering RCS Level.
8. Unexplained rise in CET, RVLMS ATS, RCS T_H, or SDC temperatures.
9. Low or erratic LPSI Header pressure (2PI-5092).
10. "LPSI 2P60A/B BREAKER TRIP" annunciator (2K06-B2/2K05-B2) or "CNTMT SPRAY 2P35 A/B BREAKER TRIP" annunciator (2K06-B1/2K05-B1) in alarm.
11. Unexplained rises in CNTMT Building or Auxiliary Building Sump levels with lowering RCS Level.
12. Unexplained rises in Quench tank, RDT or RWT levels with lowering RCS level.
13. "SW HEADER LOOP 1/2 PRESS LOW" annunciator (2K06-A6/2K05-A6) in alarm.
14. Loss of Instrument Air.
15. Loss of 125v DC to bus 2D22.
16. Indications of RCS to SW leak.
17. "LPSI PUMP MOTOR AMPS HI/LO" annunciator (2K07-C7) in alarm.

INSTRUCTIONS	CONTINGENCY ACTIONS
7. Check ALL SDC RCS Isolation MOVs open: • 2CV-5038-1 • 2CV-5084-1 • 2CV-5086-2	**7. Stop SDC pump.**

> **NOTE**
> **During pressurization events affecting indicated level, RCS inventory changes can be validated using alternate indications (i.e., LPSI Pump motor amps, LPSI Pump suction pressure, etc.).**

***8. Check RCS level stable or rising.**	***8. Attempt to stop inventory loss as follows:** A. Stop ALL RCS draining. B. <u>IF</u> Letdown in service <u>AND</u> location of leak unknown, <u>THEN</u> close at least ONE Letdown Isolation valve: • 2CV-4820-2 • 2CV-4821-1 • 2CV-4823-2 (least preferred) C. <u>WHEN</u> Letdown isolated, <u>THEN</u> operate Charging as needed to maintain RCS level. D. <u>IF</u> RCS level lowering rapidly, <u>THEN</u> perform the following: 1) Verify SDC pump stopped. 2) Close at least ONE SDC RCS Isolation MOV. 3) Close ALL LPSI Injection MOVs. 4) **GO TO** 2202.011, Lower Mode Functional Recovery.

(Step 8 continued on next page)

INSTRUCTIONS	CONTINGENCY ACTIONS
8. (continued)	E. IF 2E-35A Outlet Radiation monitor (2RITS-1453) indicates RCS leak to Service Water, THEN perform the following: 1) Open SW to 2E-35B (2CV-1456-2). 2) Locally open "SHUTDOWN COOLING TO 2E-35B" (2SI-4B). 3) Locally close "SHUTDOWN COOLING TO 2E-35A" (2SI-4A). 4) Locally close "SDC COOLER TO LPSI DISCH HEADER" (2SI-5A). 5) Close SW to 2E-35A (2CV-1453-1). 6) Locally verify "SDC HX 2E35A SW OUTLET" (2SW-11A) closed. 7) Notify Chemistry to perform the following: • Sample RCS for chlorides. • Calculate ANY offsite releases.

(Step 8 continued on next page)

Bank:	1873	**Rev:**	0	**Rev Date:**	5/22/2012 10:27:2	**QID #:**	52	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	Modified NRC bank 0579		
Search	076000K402	**10CFR55:**	41.7	**Safety Function**	4				
System Title:	Service Water System (SWS)	**System Number**	076	**K/A**	K4.02				
Tier:	2	**Group:**	1	**RO Imp:**	2.9	**SRO Imp:**	3.2	**L. Plan:**	A2LP-RO-SWACW
OBJ	5								

Description: Knowledge of SWS design feature(s) and/or interlock(s) which provide for the following: - Automatic start features associated with SWS pump controls

Question:

Consider the following:

- Unit 2 is operating at 100% power
- 2P-4B and 2P-4C Service Water pumps are in operation
- 2P-4A Service Water pump is in standby
- The Reactor tripped due to a Loss of Offsite Power
- All plant equipment/components have operated as designed

Given these conditions, 2P-4B Service Water pump should be ____________ and 2P-4C Service Water pump should be ____________.

A. running; running

B. secured; secured

C. running; secured

D. secured; running

Answer:

A. Correct; with a loss of power to the SW pumps without an actuation, the pumps that were running will be the pumps that will restart with the restoration of power (EDG start)

Notes:

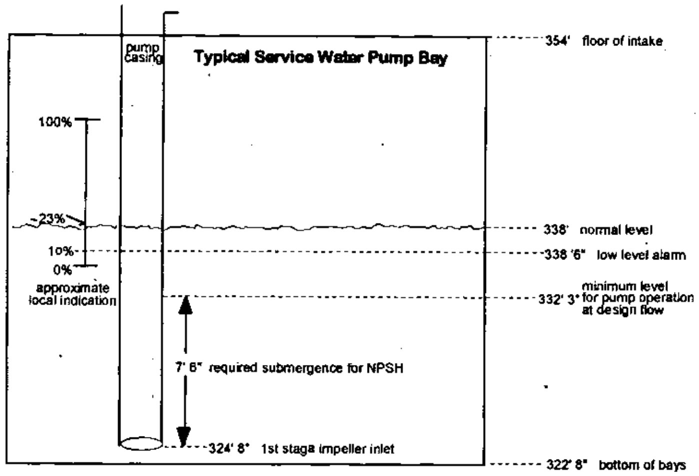
B, C and D are Incorrect; due to reasons stated above both "B" and "C" SW pumps will auto restart and "A" SW pump will remain secured.

References:

STM 2-42 section 3.1.1.1 [pages 21 and 22]
A2LP-RO-SWACW, Rev. 14, Obj. 5: Describe the construction and operation of the Service Water pumps.

Historical Comments:

Modified NRC bank question 0579



3.1.1 Service Water Pump Breaker Interlocks

The Service Water pumps are controlled by handswitches in the control room; 2P-4A on 2C17, 2P-4C on 2C16 and 2P-4B, the swing pump, has two handswitch controls because it may be powered from the RED bus on 2C17 or the GREEN bus on 2C16.

3.1.1.1 Breaker Closing Logic

The logic schemes for the service water pump breakers will not allow two breakers to be automatically closed on the same bus. The purpose of this interlock is to protect the loading of the emergency diesels. This logic is supplied by a 152/b contact from the other pump breaker for the respective bus. This interlock is enhanced by the different timer settings between the swing 'B' pump breakers and the 'A' and 'C' pump breakers.

It is important to note that there is nothing to prevent manually starting two pumps on the same bus. However, doing this will cause a Control Room alarm on 2K05-B6 (2P4B & 2P4C RUNNING ON BUS 2A4) and on 2K06-B6 (2P4A & 2P4B RUNNING ON BUS 2A3).

The following are permissives for manually closing a service water pump breaker.

- There are no permissives in the logic scheme for manually closing the breaker for the 'A' or 'C' service water pump breakers.
- The handswitch for the respective disconnect for the 'B' service water pump breaker must be in the closed position for the breaker to be manually or automatically closed.

The following are permissives for automatically closing a service water pump breaker.

- The breaker for the other pump on that 4160V bus must be open.
- The interposing relays for bus undervoltage actuation must be deenergized. (i.e. bus voltage is adequate or the EDG is supplying that bus)

- The power to the respective 4160V vital bus has to be supplied from an Emergency Diesel Generator or off-site power for any motor breaker on that bus to automatically close. If the vital 4160V bus is being supplied from its respective cross-tie breaker (which is the case if the AAC Diesel is supplying the bus) the auto start features are defeated for all motors on that bus.
- The diesel loading control timer for that breaker must be timed out. (4.5 seconds for the 'A' and 'C' pump breakers and 6.0 seconds for the 'B' pump breaker)
- The handswitch for the respective disconnect for the 'B' service water pump breaker must be in the closed position for the breaker to be manually or automatically closed.

All automatic breaker closures are controlled by the following timers.

- There is a 4.5 second time delay for pumps 2P-4A and 2P-4C.
- There is a 6.0 second time delay for the swing pump 2P-4B.

The Service Water pump breakers will automatically close upon actuation of any of the following Engineering Features Actuation Signals as follows.

- SIAS
- MSIS
- EFAS
- If there is an ESFAS actuation coincident to the loss of power event the 'A' or 'C' pump breaker would be preferred by the automatic start circuit over the 'B' pump breaker because of the shorter time delay.

The Service Water Pump breakers will also automatically close under the following conditions.

- A loss of power and subsequent return of power to the bus for an operating pump.
- The power must be supplied from the EDG or off-site power.
- If there is an ESFAS actuation coincident to the loss of power event the 'A' or 'C' pump breaker would be preferred by the automatic start circuit over the 'B' pump breaker because of the shorter time delay.

QID: 0579 **Rev:** 0 **Rev Date:** 5/5/2006 **RO Select:** **SRO Select:** **Points:** 1.00

Lic Level: R **Difficulty:** 1 **Taxonomy:** 2 **Source:** ANO-OPS2-12609 **Originator:** Simpson

10CFR55_41: 41.7 **10CFR55_43:** **Section:** **Type:**

System Title: Service Water **System Number** 076 **K/A:** K4.02

RO Tier: 2 **RO Group:** 1 **RO Imp:** 2.9 **SRO Tier:** **SRO Group:** **SRO Imp:**

Description: Knowledge of automatic start features associated with SW pump controls

Question:

The following conditions exists:

* SW pumps 2P-4A and 2P-4B are in service with 2P-4C in standby.
* The reactor trips due to an SIAS actuation.
* Coincident with the trip is a loss of off-site power.
* Both DGs are now supplying their respective bus.

Given these conditions, SW pump 2P-4C would be ______________ and 2P-4B would be ______________.

A. secured; running

B. secured; secured

C. running; secured

D. running; running

Answer:

C. running; secured

Notes:

References:

STM 2-42 section 3.1

Historical Comments:

PARENT

Bank:	1874	**Rev:**	0	**Rev Date:**	5/11/2012 12:51:2	**QID #:**	53	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	Modified NRC bank 1540				
Search	078000A301	**10CFR55:**	41.7	**Safety Function**	8						
System Title:	Instrument Air System (IAS)	**System Number**	078	**K/A**	A3.01						
Tier:	2	**Group:**	1	**RO Imp:**	3.1	**SRO Imp:**	3.2	**L. Plan:**	A2LP-RO-ALIA	**OBJ**	3
Description:	Ability to monitor automatic operation of the IAS, including: - Air pressure										

Question:

Consider the following:

- Unit 2 is operating at 100% power
- The "A" Instrument Air Compressor [2C-27A] is the LAG compressor
- The "B" Instrument Air Compressor [2C-27B] is the LEAD compressor
- Annunciator 2K12 A-8, Instrument Air Pressure HI/LO, is in alarm
- Instrument Air Header pressure is reading 78 psig and trending down
- OP-2203.021, Loss of Instrument Air AOP, has been entered
- The IAO has been dispatched to locally investigate the IA system
- The IAO reports local Instrument Air Receiver pressure is reading 80 psig

With the above conditions, the IAO should report Instrument Air Compressor status as:

The "A" Instrument Air Compressor [2C-27A] is running ______________ and the "B" Instrument Air Compressor [2C-27B] is running _________________.

A. loaded; loaded

B. loaded; unloaded

C. unloaded; loaded

D. unloaded; unloaded

Answer:

A. Correct; the AOP contingency column step 7 will verify both IA compressors running loaded with IA receiver pressure <85 psig

Notes:

B, C, and D are Incorrect. The IA compressors control system is designed to so the LEAD compressor will load at 95 psig decreasing IA pressure and the standby LAG IA compressor will start prior to reaching its loading pressure of 85 psig. At 80 psig, both IA compressors will be running and fully loaded.

References:

OP-2203.012-L, 2K12 ACA, Rev. 041, window A-8, Instrument Air Pressure HI/LO, step 2.3 [page 82]
OP-2203.021, Loss of Instrument Air AOP, rev. 015, step 7, contingency column 7 [page 4]
OP 2104.024, Instrument Air System Operation, Rev. 042, section 3.0 [page 2] and section 6.1, steps 6.1.1 and 6.1.2 [page 5]
STM 2-48, Instrument Air, Rev. 13, section 2.7 [pages 8 and 9] and section 2.8.2 [page 11]
A2LP-RO-ALIA, Rev. 0, Obj. 3, Determine the mitigation strategy and instructions for actions directed by OP-2203.021, Loss of Instrument Air

Historical Comments:

Modified NRC bank question 1540, used on the 2008 RO and SRO Exam

Modified NRC bank question 1540, used on the 2008 RO and SRO Exam

1.0 PURPOSE

The purpose of this procedure is to provide a description and operating instructions for the Instrument Air system.

2.0 SCOPE

This procedure provides instructions for startup, shutdown and normal operation of the Unit 2 Instrument Air System. It also provides instructions for cross-connecting Unit 1 and Unit 2 Instrument Air systems.

3.0 DESCRIPTION

The Instrument Air System provides a continuous supply of clean, dry, oil-free, air for pneumatic instruments and valve operation. Instrument Air is used to maintain inflatable seals on the Spent Fuel Pool gates.

The Instrument Air compressors (2C-27A and 2C-27B) are Atlas Copco model ZT75-110 dry air rotary screw, 2-stage and air cooled compressors each rated for 456 scfm at 100 psig. Compressed air passes from the compressors to an air receiver. Air then flows through a coalescing pre-filter where larger particulates and excess water and oil are removed. After the pre-filter, it passes through one of two sets of air drying towers and then through one of two after filters. Air then enters the header where it branches into two basic loops, Turbine Building and Auxiliary Building. During normal operation, one compressor runs continuously and the other are in automatic.

The Unit 1 and Unit 2 Instrument Air systems are cross-connected during normal operations per ER-ANO-2002-0011-000. The systems may be cross-connected through X-Connect to Unit 1 (2CV-3004) or X-Connect to Unit 1 (2CV-3015) which provides the best stability. 2CV-3004 Air Accumulator (2T-32) is sized to provide adequate air pressure to hold 2CV-3004 shut for at least 30 minutes on a loss of Instrument Air. The Breathing Air system can also be connected to Unit 2 Instrument Air System using 2CV-3015. Air received through 2CV-3004 can either be filtered and supplied to the Turbine Building Loop or routed through the Unit 2 prefilter, an air drying tower, and an after filter before entry into the Turbine Building Loop.

Instrument Air Dryer 2M-70 is capable of handling 730 scfm at 100°F. It is a heatless regenerative type requiring 12 to 14% of the dried air to regenerate normally. Moisture Element 2ME-3001 is only associated with 2M-70 and has an alarm light on the front of 2M-70 that will come on if moisture is too high. If 2M-70 is secured, the panel remains energized and may be in alarm. This is NOT an indication of system humidity.

Instrument Air Dryer 2M-76 is capable of handling 731 scfm at 100°F. It is fully automatic; using a microcomputer based dryer control system to initiate the dryer cycle. The control system utilizes its pilot gas supply to position the dryer inlet, outlet and purge switching valves as required for the cycle at hand. The cycle time is normally controlled by a moisture sensing Amloc Probe and will cycle based on the moisture adsorbed in the drying tower. Should a failure occur to the Amloc Probe, dryer control defaults to a four hour timer and a local alarm at the dryer control panel is initiated.

Instrument Air flows through one of the two desiccant filled towers. Once the in-service tower's "moisture front" reaches the system's moisture sensing Amloc-Probe, the standby tower will be placed in service and the in-service tower will depressurize and regenerate. The regeneration period consists of depressurization, heating, sweep and re-pressurization. After regeneration complete, the tower reverts to a standby or "Amloc-Hold" status. It will be placed on line when in-service tower becomes moisture saturated or after four hours if the Amloc Probe is failed.

6.0 SETPOINTS

NOTE

2C-27A/B setpoints can be adjusted periodically to optimize parallel operation between Unit 1 and 2 IA systems. Per ER-ANO-2002-0011-000, a 10 psig load/unload pressure span must be maintained. The normal load/unload settings of 95/105 psig may be decreased by up to 5 psig. The lag compressor setpoints should NOT be lowered.

6.1 Instrument Air compressors (2C-27A and 2C-27B) setpoints:

6.1.1 LEAD (2QC-3000A/B):

- Unloads 105 psig
- Loads 95 psig

6.1.2 LAG (2QC-3000A/B):

- Unloads 105 psig
- Loads 85 psig

6.1.3

Protective Settings	Trips	Warnings
Low Oil pressure	≤ 20 psig	≤ 22 psig
High LP Outlet air temp	≥ 428°F	≥ 417°F
High HP Inlet Air temp	≥ 158°F	≥ 153°F
High HP Outlet air temp	≥ 428°F	≥ 410°F

6.1.4 Additional Trips

- Manual Emergency Trip
- Safety Instrument Failure (Protection)
- Motor overload
- Fan Motor Overcurrent

6.2 Air dryer (2M-70) setpoints:

6.2.1 Local alarms (on 2C176):

- "HIGH HUMIDITY": dew point > -40°F for 2 minutes as sensed by 2ME-3001

6.2.2 The vendor recommended purge pressure is 45 psig, which provides ~ 108 scfm purge flow. Different purge flows based on system conditions and System Engineering recommendations may be acceptable. The following relates purge pressures to approximate purge flow rates:

2PI-3007 pressure (psig)	Purge flow (scfm)
55	126
45	108
35	90

ANNUNCIATOR 2K12

A-8

INSTR AIR PRESS HI/LO

1.0 CAUSES

1.1 HIGH - Instrument Air Filter outlet pressure ≥ 110 psig (2PIS-3013)

1.2 LOW - Instrument Air Filter outlet pressure ≤ 80 psig (2PIS-3013)

2.0 ACTION REQUIRED

> **NOTE**
> High header pressure is indicative of unloader failure.

2.1 Check pressure on 2PIS-3013.

2.2 IF HIGH pressure,
THEN shift IA Compressors using Instrument Air System (2104.024).

2.3 IF LOW Pressure,
THEN GO TO Loss of Instrument Air (2203.021).

3.0 TO CLEAR ALARM

3.1 Restore header pressure to between 80 and 110 psig.

4.0 REFERENCES

4.1 E-2457-4

INSTRUCTIONS	CONTINGENCY ACTIONS
NOTE **Symptoms checked by the following two steps may be masked with IA cross-connected. Consider closing IA cross-connect valves.**	
7. Locally check BOTH IA receivers pressure greater than 85 psig. • "2T88A PRESS IND" 2PI-3033 • "2T88B PRESS IND" 2PI-3019	**7. <u>IF</u> IA receivers pressure less than 85 psig, <u>THEN</u> verify BOTH IA compressors running, refer to 2104.024, Instrument Air System.**
8. Locally check IA header pressure and air receivers pressure within 10 psid. • "IA MAIN SUPPLY HEADER" (2PIT-3013) • "2T88A PRESS IND" 2PI-3033 • "2T88B PRESS IND" 2PI-3019	**8. <u>IF</u> IA header and receivers pressure greater than 10 psid, <u>THEN</u> locally perform the following as necessary:** A. Open "COALESCING PREFILTER BYPASS" valve (2IA-186C). B. Place standby IA Dryer in service, refer to 2104.024, Instrument Air System, OR open "AIR DRYER BYPASS" valve (2IA-8). C. Place standby IA Filter in service, refer to 2104.024, Instrument Air System.

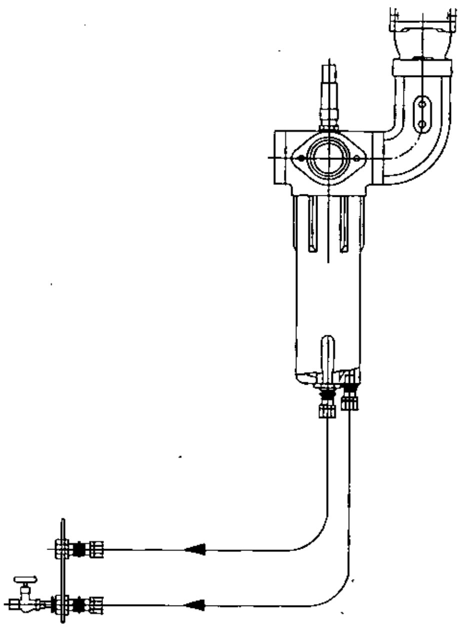
NOTE

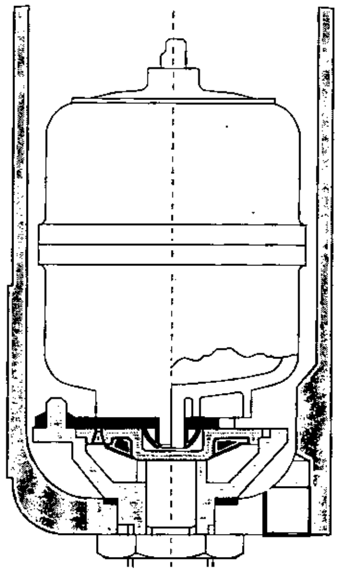
Attachment B aligns critical components to their "fail safe" position to prevent inadvertent repositioning as IA pressure restores.

■ **9. <u>IF</u> AOVs have repositioned or are repositioning due to degraded IA pressure, <u>THEN</u> perform Attachment B, Valve Switch Safe Positions, as required to prevent inadvertent repositioning.**

2.6 Condensate Drains

Two moisture traps are installed: one downstream of the intercooler (F) to prevent condensate from entering the HP compression element (G), and one downstream of the aftercooler (K) to prevent condensate from entering the Instrument Air system.





Aftercooler Moisture Trap

Each trap is equipped with a receiver provided with an automatic float valve and a manually operated drain valve. The intercooler float assembly is stainless steel with a replaceable rubber disc. The aftercooler float assembly is plastic and the entire float assembly is replaced when defective.

During normal operation there should be an intermittent flow or drops of condensate discharging from the automatic drain outlet of the moisture traps during loaded operation. The amount of condensate depends on the moisture content of the intake air. These outlets (manual and automatic, 4 total) are located at the east end of the compressor housing.

The manual drains are fitted with valves that should be opened to manually blowdown the moisture trap shiftly, this is to check the operation of the automatic float assembly and to blowdown any solids that may have collected. Approximately a cup of water is expected when blowing down the moisture traps, any more than this would be indication the float assembly is defective and is in need of repair. Blow-down the Intercooler moisture trap ONLY when the compressor is loaded since this portion of the system is at a vacuum when unloaded.

Automatic drains are installed on the discharge of each compressor due to moisture buildup in this area. Prior to the installation of these automatic drains, manual draining causes unnecessary auto starts of the compressors.

2.7 Loading & Unloading

The loading and unloading system is operated by the Elektronikon Mk III Regulator, which uses compressor outlet pressure (2PT-3002A/B).

	Loaded	Unloaded
Comp Suction	Atmospheric	~ -13 psi
LP Outlet	~ 35 psi	~ - 8 psi
HP Outlet	~ 100 psi	~ 1-2 psi

The on-off system controls the air output in relation to the air consumption and maintains the outlet pressure within the pre-selected upper and lower limits.

The Instrument Air compressors load and unload setpoints are set up so that one is the LEAD compressor, and the other is the LAG compressor. This is accomplished by having the LEAD compressor load at a higher pressure than the LAG compressor. The actual load and unload setpoints are set according to the system engineer's recommendation.

Loading operation.

The controlling pressure is less than the unloading pressure setpoint and the air pressure transmitter (2PT-3002A/B) inputs this data to the regulator (2QC-3000A/B).

1. Currently the differential pressure across the operating diaphragm is equalized through pipe (10), the loading solenoid and pipe (6), all ~ -13 psig.
2. The loading solenoid (V) is energized. Its plunger moves against spring force shutting off the port connected to the chamber (1) of the intake valve assembly. This opens up the lower port that is currently connected to atmospheric pressure via the selector valve (S).
3. This allows atmospheric pressure to chamber 2 via the Intake Valve casing, the selector valve (S), the loading solenoid (V) and pipe (6). With atmospheric pressure in chamber 2 and -13 psi in chamber 1, spring force is overcome and the throttle valve (T) starts to open allowing air to the LP element. (*The throttle valve will not open completely here because if atmospheric pressure was felt on chamber 1 the differential pressure across the operating diaphragm would be 0 and the spring would close the throttle valve*).
4. As Intercooler pressure is built up, it is fed to port (4) of the selector valve (S). With intercooler pressure on the top of the selector valve diaphragm (9) and atmospheric pressure on the bottom of it, the selector valve diaphragm swaps. This shuts off the atmospheric port and aligns intercooler pressure to chamber (2) of the intake valve assembly via pipe (5), selector valve (S), solenoid valve (V) and pipe (6).
5. Now with intercooler pressure in chamber (2) and a slight vacuum in chamber (1), the differential pressure across the operating diaphragm overcomes spring force and fully opens the throttle valve (T) and closes the Unloading valve (U).

The air output is maximum (100%). That took about 2-3 seconds.

Unloading operation.

The controlling pressure has reached the unloading pressure setpoint. The air pressure transmitter (2PT-3002A/B) inputs this data to the regulator (2QC-3000A/B).

1. The loading solenoid (V) is de-energized. Its plunger returns by spring force shutting off the port connected to the selector valve. This blocks off pressure from the intercooler and opens the port connected to chamber (1) of the intake valve assembly.
2. This aligns chamber (2) with chamber (1) through pipe (6), solenoid valve (V) and pipe (10). Differential pressure across the operating diaphragm is now zero.
3. The loading plunger moves by spring force, causing the throttle valve (T) to close and unloading valve (U) to open. The internals of

- Oil level - Above RED range and below MAX line while running. Normal oil level is between MIN and MAX.
  - It is preferable to add oil to 2C27A/B while secured. Do not exceed MAX mark when compressor is secured. If necessary, then add oil while running. Oil level drops approximately 2 inches when starting from an idle condition.
- Outlet pressure - *within the programmed pressure range (85-105 psig)*
- Intercooler Pressure - ~ 28 psig loaded and *(~ -9 psig unloaded)*
- Oil Pressure - ~ 30 psig
- LP element Air outlet Temp - ~ 329 °F
- Intercooler outlet Air Temp - ~ 113 °F
- HP element Air Out Temp - ~ 338 °F
- Aftercooler outlet Air Temp - ~ 10-15 °F above atm
- Monitor loading and unloading pressures whenever practical

Monitor condensate discharge from moisture traps - manually blowdown as necessary to check the operation of the automatic float assembly and to blowdown any solids that may have collected. Approximately a cup of water is expected when blowing down the moisture traps, any more than this would be indication the float assembly is defective and is in need of repair. Blow-down the Intercooler moisture trap ONLY when the compressor is loaded since this portion of the system is at a vacuum when unloaded.

2.8.2 Elektronikon Regulator

The operation of the compressor is governed by an electric regulator. The regulator loads, unloads, stops and restarts the compressor according to the air consumption.

The regulator takes into account a number of programmable settings, such as

- the unloading pressure
- the loading pressure
- the minimum stop time
- the maximum number of motor starts

The regulator stops the compressor whenever possible (when the expected unloading period exceeds a programmed value) to reduce the power consumption and restarts it automatically when the outlet pressure decreases. In case the expected unloading period is below a programmed value, the regulator keeps the compressor running to prevent too-short standstill periods.

When the compressor has stopped automatically and the outlet pressure decreases, the regulator will start the compressor before the outlet pressure has dropped to the loading pressure to prevent the outlet pressure from falling under the programmed minimum level.

When the compressor is stopped manually, the regulator will unload the compressor then stop the compressor after 3 seconds.

2.8.2.1 Controls and Indications

1 **Automatic operation LED** - indicates that the electronic regulator is automatically controlling the compressor: the compressor is

QID:	1540	Rev:	0	Rev Date:	10/28/2004	RO Select:		SRO Select:		Points:	1.00
Lic Level:	R	Difficulty:	2	Taxonomy:	F	Source:	ank 0393 2002 NR	Originator:	COBLE		
10CFR55_41:		10CFR55_43:		Section:		Type:					
System Title:	Instrument Air System (IAS)	System Number	078	K/A:	A3.01						
RO Tier:	2	RO Group:	1	RO Imp:	3.1	SRO Tier:	2	SRO Group:	1	SRO Imp:	3.2
Description:	Ability to monitor automatic operation of the IAS, including: - Air pressure.										

Question:

Given the following plant conditions:

* Instrument Air Compressor 2C-27A is the LEAD compressor and running unloaded.
* Instrument Air Compressor 2C-27B is the LAG compressor and is in standby after cycling off on low Instrument Air load.
* Instrument Air Pressure at the outlet of the compressors is currently 100 psig.

If Instrument Air pressure at the outlet of the compressors were to drop to 80 psig, what would be the status of the Instrument Air Compressors?

A. 2C-27A running loaded, 2C-27B running loaded

B. 2C-27A running loaded, 2C-27B running unloaded

C. 2C-27A running loaded, 2C-27B in standby

D. 2C-27A running unloaded, 2C-27B in standby

Answer:

A. 2C-27A running loaded, 2C-27B running loaded

Notes:

The LEAD compressor will load at 95 psig decreasing IA pressure and the standby LAG IA compressor will start prior to reaching its loading pressure of 85 psig. At 80 psig, both IA compressors should be running and fully loaded.

References:

A2LP-AO-IA, Objective 6
STM 2-48, Instrument Air, Sections 2.7 and 2.8.2
OP 2104.024, Instrument Air System Operation, Step 6.1.

Historical Comments:

PARENT

Data for 2012 NRC RO/SRO Exam

05-Jul-12

Bank:	1875	**Rev:**	0	**Rev Date:**	5/15/2012 10:57:4	**QID #:**	54	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	H	**Source:**	NEW				
Search	078000K105	**10CFR55:**	41.4 / 41.5 / 41.7	**Safety Function**	8						
System Title:	Instrument Air System (IAS)	**System Number**	078	**K/A**	K1.05						
Tier:	2	**Group:**	1	**RO Imp:**	3.4	**SRO Imp:**	3.5	**L. Plan:**	A2LP-RO-STEAM	**OBJ**	2

Description: Knowledge of the physical connections and/or cause-effect relationships between the IAS and the following systems: - MSIV air

Question:

Consider the following:

- A total loss of Instrument Air [IA] event has occurred on Unit 2
- The CRS directs tripping the Unit
- IA header pressure is 0 psig
- NO other operator actions have been taken

15 minutes post trip, the Main Steam Isolation Valves [MSIVs] should be ____________ and the Reactor Coolant System [RCS] heat should be removed by ____________________________.

A. closed; Steam Dump Bypass Control System

B. closed; Main Steam Safety Valves

C. open; Steam Dump Bypass Control System

D. open; Main Steam Safety Valves

Answer:

D. Correct; the MSIVs are supplied by an accumulator which is designed to maintain the MSIVs open for 30 minutes [demonstrated in modes 5and 6, or defueled with OP-2106.016, supplement 2] therefore, without operator actions the MSIVs would initially stay open and would go closed sometime after the 30 minutes. Without IA, the SDBCS downstream and bypass valves will fail closed and will be unavailable for RCS heat removal/ SG pressure control, the 2 upstream Steam Dump valves will fail open on a loss of IA but are normally kept isolated from the main Steam Header, therefore are unavailable. The MSSVs will lift to remove heat and control SG pressures.

Notes:

A, B, and C are Incorrect for reasons stated above

References:

OP-2203.021, Loss of Instrument Air AOP, Rev. 015, note above step 2 in Attachment D [page 37]
OP-2106.016, Condensate And Feedwater Operations, Rev. 064, supplement 2, section 3.0, step 3.1 [page 226]
STM 2-15, Steam Generator & Main Steam System, Rev. 16, section 3.2.4.1 [page 27]
OP-2105.008, Steam Dump and Bypass Control System Operations, Rev. 024, section 3.0 [pages 2 and 3]
A2LP-RO-STEAM, Rev. 15, Obj. 2, Describe the construction and operation of the Main Steam System. Function, design basis, expected values for process variables for different operating conditions

Historical Comments:

New Question

leakage in either direction past the valve seat will not exceed 5 cubic feet per second.

Since full-stroke testing of the MSIVs during normal operation would cause severe plant transients, an exercise control circuit is provided. This circuit allows cycling of the MSIVs from full open to 90 percent open and back to full open during power operation. This assures that the valve stems are free to move if a rapid closure signal occurs. Full stroke testing of the actuation system occurs during scheduled plant shutdown periods in accordance with Technical Specification requirements. Steam flow through the MSIV normally provides lubrication of the valve disk, guides, and seats. They are stainless steel and susceptible to galling. Therefore, stroke testing a valve with the plant shutdown requires an external source of lubricating water. This normally comes from the condensate transfer system via a hose that is connected to the above seat drain for the respective valve.

The MSIVs are safety related, pneumatically actuated, and fail closed on a loss of instrument air supply. An air accumulator provides a reserve supply of air to allow the MSIVs to remain open in the event of the loss of the Instrument Air system. This reduces the possibility of operational complications due to MSIV closure on a loss of instrument air. The accumulator provides time for the Operators to restore the Instrument Air system.

The MSIVs are equipped with a tandem actuating cylinder. One of the cylinders is a 38" bore pneumatic cylinder. The other is a 6" bore hydraulic cylinder. While the pneumatic cylinder is what actually provides the mode of force to position the valve, the hydraulic cylinder and associated control valves acts to control the rate at which the valve moves.

3.2.4.1 MSIV Air Supply System

As mentioned above, the MSIVs are pneumatically operated valves. The air supply to each MSIV is from the Instrument Air system. Each MSIV is equipped with its own in-line air filter and isolation valves. The air filters, 2F-356 and 2F-357, are 50 micron filters. A common air accumulator, 2T-091 provides a backup source of air to the MSIVs should the Instrument Air supply be lost. This accumulator has a volume of $\approx 160\ ft^3$, is internally clad with stainless steel, and is located just west of the MSIVs. Local pressure indication of accumulator pressure is provided by 2PI-1063. The MSIV air system is leak tested when the plant is in Modes 5 or 6 by opening the MSIVs, isolating IA to the accumulator and verifying that the MSIVs remain open and the total pressure drop in 2T-091 is $<$ 10 psid.

1.0 PURPOSE

Provide operating instructions for the Steam Dump and Bypass Control System.

2.0 SCOPE

This procedure describes the SDBCS and provides operating instructions for startup, shutdown, and power operations.

3.0 DESCRIPTION

The Steam Dump and Bypass Control System provides a means to manually control RCS temperature during heatup and cooldown, automatically control steam trip. The SDBCS is a dual channel system. The first channel is the Main Calculator and the second channel is the Permissive Calculator. The two channels work together to control seven valves.

Four of the valves dump steam to the atmosphere and have a capacity of 46% of total steam flow (11.5% each). Two of these Atmospheric Dump valves are located upstream of the Main Steam Isolation valves and the remaining two are located downstream. Three Turbine Bypass valves are provided to dump steam to the Condenser. One of these valves has a capacity of 5% and the other two have a capacity of 11.5%. The combined dump and bypass capacity is 74% of total steam flow. During normal operation all three Turbine Bypass valves and both Downstream Atmospheric Dump valves are set for automatic operation. The two Upstream Dump valves are maintained OFF and isolated.

STEAM DUMP AND BYPASS VALVE SUMMARY

VALVE	CAPACITY	TYPE
2CV-0303	5%	Bypass
2CV-0302	11.5%	Bypass
2CV-0306	11.5%	Bypass
2CV-0301	11.5%	Downstream Dump
2CV-0305	11.5%	Downstream Dump
2CV-1001	11.5%	Upstream Dump
2CV-1051	11.5%	Upstream Dump

There are two types of opening signals supplied to each SDBCS valve. The first signal is a modulating signal. During transients causing an abnormally high Main Steam pressure, the SDBCS valves are modulated in sequence to limit steam pressure to a programmed value. The modulation speed of the valves is relatively slow (≈ 10 to 20 seconds full stroke time), which limits the load change that can be accommodated by modulation control alone. For load reductions of large magnitude and rate, a second opening signal is required. This second signal is a quick opening signal and reduces the problem of large magnitude load rejections. The quick opening feature will open the valves in one second or less.

Each SDBCS valve Air Supply contains two three-way solenoid valves in series. The first solenoid valve is controlled by the Main Calculator and the second solenoid valve is controlled by the Permissive Calculator.

During modulation opening signals, the pneumatic signal passes through the first solenoid valve, which is de-energized, to the second solenoid valve. The second solenoid valve must be energized by a permissive signal to allow air to pass to the SDBCS valve Diaphragm. This feature assures that no single SDBCS failure will cause inadvertent opening of the valve.

The quick open signal is generated by a rapid reduction in steam flow accompanied by a rapid rise in pressurizer pressure. The number of SDBCS valves that quick open is determined by the magnitude of the upset in steam flow and pressurizer pressure. During quick opening operations, the first solenoid is energized closing the port from the electro-pneumatic converter and opening up a port which applies full instrument air pressure to the SDBCS valve. The second solenoid valve will be energized on a quick opening signal from the Permissive Calculator.

Two signals prevent the quick opening of SDBCS valves. A Reactor trip will block a quick open signal to both of the Upstream Atmospheric Dump valves (2CV-1001 and 2CV-1051). If Tave from the Reactor Regulating System drops to 553°F and a Reactor trip signal is present then quick opening signals to all valves are blocked. Tave Low by itself will not block any quick open signals. These blocking features prevent excessive cooling of the RCS.

The SDBCS has an emergency off capability that may be initiated from 2C02, the Remote Shutdown Panel (2C80), or the SDBCS Panel (2C29). Depressing any Emergency Off Pushbutton prevents the opening of any Dump or Bypass valves under any circumstances. Once initiated, the emergency off condition locks in, and can only be removed by pressing the Vac/Emerg Off Reset Pushbutton.

Low condenser vacuum will cause a SDBCS Condenser Interlock which will close the Turbine Bypass valves and prevent them from opening. SDBCS receives two independent Condenser Available signals from pressure switches 2PS-0655 and 2PS-0659. 2PS-0655 blocks the open signal to the E/P Controller and the Quick Open solenoid. 2PS-0659 disables the Permissive Solenoid. Therefore, either switch will prevent all three Bypass valves from opening. This interlock will automatically reset if the Bypass valves are in full automatic control. If the Master Controller or any HIC is in MANUAL, or any valve Permissive Switch is in OFF, the interlock must be reset by depressing the Vac/Emerg Off Reset Pushbutton when vacuum is returned to normal.

The two Upstream Atmospheric Dump valves (2CV-1001 and 2CV-1051) have motor operated isolation valves (2CV-1002 and 2CV-1052) which receive an MSIS close signal. The valves can be overridden using a pushbutton on 2C02. The Upstream Dump valves fail open on loss of instrument air, all other valves fail closed on loss of air.

The Master Controller located on 2C02 is a bumpless, balanceless controller with a Manual/Automatic Transfer Pushbutton for mode selection. In manual control, pushbuttons are used to control the output. The 0-100% Output Meter displays the Master Controller output.

2. Section 2, Critical Component Fail Positions

NOTE

Air operated components shift to their "fail" positions in the pressure range of 35psig to 64 psig. Components may NOT be in their "fail" position due to current IA pressure.

Number	Description	Fail Pos.
2CV-5091	LPSI Header Flow Control Valve	Open
2CV-5093	SDC HX Flow Control Valve	Closed
2CV-4823-2	Regen HX Outlet Isolation	Closed
2CV-1016-1	A SG Blowdown Isolation	Closed
2CV-1066-1	B SG Blowdown Isolation	Closed
2CV-3851-1	CNTMT Building Chilled Water Return	Closed
2CV-3852-1	CNTMT Building Chilled Water Supply	Closed
2CV-1010-1 *	Header #1 MSIV	Closed
2CV-1060-2 *	Header #2 MSIV	Closed
2CV-4847-2	RCP Bleedoff to VCT	Closed

* Air accumulator provides up to 30 minutes reserve capacity.

(Section 2 continued on next page)

SUPPLEMENT 2

3.0 ACCEPTANCE CRITERIA

3.1 Did MSIVs remain open for 30 minutes after air supply isolated? YES NO

3.2 IF NO answered to 3.1,
THEN perform the following corrective actions:

- Notify Shift Manager.
- Initiate WR/WO as applicable.

3.3 Comments:____

____

____

Performed By _________________________________ Date________

4.0 SUPERVISOR REVIEW AND ANALYSIS

4.1 Has this equipment been proven operable pursuant to ACCEPTANCE CRITERIA? YES NO

4.2 IF answer to 4.1 NO,
THEN verify Condition Report initiated.

4.3 Comments:____

____

____

4.4 Have all administrative requirements of this test been satisfied? YES NO

SUPERVISOR ___________________________ DATE ________

Bank:	1876	**Rev:**	0	**Rev Date:**	5/15/2012 12:37:3	**QID #:**	55	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NRC bank 0495				
Search	103000K102	**10CFR55:**	41.7 / 41.9 / 43.2	**Safety Function**	5						
System Title:	Containment System	**System Number**	103	**K/A**	K1.02						
Tier:	2	**Group:**	1	**RO Imp:**	3.9	**SRO Imp:**	4.1	**L. Plan:**	A2LP-RO-TS	**OBJ**	4b

Description: Knowledge of the physical connections and/or cause-effect relationships between the Containment System and the following systems: - Containment isolation/containment integrity

Question:

Consider the following:

- Unit 2 is operating at 100% power
- A Containment entry has been made for I&C maintenance
- Upon exiting the Containment Building the Personnel Hatch air lock door interlocks fail allowing both doors to be opened at the same time

Based on Technical Specifications, which action is required to be taken in 1 hour?

A. Commence placing the plant in Hot Standby and Cold Shutdown

B. Verify BOTH Personnel Hatch air lock doors are Closed and locked

C. Verify ONE Personnel Hatch air lock door is Operable and Closed

D. Start the Containment Purge system to create a negative pressure in Containment

Answer:

C. Correct; Verify at least one Personnel Hatch air lock door Operable and Closed.

Notes:

Containment Integrity is lost when the interlock on the doors failed. This requires Containment integrity to be restored in 1 hour in Mode 1 per TS 3.6.1.1.
TS 3.6.1.3 allows closing of one operable air lock door to restore Containment integrity.
Distracter A is incorrect because TS 3.6.1.3 allows 24 hours to restore the interlock to Operable Status.
Distracter B is incorrect because TS 3.6.1.3 allows closing of one operable air lock door to restore Containment integrity instead of a plant shutdown or the plant shutdown can be started later than 1 hour as long as hot standby is achieved in 6 hours.
Distracter D is incorrect because Containment Purge is not allowed in this mode.

References:

TS 3.6.1.1, Primary Containment Integrity , Rev. 48
TS 3.6.1.3, Containment Air Locks, Rev. 48
STM 2-13, Containment Building, Rev. 16, section 4.3.2 [page 24]
A2LP-RO-TS, Rev. 11, Obj. 4b, From memory, dicuss the LCOs and actions statements for all LCOs with action statemenys less than or equal to one hour

Historical Comments:

NRC bank question 0495, changed the wording of the question but does not met the requirements of a modified question

3/4.6 CONTAINMENT SYSTEMS

3/4.6.1 PRIMARY CONTAINMENT

CONTAINMENT INTEGRITY

LIMITING CONDITION FOR OPERATION

3.6.1.1 Primary CONTAINMENT INTEGRITY shall be maintained.

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

ACTION:

Without primary CONTAINMENT INTEGRITY, restore CONTAINMENT INTEGRITY within one hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.1.1 Primary CONTAINMENT INTEGRITY shall be demonstrated:

a. At least once per 31 days by verifying that each containment isolation manual valve and blind flange (Note 1) that is located outside containment and not locked, sealed, or otherwise secured and is required to be closed during accident conditions is closed, except for containment isolation valves that are open under administrative control as permitted by Specification 3.6.3.1.

b. By verifying that each containment air lock is OPERABLE per Specification 3.6.1.3.

c. After each closing of the equipment hatch, by leak rate testing the equipment hatch seals in accordance with the Containment Leakage Rate Testing Program.

d. Prior to entering MODE 4 from MODE 5 if not performed within the previous 92 days by verifying each containment isolation manual valve and blind flange (Note 1) that is located inside containment and not locked, sealed, or otherwise secured and required to be closed during accident conditions is closed, except for containment isolation valves that are open under administrative controls as permitted by Specification 3.6.3.1.

Note 1: Valves and blind flanges in high radiation areas may be verified by use of administrative means.

CONTAINMENT SYSTEMS

CONTAINMENT AIR LOCKS

LIMITING CONDITION FOR OPERATION

3.6.1.3 Each containment air lock shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one containment air lock door inoperable in one or more containment air locks[1,2]:

   1. Verify that at least the OPERABLE air lock door is closed in the affected air lock within one hour and either restore the inoperable air lock door to OPERABLE status within 24 hours or lock the OPERABLE air lock door closed[3].

   2. Operation may then continue 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 six hours and in COLD SHUTDOWN within the following 30 hours.

b. With the containment air lock interlock inoperable in one or more containment air locks[1]:

   1. Verify that at least one OPERABLE air lock door is closed in the affected air lock within one hour and restore the inoperable air lock interlock to OPERABLE status within 24 hours or lock an OPERABLE air lock door closed[4].

   2. Operation may then continue 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 six hours and in COLD SHUTDOWN within the following 30 hours.

c. With one or more air locks inoperable for reasons other than those addressed in ACTION a. or b.:

   1. Immediately initiate action to evaluate overall containment leakage per LCO 3.6.1.2.

   2. Verify that at least one door in the affected air lock is closed within one hour and restore the affected air lock to OPERABLE status within 24 hours.

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

---

[1] Separate ACTION entry is allowed for each air lock.
[2] With both air locks inoperable, entry and exit is permissible for seven days under administrative controls.
[3] Entry and exit is permissible to perform repairs on the affected air lock components.
[4] Entry and exit is permissible under the control of a dedicated individual.

also maintained at 60-64 psig nitrogen pressure. Also see the figures on pages 64 and 65.

4.3 Miscellaneous Penetrations

The following sections deal with the penetrations that do not penetrate the containment in a penetration room.

4.3.1 Equipment Hatch

Refer to the figure on page 66. The purpose of this hatch is to provide a passageway for equipment to be brought into or out of the containment. When closed and bolted tight, it is designed to provide a continuous seal against any containment pressure that might be developed due to an accident in the containment.

Structurally the hatch consists of a body ring that is welded to the liner plate penetration nozzle located at 270° on the containment and the flanged dished head. The minimum opening diameter of the equipment hatch is 15'-4". The body ring has 2 concentric grooves machined in its face that contain the 2 concentric O-ring seals. The flange on the cover has a smooth face and when bolted tight, effects a seal against the O-rings. A guide plate is located at the bottom of the cover and when the cover is moved sideways, it is guided by two angle irons which are bolted to the concrete floor.

The hatch is manually operated. When it is desired to move the hatch, the nuts on the bolts must be first loosened and the bolts then swung clear of the lugs, which are welded onto the head. The hatch is supported by two beam trolleys, one of which has a chain wheel operator. This chain wheel is used to move the head either to the left to open or the right to close the opening.

When the bolts are loosened and the head is hanging free, the face of the cover flange should be 2" away from the body ring sealing surface. The bolts are purposely made extra long so that they can be swung into the lugs while the head is in its free-hanging position and then the nuts can be tightened down until a good seal has been made.

A threaded pipe connection is provided on the horizontal center line of the body ring to permit periodic leak testing between the seals.

4.3.2 Personnel Air Lock

Although the personnel air lock penetrates the containment in the upper south electrical penentration room, it will be covered in this section. The figure below shows a cutaway of the personnel air lock penetration (also on page 67). The purpose of this lock is to provide a personnel passageway for entering and leaving the containment. It is designed to provide a continuous seal against any pressure that might be developed due to an accident in the containment.

QID:	0495	**Rev:**	0	**Rev Date:**	10/29/2004	**RO Select:**		**SRO Select:**		**Points:**	1.00
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	A	**Source:**	OLD	**Originator:**	COBLE		
10CFR55_41:	41.5	**10CFR55_43:**	41.3	**Section:**	3.5	**Type:**	CONTAINMENT INTEG				
System Title:	Containment System	**System Number**	103	**K/A:**	K1.02						
RO Tier:	2	**RO Group:**	1	**RO Imp:**	3.9	**SRO Tier:**	2	**SRO Group:**	1	**SRO Imp:**	4.1

Description: Knowledge of the physical connections and/or cause-effect relationships between the Containment System and the following systems: - Containment isolation/containment integrity

Question:

Given the following:

* The plant is at full power
* Annunciator 2K11-A9 "Fire Alarm" has come in.
* On 2C343-1 Detector 1-4-4-T, the South Containment Cable Spreading Areas is in Alarm
* The Shift Manager has determined that an immediate emergency Containment entry is required to access the potential fire in Containment.
* The Containment entry is made and it is determined that a false alarm has occurred.
* When exiting Containment the Personnel Hatch air lock door interlocks fail allowing both doors to be opened at the same time.

Based on the given conditions and in accordance with Technical Specifications which of the following actions is required to be taken in one hour.

a. Verify at least one Personnel Hatch air lock door is Operable and Closed.

b. Verify the interlock for the Personnel Hatch air lock doors is Operable.

c. Commence placing the plant in Hot Standby and Cold Shutdown.

d. Start the Containment Purge system to create a negative pressure in Containment.

Answer:

a. Verify at least one Personnel Hatch air lock door Operable and Closed.

Notes:

Containment Integrity is lost when the interlock on the doors failed. This requires Containment integrity to be restored in 1 hour in Mode 1 per TS 3.6.1.1.
TS 3.6.1.3 allows closing of one operable air lock door to restore Containment integrity.
Distracter B is incorrect because TS 3.6.1.3 allows 24 hours to restore the interlock to Operable Status.
Distracter C is incorrect because TS 3.6.1.3 allows closing of one operable air lock door to restore Containment integrity instead of a plant shutdown or the plant shutdown can be started later than 1 hour as long as hot standby is achieved in 6 hours.
Distracter D is incorrect because Containment Purge is not allowed in this mode.

References:

TS 3.6.1.1, Primary Containment Integrity.
TS 3.6.1.3, Containment Air Locks
STM 2-13, Containment Building, Section 4.3.2
A2LP-RO-TS, OBJ. 4.b, From memory, discuss the LCOs and actions statements for all LCOs with action statements less than or equal to one hour.
A2LP-WCO-CBLDG, OBJ. 21, List the components required to be OPERABLE to satisfy the Containment Related System LCOs.

Historical Comments:

This question has not been used on any previous NRC exams. BNC 10/29/2004.

Bank: 1877	**Rev:** 0	**Rev Date:** 5/15/2012 2:31:17	**QID #:** 56	**Author:** Foster					
Lic Level: R	**Difficulty:** 2	**Taxonomy:** H	**Source:** NEW						
Search 002000K511	**10CFR55:** 41.1 / 41.4 / 41.5	**Safety Function** 2							
System Title: Reactor Coolant System (RCS)	**System Number** 002	**K/A** K5.11							
Tier: 2	**Group:** 2	**RO Imp:** 4.0	**SRO Imp:** 4.2	**L. Plan:** A2LP-RO-STEAM	**OBJ** 4				

Description: Knowledge of the operational implications of the following concepts as they apply to the RCS: - Relationship between effects of the primary coolant system and the secondary coolant system

Question:

Consider the following:

- Unit 2 is operating at 100% power
- "A" Heater Drain Pump has tripped

Reactor power should ____________ due to the loss of the "A" Heater Drain Pump due to the

____________.

A. lower; higher steam demand to the Main Feed Pumps

B. lower; loss of feedwater preheat

D. raise; higher steam demand to the Main Feed Pumps

D. raise; loss of feedwater preheat

Answer:

D. Correct; the heater drain pumps tank suction from the heater drain tanks [2T-40 A/B] and supplies the heated water to the MFP suction. The Heater Drain Pumps are 50% capacity pumps therefore when one pump trips the other will go to run out and the 2T40s will fill up until they "dump" to the Main Condenser [loss of preheated water] more water is supplied from the condenser and feedwater temperature will go down. Extraction steam flow will rise due to the colder feedwater temperature but extraction steam is supplied downstream [after] the main Turbine control valves which are controlled in manual [held in position] limiting steam flow. For the same reason, the increase in MFP steam flow to compensate for the loss of suction pressure is from extraction steam [at 100% power, MFPs run on low pressure or cross over steam].

Notes:

A, B, and C, are Incorrect for reasons stated above

References:

OP-2106.016, Condensate and Feedwater Operations, Rev. 064, section 3.0 [pages 3, 4, 5]
OP-2203.012-C ACA, Rev. 028, window A-7, note before step 2.1 [page 66]
A2LP-RO-STEAM, Rev. 15, Obj. 4, Describe the construction and operation of the Extraction Steam System: function, loads, supply to each Heater drain tanks, operation of the HDPs

Historical Comments:

New Question

1.0 PURPOSE

To provide the steps necessary for the startup, operation, and shutdown of the Condensate and Feedwater System. To provide the necessary steps for the replacement of the MSIV MSIS Solenoids.

2.0 SCOPE

This procedure provides a description and instructions for operation of the Condensate and Feedwater Systems including various valve lineups. It also includes instructions for MSIV MSIS solenoid replacement.

3.0 DESCRIPTION

The Condensate and Feedwater System (CFWS) is designed to provide continuous feedwater supply to the two steam generators at the required pressures and temperatures under all anticipated steady state and transient conditions. It has also been designed with the capability to maintain unit operation when the system has to operate under abnormal conditions due to a feed pump, a condensate pump, a heater drain pump, or a heater or string of heaters, being out of service.

The CFWS design includes provisions for automatic isolation of the system from the steam generators when required to mitigate the consequences of a steam line break.

The CFWS is made up of two interconnected trains. The two trains are interconnected at the main suction lines from the condenser hotwells, at the condensate pumps discharge, and at the suction and discharge sides of the main feedwater pumps. The CFWS has the following components:

- Four 40% capacity, vertical condensate pumps 2P-2A/B/C/D
- Five stages of low-pressure feedwater heaters, each capable of 140% of normal flow: 2E-7A/B, 2E-6A/B, 2E-5A/B, 2E-4A/B, and 2E-3A/B
- Two 50% capacity heater drain pumps 2P-8A/B. Each pump takes suction from its own heater drain tank and discharges into the feedwater pump suction
- Two 75% capacity feedwater pumps 2P-1A/B
- Two stages of high-pressure feedwater heaters (2E-2A/B and 2E-1A/B), each capable of 140% of normal flow
- Piping, control and isolation valves, and instrumentation

The condensate pumps take suction from the condenser hotwells and discharge into strings of low-pressure feedwater heaters to supply feedwater pumps suction. The heater drain pumps take suction from heater drain tanks and discharge to combine with the main condensate streams at main feedwater pump suctions. The heater drain tanks are supplied by high temperature feedwater heater drains from heaters 2E-2A/B, 2E-3A/B and drains from main condensate separation reheater units. Drains from low-pressure feedwater heaters (2E-4A/B through 2E-7A/B) are cascaded down to the condenser hotwell. The feedwater pumps discharge heated condensate, via feedwater control valves and a common header, into the steam generators.

The two trains of feedwater and condensate systems have been furnished with several cross connections to have flexibility and to permit the maximum and most efficient combination of operating pumps and feedwater heaters at all times, including the remote case of single train operation.

Condensate pumps and Heater Drain pumps are vertical, multi-stage, can-type, constant speed, motor-driven centrifugal pumps. Main feedwater pumps are vertically split, single stage, double-suction, steam turbine-driven horizontal centrifugal pumps.

Main feedwater pumps are driven by a dual-admission-type steam turbine with a connection to both the main steam and crossover steam piping. Normally, the turbine drivers are powered by low-pressure crossover steam. High-pressure main steam is used during startup, low load, or transient conditions when crossover steam is either not available or of insufficient pressure.

Feedwater heaters are U-tube types with integral drain coolers except 2E-3A/B feedwater heaters that have no drain cooling sections. 2E-6A/B, 2E-7A/B feedwater heaters are installed in the condenser necks.

Crossover piping at the feedwater pump suction and the main feedwater lines just before the containment building penetrations are furnished with motor-operated control valves. Manually operated valves are provided at the suction and discharge side of each pump, cross-tie piping, and appropriate points in the feedwater trains as required for isolation of a heater or string of heaters.

Air-Operated feedwater control valves, 2CV-0748 and 2CV-0740 with their corresponding bypass valves, 2CV-0753 and 2CV-0744, respectively, are provided downstream of the main feedwater pumps just after the discharge cross-tie piping, and just upstream of the high-pressure feedwater heaters. The emergency feedwater line for each steam generator joins the main feedwater lines to the steam generators inside the Containment, just downstream of the main feedwater line check valves.

Feedwater flow to each steam generator is controlled by an output signal from the feedwater control system (FWCS), which determines position of feedwater regulating valves (2CV-0748 and 2CV-0740), bypass valves (2CV-0753 and 2CV-0744), and speed of feedwater pumps turbine drivers.

The trip of one condensate pump while a feedwater pump is running will auto start the standby condensate pump.

The Seismic Category II portion of the CFWS, including condensate pumps, low-pressure and high-pressure feedwater heaters, main feedwater pumps and main feedwater piping up to the motor-operated isolation valves, is not essential for safe plant shutdown. In the event of failure of both main feedwater trains, the emergency feedwater pumps will be started and will supply water for safe shutdown of the plant.

A flow element with a flow transmitter is installed at each main feedwater pump suction. Flow signals are transmitted to 1) a flow switch which sounds an alarm at low flow, and trips the feedwater pump turbine driver on low-low flow (if not bypassed), 2) a flow indicating controller which activates and modulates the feedwater recirculation valve to ensure minimum safe flow through the feedwater pump, 3) a flow summer which sums each feedwater pump flow with the heater drain pump flow to determine condensate flow. Loop condensate flow is indicated on 2C02 and used to control condensate recirc valves 2CV-0662 and 2CV-0663 (0 gpm, full open, 3000 gpm full closed).

Pressure switches are located at the suction and discharge of each feedwater pump. 2PS-0735 provides the standby condensate pump with an auto-start signal on low suction pressure and trips 2P-1A turbine driver on low-low suction pressure. 2PS-0742 provides the same function for B loop. 2PS-0732 provides high discharge pressure protection for 2P-1A by opening its recirc valve 2CV-0741. 2PIS-0739 provides 2P-1A discharge pressure indication on 2C02 and high-pressure alarm. 2PS-0756 (2CV-0749) and 2PIS-0747 provide the same functions for 2P-1B. Downstream of 2E-1A and B are flow instruments (2FT-1029 and 2FT-1129) that provide feedwater flow to the FWCS, and pressure instruments (2PT-1020 and 2PT-1070) that provide indication on 2C02 and trip their respective MFWP turbine drivers on high pressure.

In order to protect the low-pressure feedwater heaters, pressure switches are installed at each condensate pump discharge to trip the pump on high discharge pressure. Also, each pump start switch is interlocked with the suction valve position indicator to avoid starting a pump with a closed suction valve.

- Heater drains portion of condensate and feedwater system used to re-inject high energy drains at the MFW pump suction to maximize plant efficiency. In order to maintain sufficient NPSH, heater drain tank level is maintained by recirc level control valves (2CV-0725 and 2CV-0719). Heater drain pumps have a start interlock with heater drain tank level. HDP trips are listed in Annunciator 2K03 Corrective Action (2203.012C).

ANNUNCIATOR 2K03

A-7

2P8A TRIP

1.0 CAUSES

1.1 Heater Drain Pump (2P-8A) breaker (2A-107) open with handswitch 2HS-0730 in START or NORMAL AFTER START.

1.2 The following conditions will trip 2P-8A:

- > 773 psid across pump (7 second time delay)
- 2T-40A level < 2 feet (7 second time delay)
- 2K-2A LP Stop valve closed with MFP Suction Crossover (2CV-0742) closed
- Bus Undervoltage
- MSIS
- SIAS
- CSAS
- 2T-40A pressure < 35 psig
- Time Overcurrent (Phase A & C Only)
- Instantaneous Overcurrent
- Ground Sensor
- Load shed caused by SU 2 feeder breaker (2A-111 or 2A-211) closed

2.0 ACTION REQUIRED

NOTE

- At full power operation, securing a Heater Drain pump will result in a Reactor power rise (~ 0.15%) and a lowered megawatt output (~ 30 MW). Depending on time in core life, Reactor power change may be slightly higher (end of life) or slightly lower (beginning of life) than 0.15%.
- Time spent running four condensate pumps and one heater drain pump is limited to 2 to 3 weeks per year (ER-ANO-2-2002-0613).
- Running four condensate pumps is NOT allowed if all ANO2 non-vital 6900V and 4160V buses are energized from SU3 (ER-ANO-2-2002-0613).

2.1 Verify Reactor Power < 100%.

2.2 IF necessary to maintain MFP suction pressure > 450 psig, THEN start standby condensate pump. Refer to Condensate and Feedwater Operations (2106.016).

(A-7 Continued on next page)

Bank: 1878	**Rev:** 0	**Rev Date:** 5/16/2012 10:31:0		**QID #:** 57		**Author:** Foster			
Lic Level: R	**Difficulty:** 2	**Taxonomy:** F		**Source:** NEW					
Search 015000K201		**10CFR55:** 41.7		**Safety Function** 7					
System Title: Nuclear Instrumentation System				**System Number** 015		**K/A** K2.01			
Tier: 2	**Group:** 2	**RO Imp:** 3.3	**SRO Imp:** 3.7	**L. Plan:** A2LP-RO-ICI		**OBJ** 4			

Description: Knowledge of bus power supplies to the following: - NIS channels, components, and interconnections

Question:

The Incore Neutron Flux Detectors are powered from the ________________.

A. 120vac vital bus

B. 120vac instrument buses

C. Cesium decay inside the detector

D. Rhodium decay inside the detector

Answer:

D. Correct;

Notes:

A. Incorrect; Vital 120 vac supplies the Excores
B. Incorrect; 120 vac instrument buses do not power either
C. Incorrect; Cesium is a fission product

References:

STM 2-67-2, Incore Flux Monitoring System, Rev. 5, section 2.2.2 [pages 5 and 6]
A2LP-RO-ICI, Rev. 11, Obj. 4, Describe a fixed incore detector's components as described in STM 2-67-2 including: Rhodium detector

Historical Comments:

New Question

- ~1.8% of the time Rh^{104} issues a 1.88 Mev beta then issues a 0.556 Mev gamma to decay to Pd^{104}.
- ~1% of the time Rh^{104} issues a 0.64 Mev beta and then emits two gammas of 1.24 and 0.556 Mevs to return to Pd^{104}.
- The half life of these three reactions is 42 seconds.

Note that there are two other mechanisms to produce electrons. Both involve Compton scattering and photoelectric effect.

- First, as has been described above, neutron capture in the emitter produces capture gamma rays which are partly absorbed in the emitter itself, producing Compton and Photo electrons. Some of these are energetic enough to escape from the emitter and surrounding insulator resulting in the required positive charge on the emitter. The conversion efficiency is rather low, about one electron per 50 captures, but the response is prompt.
- Second, incident gamma rays absorbed by the emitter produce Compton and photoelectrons, which, as before, can generate a measurable voltage or current.

These electrons (betas) penetrate the solid insulation and come to rest on the detector sheath or its surroundings.

The deficiency of electrons in the emitter results in a positive charge on the center conductor of a coaxial cable or lead wire attached to the emitter

If the center conductor of the cable is connected to the outer sheath of the cable by a resistor, the rate of positive charge production can be measured as a voltage or current. This voltage or current is directly proportional to the rate at which radiation is being absorbed by the emitter

The current is passed through a 40,000 ohm resistor, resulting in a 0-200mv signal proportional to flux. This in turn is amplified to indicate 0-5 volts, which is the raw detector voltage. It is this voltage that is used as variable "E" in the calculation of flux.

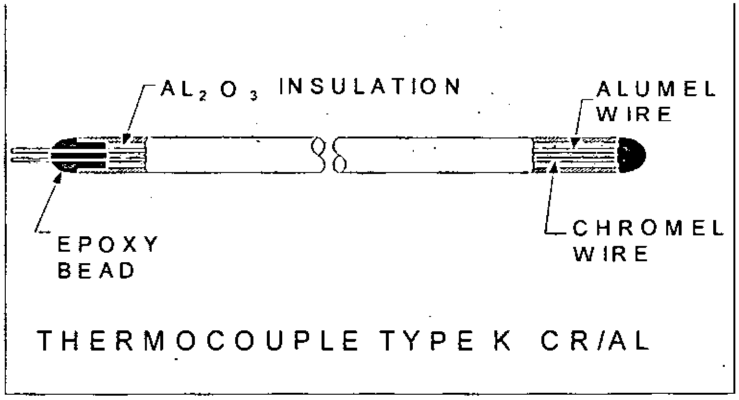
2.2.2 Thermocouple

The thermocouple is a chromel/alumel "Type K" located at the top of the core to monitor the reactor outlet coolant temperature.

Thermocouples are commonly used in all power plants for many purposes. They are seldom direct indicating devices but are usually connected to remote indicating circuits.

The action of the chromel/alumel thermocouple is as follows:

When the fused junction of two dissimilar metal wires is heated, a voltage is produced. This voltage is very small, and a sensitive meter and amplifier are required to measure it accurately.



Thermocouples provide a fast response, are relatively accurate, and are comparatively inexpensive.

The meter reading is proportional to the difference in temperature between the hot and cold junctions. The temperature of the cold junction is known and is usually fairly constant, so the meter reading indicates the temperature existing at the hot junction.

If two wires of dissimilar metals are joined together, an electric current will flow in the circuit when they are at different temperatures. The electromotive force (emf or voltage) which forces the current through the circuit is caused by the summation of two effects:

Peltier emf exists when two different metals are placed in contact; the magnitude of emf depends on the metals used and the temperature of the junction.

Thomson emf exists along a wire when one end is hotter than the other; the magnitude of emf depends upon the wire material and the difference in temperature between the ends of the wire.

The total emf developed is the algebraic sum of the two Peltier emf's and the two Thomson emf's; the magnitude of the total emf depends on the temperatures at the two junctions. If both junctions are at the same temperature, no current will flow because the Thomson emf's are zero and the Peltier emf's are equal and opposite, canceling each other out.

So, in a thermocouple, the total circuit emf depends only on the temperatures at the two junctions, not on any temperature differences along the wires. If we know the reference temperature at one junction and the emf developed, we can determine temperature at the other junction.

2.2.3 Background Detectors

The forty-two (42) assemblies each include a background detector. As per OP 2312.021, "Incore Detector Background Signal Measurement", all 42 background detector signals are verified at power to determine if the background correction factors loaded on the plant computer are acceptable.

A background cable is essentially a terminated lead cable which extends a predetermined length into the core region.

Bank:	1879	**Rev:**	0	**Rev Date:**	5/17/2012 2:09:52	**QID #:**	58	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	Modified NRC bank 1668		
Search	017000K601	**10CFR55:**	41.2 / 41.7 / 43.2	**Safety Function**	7				
System Title:	In-Core Temperature Monitor (ITM) System	**System Number**	017	**K/A**	K6.01				
Tier:	2	**Group:**	2	**RO Imp:**	2.7	**SRO Imp:**	3.0	**L. Plan:**	A2LP-RO-ICI
OBJ	6								
Description:	Knowledge of the effect of a loss or malfunction of the following will have on the ITM System components: - Sensors and detectors								

Question:

Considering the availability of Core Exit Thermocouples (CETs) during Post Accident conditions, Tech Spec 3.3.3.6, Post Accident Instrumentation, requires ______________________ .

A. 1 CET per core quadrant

B. 2 CETs per core quadrant

C. 4 CETs total in the core

D. 8 CETs total in the core

Answer:

B. Correct; per T.S. 3.3.3.6 table 3.3-10

Notes:

A. Incorrect based on T.S. requirements for 2 CETs
C and D and Incorrect; because 8 total CETs could be available but they could all be in one quadrant which would not meet the T.S.

References:

T.S. 3.3.3.6, Post Accident Monitoring, Table 3.3-10 Rev. 48
T.S. 3.3.3.6 bases, Rev. 48
STM 2-67-2, Incore Flux Monitoring System, Rev. 5, section 2.1 [page 2] section 2.2.2 [page 5]
A2LP-RO-ICI, Rev. 11, Obj. 6, Explain the Operating requirements and surveillances for the Incore Flux Monitoring System as described in the SAR

Historical Comments:

Modified NRC bank question 1668, used on the RO and SRO 2009 NRC Exam

INSTRUMENTATION

POST-ACCIDENT INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.3.6 The post-accident monitoring instrumentation channels shown in Table 3.3-10 shall be OPERABLE.

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

As shown in Table 3.3-10.

SURVEILLANCE REQUIREMENTS

4.3.3.6 Each post-accident monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK and CHANNEL CALIBRATION operations at the frequencies shown in Table 4.3-10.

TABLE 3.3-10

POST-ACCIDENT MONITORING INSTRUMENTATION

INSTRUMENT		MINIMUM CHANNELS OPERABLE	ACTION
1.	Containment Pressure (Normal Design Range)	2	1
2.	Containment Pressure (High Range)	2	2
3.	Pressurizer Pressure	2	1
4.	Pressurizer Water Level	2	1
5.	Steam Generator Pressure	2/steam generator	1
6.	Steam Generator Water Level	2/steam generator	1
7.	Refueling Water Tank Water Level	2	1
8.	Containment Water Level – Wide Range	2	2
9.	Emergency Feedwater Flow Rate	1/steam generator	1
10.	Reactor Coolant System Subcooling Margin Monitor	1	1
11.	Pressurizer Safety Valve Acoustic Position Indication	1/Valve	1
12.	Pressurizer Safety Valve Tail Pipe Temperature	1/Valve	1
13.	In Core Thermocouples (Core Exit Thermocouples)	2/core quadrant	1
14.	Reactor Vessel Level Monitoring System (RVLMS)	2	3, 4

Note 6 to Table 4.3-3 allows up to 3 hours to perform the monthly CHANNEL FUNCTIONAL TEST of the Control Room ventilation intake duct radiation monitors without declaring the LCO not met. If the test is not completed in $\leq$ 3 hours, affected intake duct monitors must be declared inoperable and applicable ACTION(s) of TS Table 3.3-6 applied.

3/4.3.3.5 REMOTE SHUTDOWN INSTRUMENTATION

The OPERABILITY of the remote shutdown instrumentation ensures that sufficient capability is available to permit shutdown and maintenance of HOT STANDBY of the facility from locations outside of the control room. This capability is required in the event control room habitability is lost and is consistent with General Design Criteria 19 of 10 CFR 50. With regard to CST level, the required Remote Shutdown panel indication is that CST level indication associated with the CST aligned to the EFW system.

3/4.3.3.6 POST-ACCIDENT INSTRUMENTATION

The OPERABILITY of the post-accident instrumentation ensures that sufficient information is available on selected plant parameters to monitor and assess these variables following an accident. This capability is consistent with the recommendations of Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Plants to Assess Plant Conditions During and Following an Accident," December 1975 and NUREG-0578, "TMI-2 Lessons Learned Task Force Status Report and Short Term Recommendations."

The Reactor Vessel Level Monitor is provided as a means of indicating level in the reactor vessel during accident conditions. A minimum of two operable level sensors in the upper plenum region and one operable level sensor in the dome region are required for RVLMS channel operability. When Reactor Coolant Pumps are running, all except the dome sensors are interlocked to read "invalid" due to flow induced variables that may offset the sensor outputs. If the equipment is inaccessible due to health and industrial safety concerns (for example, high radiation area, low oxygen content of the containment atmosphere) or due to physical location of the fault (for example, probe failure in the reactor vessel), then operation may continue until the next scheduled refueling outage and a report filed.

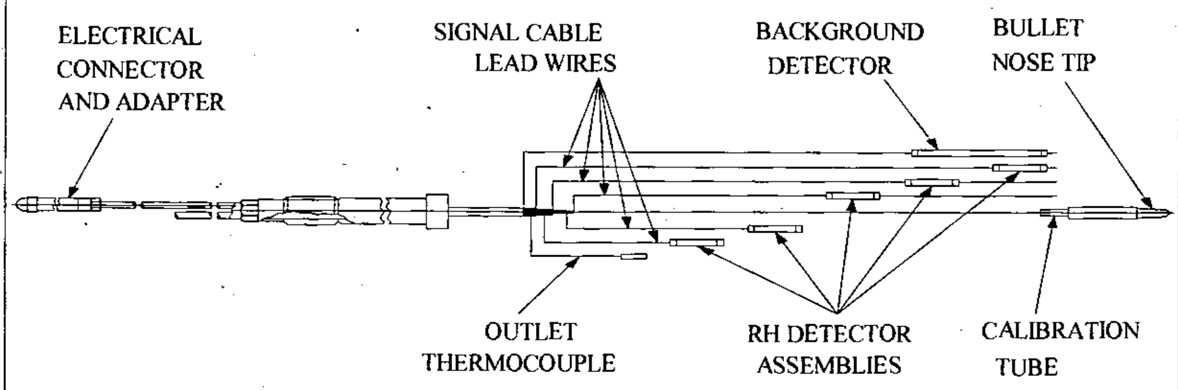
Two CETs are required to be operable in each quadrant of the reactor core. The CETs relied upon for operability must be powered from redundant trains to meet single failure criteria. This restriction is consistent with Category 1 instrumentation requirements of Regulatory Guide 1.97.

The specification requires one EFW flow indication per SG. EFW flow is used by the operator to verify that the EFW system is delivering flow to each SG. However, the primary indication used by the operator to ensure an adequate inventory is SG level. Redundant monitoring capability is provided by two independent trains of instrumentation for each steam generator. Each EFW pump feed line to each SG contains one flow instrument, for a total of four indications. Each of these indications is required to be OPERABLE for the purposes of this specification.

2.0 Detailed System Description

2.1 Incore Detector Overview

The following figure shows the incore detector assembly. There are 42 strings of detectors.



INCORE DETECTOR ASSEMBLY

The standard assembly consists of;

- five self-powered neutron detectors,
- one thermocouple and,
- one dry calibration tube installed in an Inconel outer sheath tube equipped with a bullet nose, a seal plug, and electrical connector.

The data obtained from the incores is used to measure power distribution and fuel burnup that assists in fuel management

The temperature detectors are thermocouples located at the top of the fuel that measure the core outlet temperature and provide temperature indication through the Reactor Vessel Level Monitoring System (RVLMS) cabinets to the Safety Parameter Display System (SPDS). These thermocouples are known as the Core Exit Thermocouples, or "CETs".

The system does not provide protective or direct control functions due to the slow response time of incore detectors during a transient.

The fixed detector locations correspond to five axial elevations in the core to give the axial flux shape or Axial Shape Index (ASI).

Azimuthally symmetric incores are used to determine power differences between the fuel assemblies or AZTILT.

The outputs of the fixed detectors are compensated with background detectors that correct the fixed detector outputs for signals generated in the cables of the detectors. This is not a "live" correction but is based upon correction constants determined from background detector readings.

- ~1.8% of the time Rh^{104} issues a 1.88 Mev beta then issues a 0.556 Mev gamma to decay to Pd^{104}.
- ~1% of the time Rh^{104} issues a 0.64 Mev beta and then emits two gammas of 1.24 and 0.556 Mevs to return to Pd^{104}.
- The half life of these three reactions is 42 seconds.

Note that there are two other mechanisms to produce electrons. Both involve Compton scattering and photoelectric effect.

- First, as has been described above, neutron capture in the emitter produces capture gamma rays which are partly absorbed in the emitter itself, producing Compton and Photo electrons. Some of these are energetic enough to escape from the emitter and surrounding insulator resulting in the required positive charge on the emitter. The conversion efficiency is rather low, about one electron per 50 captures, but the response is prompt.
- Second, incident gamma rays absorbed by the emitter produce Compton and photoelectrons, which, as before, can generate a measurable voltage or current.

These electrons (betas) penetrate the solid insulation and come to rest on the detector sheath or its surroundings.

The deficiency of electrons in the emitter results in a positive charge on the center conductor of a coaxial cable or lead wire attached to the emitter

If the center conductor of the cable is connected to the outer sheath of the cable by a resistor, the rate of positive charge production can be measured as a voltage or current. This voltage or current is directly proportional to the rate at which radiation is being absorbed by the emitter

The current is passed through a 40,000 ohm resistor, resulting in a 0-200mv signal proportional to flux. This in turn is amplified to indicate 0-5 volts, which is the raw detector voltage. It is this voltage that is used as variable "E" in the calculation of flux.

2.2.2 Thermocouple

The thermocouple is a chromel/alumel "Type K" located at the top of the core to monitor the reactor outlet coolant temperature.

Thermocouples are commonly used in all power plants for many purposes. They are seldom direct indicating devices but are usually connected to remote indicating circuits.

The action of the chromel/alumel thermocouple is as follows:

When the fused junction of two dissimilar metal wires is heated, a voltage is produced. This voltage is very small, and a sensitive meter and amplifier are required to measure it accurately.

QID:	1668	**Rev:**	1	**Rev Date:**	7/24/2009 3:	**RO Select:**		**SRO Select:**	
Points:									
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	New	**Originator:**	Coble
10CFR55_41:		**10CFR55_43:**		**Section:**		**Type:**			
System Title:	In-Core Temperature Monitor (ITM) System	**System Number**	017	**K/A:**	K6.01				
RO Tier:	2	**RO Group:**	2	**RO Imp:**	2.7	**SRO Tier:**		**SRO Group:**	2
SRO Imp:	3.0								
Description:	Knowledge of the effect of a loss or malfunction of the following will have on the ITM System components: - Sensors and detectors								

Question:

If some of the Core Exit Thermocouples (CETs) were to fail, how many CET indications must be left to monitor the core temperature during post accident conditions before a T.S. LCO entry must be made?

A. Greater than 75% of 42 or 32 total CETs available

B. At least 6 CETs per core quadrant available

C. At least 2 CETs per core quadrant available

D. Greater than 19% of 42 or 8 total CETs available

Answer:

C. At least 2 CETs per core quadrant available

Notes:

Post Accident TS. 3.3.3.6 requires 2 CETs per core quadrant or Action 1 LCO will be applicable. The SAR requires 75% of all incore instruments to be operable and at least enough incore instruments to provide 6 tilt estimates; however, these are not TS requirements nor requirements for the CETs. If 2 CETs are available per core quadrant then 8 total would be available which is 19% of 42. Distracter D is incorrect because the 8 could all be in one quadrant which would not meet the T.S.

References:

T. S 3.3.3.6, Post Accident Monitoring, Table 3.3-10, Amendment 255
STM 2-67-2, Incore Flux Monitoring System, Rev. 4, Sections 2.1 and 5.0
Lesson Plan A2LP-RO-ICI, Rev. 11, Objective 6: Explain the applicable Operating requirements and surveillances for the Incore Flux Monitoring System as described in the SAR.

Historical Comments:

Bank:	1880	**Rev:**	0	**Rev Date:**	5/15/2012 3:49:34	**QID #:**	59	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	H	**Source:**	NEW		
Search	033000K303	**10CFR55:**	41.7 / 45.6	**Safety Function**	8				
System Title:	Spent Fuel Pool Cooling System (SFPCS)	**System Number**	033	**K/A**	K3.03				
Tier:	2	**Group:**	2	**RO Imp:**	3.0	**SRO Imp:**	3.3	**L. Plan:**	A2LP-RO-SWACW	**OBJ**	11

Description: Knowledge of the effect that a loss or malfunction of the Spent Fuel Pool Cooling System will have on the following: - Spent fuel temperature

Question:

Consider the following:

- Unit 2 has tripped due to a large Steam Leak inside the Containment Building
- Containment Building pressure is 19.7 psia and trending up

As a result of the event, Spent Fuel Pool temperature should be ________ and level should be ________.

A. trending up; unchanged

B. trending up; trending up

C. unchanged; trending up

D. unchanged; unchanged

Answer:

B. Correct; the high containment pressure will initiate an Safety Injection Actuation Signal [SIAS] which will close both Service Water isolation valves to the SFP Hx. Without cooling water aligned to the Hx, SFP temperature and level will both trend up.

Notes:

A, C, and D are Incorrect due to reasons stated above.

References:

STM 2-42, Service Water & Auxiliary Cooling Water Systems, Rev. 35, section 3.5.3 [page 30]
A2LP-RO-SWACW, Rev 14, Obj. 11, Given a set of plant conditions, describe the response of the Service Water/Auxiliary Cooling Water systems to ANY ESFAS actuation

Historical Comments:

New Question

Valve	Power Supply	Cooler Served	HS Location
2CV-1500-1	2B52 breaker K3	2VUC-7A	2C-33 & 2B52
2CV-1502-2	2B62 breaker K4	2VUC-7B	2C-33 & 2B62
2CV-1501-5	2B54 breaker F4	2VUC-7C	2C-33 & 2B54
2CV-1501-5	2B64 breaker F4	2VUC-7C	2C-33 & 2B64

These valves are interlocked to automatically open when their respective cooler starts. Also, the valves are interlocked such that when the cooler is running, the valve cannot be closed.

As seen in the Table above, the valve that isolates Service Water to 2VUC-7C can be aligned to either a RED TRAIN or a GREEN TRAIN power supply. To prevent the cross-tie of power supplies, the breakers for these valves have a key interlock such that the valve must be down powered by opening the breaker and removing the key from the breaker (which prevents the breaker from being closed), swapping the pigtails locally at the valve and then inserting the same key into the other breaker (on the opposite train), unlocking and closing it.

These valves are equipped with a seal-in circuit that allows the valve to travel fully open or closed by taking the handswitch to the appropriate position and releasing it.

The Charging Pump Room Coolers can be started manually from the Control Room and they will automatically start when the associated Charging Pump starts. The Service Water isolation valves should be open under these conditions.

3.5.3 Spent Fuel Pool Heat Exchanger

Service Water is supplied to the shell side of the Spent Fuel Pool Heat Exchanger 2E-27, from either Service Water loop, to continuously remove decay heat from the pool volume.

The Service Water inlet isolation valves to the Spent Fuel Pool Heat Exchanger are motor operated valves which can be controlled from the Control Room with a two position (OPEN - CLOSE) spring return to center handswitch. The valve equipment ID, power supply, heat exchanger served and handswitch location are listed in the following table.

Isolation Valve	Power Supply	HX Served	HS Location
2CV-1525-1	2B53 breaker E4	2E-27	2C-17
2CV-1526-2	2B63 breaker E4	2E-27	2C-16

These valves are interlocked to automatically close on a Main Steam Isolation Signal (MSIS) or a Safety Injection Isolation Signal (SIAS). These valves CANNOT be overridden from the Control Room.

These valves are equipped with a seal-in circuit that allows the valve to travel fully open or closed by taking the handswitch to the appropriate position and releasing it.

Bank:	1881	**Rev:**	0	**Rev Date:**	5/29/2012 7:34:07	**QID #:**	60	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	035000A408	**10CFR55:**	41.7	**Safety Function**	4						
System Title:	Steam Generator System (S/GS)	**System Number**	035	**K/A**	A4.08						
Tier:	2	**Group:**	2	**RO Imp:**	4.1	**SRO Imp:**	4.4	**L. Plan:**	A2LP-RO-APSEC	**OBJ**	7

Description: Ability to manually operate and/or monitor in the control room: - Recognition that increasing radiation levels in secondary systems may mean leaking and possibly ruptured S/G tubes

Question:

Consider the following:

- Unit 2 is operatng at 30% power
- Annunciator 2K-11 K-8, Trouble/LKRT HI, is in alarm
- "A" Steam Generator N-16 monitor (2RITS-0200) is reading .09 gpm and trending up
- "B" Steam Generator N-16 monitor (2RITS-0201) is reading <.01gpm and steady

What action(s), if any, are required due to the above conditions?

A. No actions required, the N-16 monitiors do not calulate a leakrate at this power

B: T.S. SG Leakage has not been exceeded, adjust N-16 setpoint and monitor

C. T.S. SG Leakage has not been exceeded, enter Primary to Secondary Leakage AOP

D. T.S. leakage has been exceeded, Trip the Unit and enter Steam Generator Tube Rupture EOP

Answer:

C. Correct; RCS T.S. leakage for SG tubes is 150 gpd per SG. 0.09 gpm is equal to 129.6 gpd, therefore the current leakage does not exceed T.S. limits. With the leakage trending up, entry into the Primary to Secondary Leakage AOP will be directed by the ACA [step 2.4.3]

Notes:

A. Incorrect; N-16 monitors actively calculate SG tube leakage when plant power is >20%
B. Incorrect; T.S. SG Leakage has not been exceeded but with the upward trend, adjusting the N-16 setpoint is the wrong action. The ACA direct this action if the leakrate value is stable
D. Incorrect; T.S. leakage has NOT been exceeded; Tripping the Unit is directed out of the Primary to Secondary Leakage AOP if the leakrate exceeds 44 gpm

References:

OP-2203.012-K, Rev. 040, window K-8, section 2.4 [pages 77 and 78]
T.S. 3.4.6.2, Rev. 48, RCS Leakage
A2LP-RO-APSEC, Rev. 0, Obj. 7; Discuss the Unit 2 Technical Specifications that are associated with the Primary to Secondary Leakage AOP.

Historical Comments:

New Question

REACTOR COOLANT SYSTEM OPERATIONAL LEAKAGE

LIMITING CONDITION FOR OPERATION

3.4.6.2 Reactor Coolant System operational leakage shall be limited to:

a. No PRESSURE BOUNDARY LEAKAGE,

b. 1 GPM UNIDENTIFIED LEAKAGE,

c. 150 gallons per day primary to secondary leakage through any one steam generator (SG),

d. 10 GPM IDENTIFIED LEAKAGE from the Reactor Coolant System, and

e. Leakage as specified in Table 3.4.6-1 for those Reactor Coolant System Pressure Isolation Valves identified in Table 3.4.6-1.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With any PRESSURE BOUNDARY LEAKAGE or any primary to secondary leakage not within limit, be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With any Reactor Coolant System operational leakage greater than any one of the above limits, excluding PRESSURE BOUNDARY LEAKAGE and primary to secondary leakage, reduce the leakage rate to within limits within 4 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With any Reactor Coolant System Pressure Isolation Valve leakage greater than the above limit, isolate the high pressure portion of the affected system from the low pressure portion within 4 hours by use of at least two valves* in each high pressure line having a non-functional valve and be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

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* These valves may include check valves for which the leakage rate has been verified, manual valves or automatic valves. Manual and automatic valves shall be tagged as closed to preclude inadvertent valve opening.

ANNUNCIATOR 2K11

K-8

TROUBLE/LKRT HI

1.0 CAUSES

NOTE

- This alarm generated by Plant Monitoring System.
- If any of the following conditions exist, then leak rates for associated Steam Generator will NOT be valid:
  - COLSS Plant Power (CV9000) < 20%
  - S/G Tube Leak System Trouble
  - MSIV for associated Steam Generator closed

1.1 EITHER Steam Generator Tube Leak N-16 Monitor (2RITS-0200 or 2RITS-0201) leak rate greater than variable HI Alarm setpoint (normally 0.01 gpm) in PMS (PID R0200 or R0201).

1.2 ANY of the following Plant Computer system troubles in alarm:

- XS0200 - 2RITS-0200 internal processor detects fault
- XS0201 - 2RITS-0201 internal processor detects fault
- T0433 - 2C433 temperature > 33°C (91.4°F) (2TE-0433)
- CFUSE200 - 2RITS-0200 signal output to Plant Computer lost
- CFUSE201 - 2RITS-0201 signal output to Plant Computer lost

2.0 ACTION REQUIRED

2.1 Check PMS Group Display GI6 to determine cause of alarm.

2.2 IF System Trouble indicated,
THEN refer to Radiation Monitoring and Evacuation Alarm System (2105.016).

2.3 IF N-16 Monitor inoperable,
THEN notify Chemistry to establish alternate sampling.
Refer to Measurement of Primary to Secondary Leak Rate (1604.013).

(K-8 Continued on next page)

ANNUNCIATOR 2K11

K-8

TROUBLE/LKRT HI
(Continued)

2.4 IF Hi Leak Rate alarm and no System Trouble, THEN perform the following:

2.4.1 Determine affected Steam Generator using PMS and Secondary System Trend Recorders (2RR-1007 and 2RR-1057).

2.4.2 Notify Chemistry to sample Steam Generators.

2.4.3 IF rising trends or unexplained alarm, THEN GO TO Primary To Secondary Leakage (2203.038).

2.4.4 IF leak rate stable and alarm locked in, THEN adjust setpoint using Radiation Monitoring and Evacuation Alarm System (2105.016).

NOTE

If manual substitution used and actual plant power changes, then leakrate values will be invalid.

2.5 IF COLSS Plant Power (CV9000) failed or reading low, THEN actual power may be manually substituted on PID AOPP using Radiation Monitoring and Evacuation Alarm System (2105.016).

3.0 TO CLEAR ALARM

3.1 Reduce leak rate.

3.2 Adjust variable alarm setpoint using 2105.016.

3.3 Correct system trouble.

4.0 REFERENCES

4.1 E-2457-2

4.2 DCP-92-2019

Bank: 1882	**Rev:** 1	**Rev Date:** 6/27/2012 10:35:0	**QID #:** 61	**Author:** Foster			
Lic Level: R	**Difficulty:** 3	**Taxonomy:** H	**Source:** NEW				
Search 041000A102	**10CFR55:** 41.5 / 45.5	**Safety Function** 4					
System Title: Steam Dump System (SDS) and Turbine Bypass	**System Number** 041	**K/A** A1.02					
Tier: 2	**Group:** 2	**RO Imp:** 3.1	**SRO Imp:** 3.2	**L. Plan:** A2LP-RO-SDBCS	**OBJ** 1		

Description: Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SDS controls including: - Steam pressure

Question:

Consider the following:

- Unit 2 has completed forced outage and is performing a plant startup
- Power is being maintained at 10% in preperations to place the Main Turbine Generator [MTG] on line
- Steam Dump Bypass Valve, 2CV-0303, is in AUTO
- Steam Dump Bypass Valve, 2CV-0302, is in MANUAL
- Rolling of the Main Turbine Generator [MTG] is in progress

When the Main Turbine Generator (MTG) speed reaches 1800 rpm, steam header pressure should be _______________ and Reactor Power should be _______________ than before the Main Turbine Generator (MTG) roll was started.

A. higher; higher

B. lower; higher

C. the same; the same

D. higher; lower

Answer:

C. Correct; with the 2CV-0303 in AUTO, the Steam Dump bypass valves will control Steam Generator pressure constant [as steam is diverted to the MTG to roll it up to speed, the 2CV-0303 will go closed to compensate and maintain SG pressure (reactor power) constant. Therefore, there will be no change in SG pressure or Reactor Power

Notes:

A, B, and D are Incorrect for reasons stated above

References:

STM 2 23, Steam Dump & Bypass Control System, Rev. 16, section 1.2 [page1]
OP-2105.008, Steam Dump and Bypass Control System Operations, Rev. 024, section 10.0 steps 10.5.1 and 10.5.2 [page 13]
A2LP-RO-SDBCS, Rev. 11, Obj. 1, State the functions of the Steam Dump & bypass Control System

Historical Comments:

New Question
Rev. 1: added more detail to plant status (why power is at 10%) and clarified evalution for compaison of plant plant parameters

1.0 Introduction

1.1 System Functions

The functions of the Steam Dump and Bypass Control System (SDBCS) are as follows:

1) The system automatically dissipates a limited amount of excess energy in the Reactor Coolant System by regulating the flow of Main Steam through Turbine Bypass and Atmospheric Dump valves. Steam Header pressure is thereby controlled so that:

   a. Small load rejections can be accommodated without tripping the reactor or lifting either the pressurizer or main steam safety valves.

   b. Hot zero-power, or Hot Standby, conditions can be maintained.

   c. Desired RCS thermal conditions can be achieved during periods when Reactor power is required to be greater than turbine power (for example, during Turbine synchronization).

2) The system in manual allows operator control of Reactor Coolant System temperature during heatup or cooldown when the condenser is available using the Condenser Bypass valves or , when the condenser is unavailable, using the Atmospheric Dump valves.

1.2 General System Description

The Steam Dump and Bypass Control System (SDBCS) is a non-safety related system whose primary purpose is to provide a steam path from the Steam Generators to the Condenser or to the atmosphere. This is necessary in order to limit Main Steam Header pressure and, as a result, Reactor Coolant System temperatures during periods where the Main Turbine is unavailable or a Plant load transient is occurring.

The SDBCS controls seven valves. Four of the valves *Dump* to the atmosphere and have a capacity of 46% of total steam flow. Two of these Atmospheric Dump valves (ADVs) are located upstream of the Main Steam Isolation valves and the remaining two ADVs are located downstream.

Three Turbine *Bypass* valves are provided to bypass Main Steam around the Turbine directly to the main Condenser. One of these valves has a capacity of 5% and the two other bypass valves have a capacity of ~11.5%. The combined Dump and Bypass capacity is ~74% of total Steam flow. The original design of the 11.5% Bypass and Dump valves was 13 1/3% capacity each, but the valves internals were modified during plant startup testing to reduce valve failure and improve reliability.

The following table lists the capacity of each of the SDBCS valves (900 psia @ turbine stop valves) and whether the valve is a Dump valve or a Bypass valve.

10.0 OPERATION OF SDBCS DURING HOT STANDBY AND POWER ASCENSION

R A P

CAUTION

The following section has been determined to have a Reactivity Addition Potential (RAP) and this activity is classified as a Risk Level R2.

10.1 IF a Reactivity Management Brief has NOT been conducted, THEN perform a Reactivity Management Brief per COPD-030 with an SRO.

10.2 Review Limit and Precaution 5.4.

10.3 Place SDBCS Master Controller (2PIC-0300) in AUTO/LOCAL using applicable section of this procedure.

10.4 Adjust SDBCS Master Controller setpoint to maintain RCS Tave within 2°F of Tref.

10.5 Maintain balanced condenser steam flows by performing the following:

10.5.1 Operate 2CV-0302 and 2CV-0306 in Manual per Section 8.0.

* 10.5.2 Throttle open 2CV-0302 and/or 2CV-0306 while maintaining approximately 50% demand on 2CV-0303.

* 10.5.3 Maintain turbine exhaust hood temperatures (T0602 and T0640) as close to equal as possible.

QID:	1472	**Rev:**	0	**Rev Date:**		**RO Select:**		**SRO Select:**		**Points:**	1.00
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	An	**Source:**	NEW	**Originator:**	Coble		
10CFR55_41:		**10CFR55_43:**		**Section:**		**Type:**	NEW				
System Title:	Steam Dump System (SDS) and Turbine Bypas	**System Number**	041	**K/A:**	A2.02						
RO Tier:	2	**RO Group:**	2	**RO Imp:**	3.6	**SRO Tier:**		**SRO Group:**	2	**SRO Imp:**	3.9

Description: Ability to (a) predict the impacts of the following malfunctions or operations on the SDS and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: - Steam valve stuck open

Question:

The following conditions exist:

* Plant power has been lowered and stabilized at 92% for turbine control valve testing surveillance.
* Turbine Bypass valve, 2CV-0303, is in MANUAL and is being throttled opened to maintain Tave constant.

Turbine Bypass valve, 2CV-0303, now fails open..

What would be the expected final plant power with no operator action AND what action should be taken to close 2CV-0303?

a. Greater than 100% power; reduce the output of the valves HIC to 0.

b. Less than 100% power; place the permissive switch for the valve in OFF.

c. Greater than 100% power; place the permissive switch for the valve in OFF.

d. Less than 100% power; place the SDBCS Master Controller in Emergency OFF.

Answer:

b. Less than 100% power; place the permissive switch for the valve in OFF.

Notes:

References:

STM 2 23, SDBCS Sections 1.2 and 2.6

Historical Comments:

Data for 2012 NRC RO/SRO Exam REV. 0

27-Jun-12

Bank:	1882	**Rev:**	0	**Rev Date:**	5/23/2012 5:27:37	**QID #:**	61	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW		
Search	041000A102	**10CFR55:**	41.5 / 45.5	**Safety Function**	4				
System Title:	Steam Dump System (SDS) and Turbine Bypass	**System Number**	041	**K/A**	A1.02				
Tier:	2	**Group:**	2	**RO Imp:**	3.1	**SRO Imp:**	3.2	**L. Plan:**	A2LP-RO-SDBCS
OBJ	1								

Description: Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SDS controls including: - Steam pressure

Question:

Consider the following:

- Unit 2 is being maintained at 10% power
- Steam Dump Bypass Valve, 2CV-0303, is in AUTO
- Steam Dump Bypass Valve, 2CV-0302, is in MANUAL
- Rolling of the Main Turbine Generator [MTG] is in progress

When the Main Turbine Generator (MTG) speed reaches 1800 rpm, steam header pressure will be _______________and Reactor Power will be _______________ than before the evolution started.

A. higher; higher

B. lower; higher

C. the same; the same

D. higher; lower

QID use History

	RO	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☑	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

Answer:

C. Correct; with the 2CV-0303 in AUTO, the Steam Dump bypass valves will control Steam Generator pressure constant [as steam is diverted to the MTG to roll it up to speed, the 2CV-0303 will go closed to compensate and maintain SG pressure (reactor power) constant. Therefore, there will be no change in SG pressure or Reactor Power

Notes:

A, B, and D are Incorrect for reasons stated above

References:

STM 2 23, Steam Dump & Bypass Control System, Rev. 16, section 1.2 [page1]
OP-2105.008, Steam Dump and Bypass Control System Operations, Rev. 024, section 10.0 steps 10.5.1 and 10.5.2 [page 13]
A2LP-RO-SDBCS, Rev. 11, Obj. 1, State the functions of the Steam Dump & bypass Control System

Historical Comments:

New Question

Bank:	1883	**Rev:**	0	**Rev Date:**	5/23/2012 5:34:10	**QID #:**	62	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NEW				
Search	055000K106	**10CFR55:**	41.7 / 43.4	**Safety Function**	4						
System Title:	Condenser Air Removal System (CARS)	**System Number**	055	**K/A**	K1.06						
Tier:	2	**Group:**	2	**RO Imp:**	2.6	**SRO Imp:**	2.6	**L. Plan:**	A2LP-RO-ESGTR	**OBJ**	2

Description: Knowledge of the physical connections and/or cause-effect relationships between the CARS and the following systems: - PRM system

Question:

The condenser off-gas rad monitor [2RE-0645] is used to detect ______________ and discharges to the __________________.

A. a primary to secondary RCS leak; suction of the Aux Building Exhaust Fans [2VEF-8A/B]

B. high RCS activity; suction of the Aux Building Exhaust Fans [2VEF-8A/B]

C. a primary to secondary RCS leak; suction of the Aux Extension Building Exhaust Fans [2VEF-51A/B]

D. high RCS activity; suction of the Aux Extension Building Exhaust Fans [2VEF-51A/B]

Answer:

A. Correct; the rad monitor is designed to detect a SG U-tube leak/rupture, and will discharge to the suction of the 2VEF-8, Aux Building Exhaust Fans

Notes:

B, C, and D are Incorrect due to either the wrong location as to where the Rad monitor draws its sample from or wrong reason for monitoring [high RCS activity will make the condenser off gas monitor come into alarm quicker and based on chemistry sample results, that RCS activity is trending up, but only if there is a primary to secondary leak.

References:

STM 2-22, Condenser Vacuum System, Rev. 13, section 1.2 [page 2] section 2.4 [page 6] section 7.0 [page 17] simplified drawing [21]
A2LP-RO-ESGTR, Rev. 7, Obj. 2, Given a set of plant conditions, determine if the required entry conditions exists to enter the SGTR emergency operating procedure (EOP)

Historical Comments:

STM 2-22

Condenser Vacuum System

1.0 Introduction

1.1 Purpose

The purpose of the condenser vacuum system is to remove air and non-condensable gases from the main condenser during plant startup, cooldown, and normal operation. Anything which can be done to raise the amount of available energy and/or lower the amount of unavailable energy within the secondary cycle will raise the thermal efficiency of plant operation overall. Condensing the turbine exhaust at lower pressures (i.e., under a vacuum) improves thermal efficiency by raising available energy and lowering unavailable energy within the secondary cycle.

1.2 General System Description

Refer to Figure 22-01. Most components associated with the condenser vacuum pumps are located in the turbine building at the 335' elevation southeast, near the hydrogen seal oil and stator cooling water skids. The condenser vacuum system consists of two redundant trains of 100 percent capacity exhauster assemblies. Each exhauster assembly consists of:

- One motor driven rotary type vacuum pump,
- One vacuum pump seal water system, including:
  - One centrifugal pump,
  - One heat exchanger (seal water cooler)
- Two air ejectors (jet nozzles)
- Two integral air ejector heaters
- One separator tank
- Four vacuum pump suction valves
  - Two manual valves, one from each condenser section 2E-11A and 2E-11B
  - Two air-operated valves, each in series with the manual valves; air to open
- Two air-operated air ejector bypass valves; air to close
- One motive air valve in the combined air ejector suction line; air to open
- One manual 3-way valve in series with the motive air valve which can be aligned to allow vacuum pump suction from atmosphere or the separator tank. It is normally aligned to atmosphere.

Each vacuum pump is designed to continuously remove 25 scfm of air and non-condensable gases at 1" HgA while in the "holding" mode and 750 scfm at 10" HgA in the "hogging" mode.

The vacuum pump suction valves, air ejector bypass valves, and the motive air isolation valve may not shift to their proper position for a particular operating mode for a variety of reasons. These reasons include, but are not entirely limited to, a loss of air pressure for valve operation, a loss of AC solenoid control power, and improper valve maintenance (e.g., packing too tight, improper valve operator lubrication, etc.). If air pressure is lost to the valve operators, they will fail as if the pump were secured (motive air valve closed, bypass valves open, and the system diaphragm valves closed). The same would result from a loss of power to the solenoid valves since this would cause a loss of air to each of these valves. These solenoids are powered from the associated Seal Water Pump breaker control power (120 VAC).

The condenser vacuum system is equipped with a condenser off-gas radiation monitor (2RE-0645) which is located on elevation 372' of the turbine building by the turbine pedestal, and a demister filter, located on the 404' elevation of the auxiliary building on the west side of the spent fuel pool area.

1.3 General System Operation

Non-condensable gases, air, and water vapor are drawn from each main condenser shell by the vacuum pump. Any water vapor is condensed in the vacuum pump and collects in the separator tank. Non-condensable gases and air are vented from the vacuum pumps via a common header. The discharge header is routed through the demister filter. From the demister the gases and air are sent through the auxiliary building ventilation system radwaste area exhaust fans (2VEF-8A/B) and their associated filtering unit to a containment building flute before exhausting to atmosphere.

The air and gases discharged from the vacuum pumps is sampled prior to reaching the demister filter by a process radiation monitor physically located off and away from the common discharge header.

2.3 Air Ejector Heaters

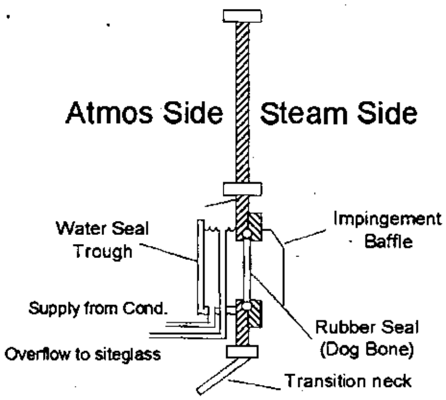
The air ejector heaters are rated at 590 watts each and are powered from 23LA-19 and 23LA-20. When the associated vacuum pump's breaker is closed the heaters will cycle on at 43°F and cycle off at 49°F. Ambient temperature in the control cabinet is sensed by a thermostatic controller for each vacuum pump to cycle the air ejector heaters on and off. This serves to prevent freezing in the air ejector with air temperature lowering as the air expands exiting the air ejector at high velocity.

2.4 Condenser Off-Gas Radiation Monitor (2RE-0645)

The condenser off-gas radiation monitor, 2RE-0645, is provided to continuously sample a portion of the vacuum pump discharge. This monitor is a gamma sensitive GM tube. It measures the radiation count rate of the condenser vacuum pump exhaust air and gases before the exhaust passes through the auxiliary building ventilation system. This monitor provides rapid detection of a primary to secondary steam generator tube leak. It is located on the 372' elevation of the turbine building, northeast of the turbine building elevator (north of current limiting reactor 2X32).

2.5 Steam Seal Expansion Joint

Working in conjunction with the condenser vacuum system to maintain condenser vacuum is the steam seal expansion joint. This expansion joint, also referred to as the "dog-bone seal", provides a flexible seal between the low pressure turbines and the condenser.



Steam Seal Expansion Joint

The dog-bone seal is surrounded on the outside by a water seal trough to minimize air in-leakage should the rubber seal develop a leak. Water from the condensate system is aligned to the trough and overflows into a standpipe inside the trough. The trough is full when flow can be seen through a sightglass. The seal water supply valve is throttled so that just a trickle of flow is maintained through the sightglass. There is approximately 700 psid across the valves, so adjustments should be made with extremely small increments and frequently monitored. Too much flow will cause leakage down the side of the condensers, and could cause "ejection" of water from the trough.

One sightglass per dog-bone seal, two total, is provided for condenser sections 2E-11A and 2E-11B. The sightglasses are located in the turbine building on the southeast heater deck, north of the isophase ductwork. If flow through a sightglass should lower or stop, a leak in the dog-bone seal may be indicated.

2.5.1 The "Piezometric" Ring

The piezometric ring is the ring where the sensing heads for the condenser vacuum pressure instruments are located. This ring leaves the condenser and goes to pressure transmitters. There is one piezometric ring per condenser section. The pressure transmitters provide control room indications and alarms for condenser vacuum, Remote Shutdown panel indication, input to the Plant Monitoring System, as well as input to the condenser overpressure steam dump and bypass system (SDBCS Condenser Override).

7.0 System Interrelations

Numerous other plant systems have some interconnection with the condenser vacuum system. A list of these systems and a description of the function of the interconnection is presented here.

The Condensate Transfer System supplies the vacuum pumps with packing seal water and also supplies automatic makeup to the separator tanks through float valves 2CV-0685 and 2CV-0695.

The Auxiliary Cooling Water System supplies the cooling medium for the vacuum pump seal water coolers (2E46A, 2E46B). Each seal water cooler has an ACW inlet strainer (2F-338A/B) with local differential pressure indication (2PDI-1670/1672).

Condensate and Feedwater System: The condenser vacuum system maintains the main condenser under vacuum conditions during plant operation to raise the efficiency of the secondary cycle.

Air and other non-condensable gases are discharged by the vacuum pumps through the separator tanks where the majority of entrained moisture is removed. The separator tanks vent the air and non-condensable gases to the Auxiliary Building Ventilation System exhaust duct. This vent path is monitored by the condenser off-gas radiation monitor (2RE-0645). Further moisture removal is performed downstream of the radiation monitor by demister assembly (2F-293) prior to entering the exhaust duct. Final discharge is through the radwaste areas filter unit and exhaust fans (2VEF-8A/B) and then through the containment building flutes.

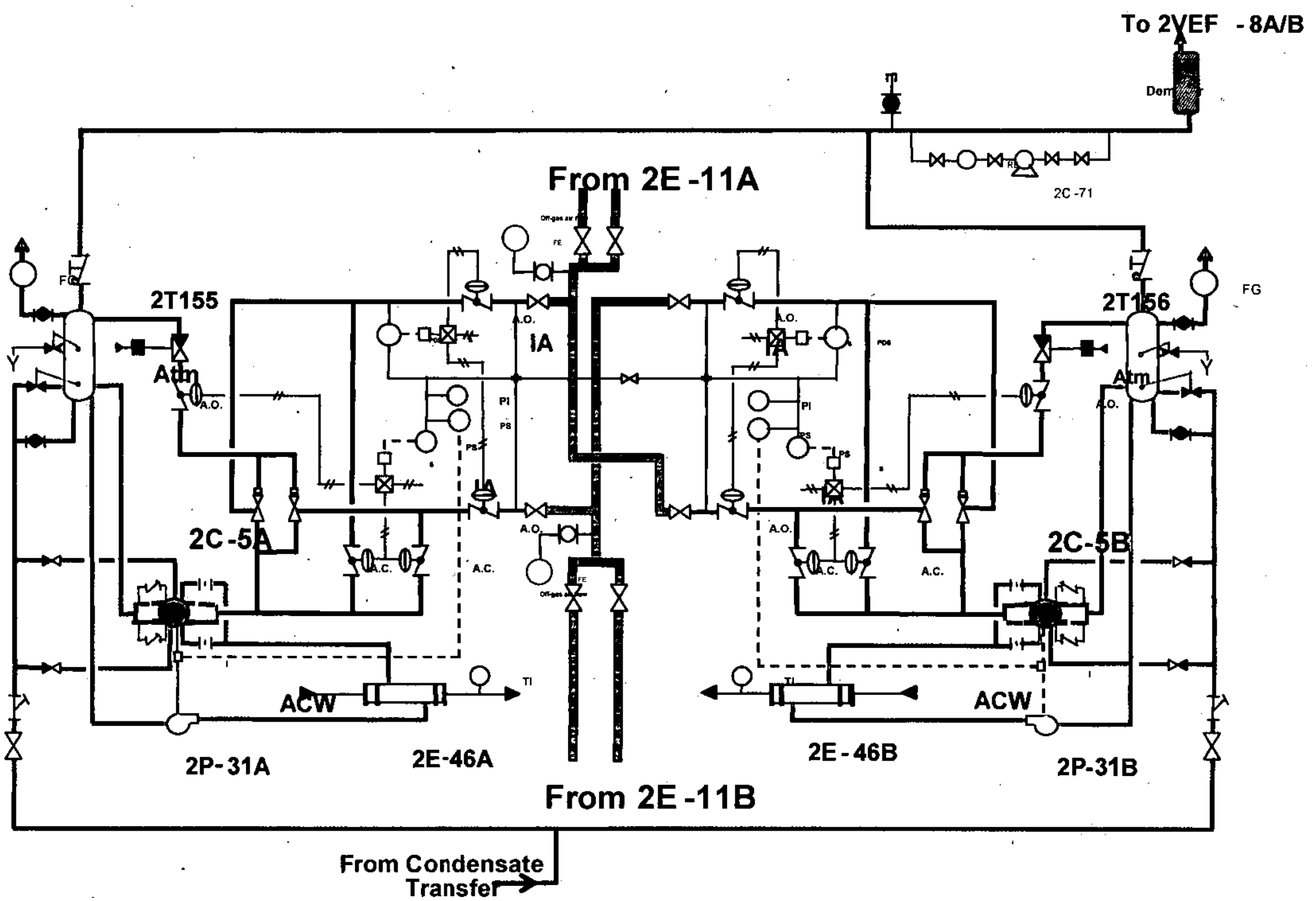


Figure 22-01 Condenser Vacuum System

Bank:	1884	Rev:	0	Rev Date:	5/22/2012 11:04:3	QID #:	63	Author:	Foster
Lic Level:	R	Difficulty:	3	Taxonomy:	H	Source:	Modified NRC bank 0060		
Search	0710002128	10CFR55:	41.7	Safety Function	9				
System Title:	Waste Gas Disposal System (WGDS)	System Number	071	K/A	2.1.28				
Tier:	2	Group:	2	RO Imp:	4.1	SRO Imp:	4.1	L. Plan:	A2LP-WCO-GRW OBJ 5

Description: Conduct of Operations - Knowledge of the purpose and function of major system components and controls.

Question:

Consider the following:

- Unit 2 is operating at 100% power
- Waste Gas Decay Tank [2T-18A] is being filled
- 2T-18A pressure is 350 psig

With the above conditions, if a hydrogen burn were to occur, which one (1) of the following describes the results on the Waste Gas System?

A. A rupture disc will relieve pressure directly to the on Line Holdup Tank [2T-12]

B. A rupture disc will relieve pressure directly to the Waste Gas Surge Tank [2T-17]

C. A rupture disc will unisolate a relief valve and relieve pressure directly to the on Line Holdup Tank [2T-12]

D. A rupture disc will unisolate a relief valve and relieve pressure directly to the Waste Gas Surge Tank [2T17]

Answer:

D. Correct; the Waste Gas Tanks do relieve to the Waste Gas Surge Tank via a rupture disc in series with the relief valve

Notes:

A, B and C are incorrect due to either not having a relief valve or discharging to the wrong place.
The 2T-17 will relieve to the on line Holdup Tank via a rupture disc and relief valve

References:

OP-2104.022, Gaseous Radwaste System, Rev. 40, Step 5.10 (pages 2,3,4 and 5]
STM 2-54, Gaseous Radwaste System, Rev: 9, section 2.5 [page 4] section 2.7 [page 6] simplified draw [page 16]
A2LP-WCO-GRW, Rev. 14, Obj. 5: Describe the functions and operation of the system components

Historical Comments:

Modified NRC bank question 0060

1.0 PURPOSE

To provide instructions for operating the Gaseous Radwaste System.

2.0 SCOPE

This procedure provides a description of the Gaseous Radwaste System and instructions for startup and operation. It includes the Gaseous Release Permit for discharging radioactive gases.

This procedure, in conjunction with Waste Gas Sampling and Analyzer Operations (2607.018), satisfies the requirements of TS Surveillance 4.11.3 and Table 3.11-3.1 a and b Action 1; ODCM App 2, S2.2.1, Table 2.2-2.1 a and b (Channel Check and Source Check) and Table 2.2-1.1 a and b Actions 1 and 2.

3.0 DESCRIPTION

The Waste Gas System consists of the Gas Surge Header (GSH), Gas Collection Header (GCH), Containment Vent Header (CVH), Waste Gas Surge Tank, Waste Gas Compressors, Waste Gas Decay Tanks, Gaseous Radwaste Monitoring System and Waste Gas Analyzer. Gases are collected from various components of the Chemical and Volume Control, Liquid Radwaste, Boron Management and Fuel Pool Systems.
The CVH is aligned directly to the suction of the Waste Gas Compressors (2C-75A/B) via Containment isolation valves formerly used for QT sample. Gases vented from the Volume Control Tank (VCT) and Vacuum Degasifier also discharge to the Waste Gas Compressor suction header. When in service, the Vacuum Degasifier provides the bulk of the waste gases collected.

The CVH receives gas vented from the Reactor Drain Tank (RDT), Quench Tank (QT), Failed Fuel Detector and Regenerative Heat Exchanger. The gases flow to the Waste Gas Compressor suction header. The compressors are two stage reciprocating type and will move 10 scfm with suction pressure at 5 psig. Capacity will increase with rising suction pressure.. Each compressor skid has a pre-cooler, inter-stage cooler and after cooler to cool the gas before entering the on-line Waste Decay Tank (2T-18A/B/C). When the on-line 2T-18 pressure reaches 250 psig, it is isolated for decay of short-lived radioactive isotopes. Normally this is at least 30 days, however if plant conditions warrant it can be released sooner if Tech Spec release limits are not exceeded. A Gaseous Release Permit is submitted for sampling and a Pre-release Report is generated based on sample results. It specifies the release flow rate and setpoint of the GRW Gas Decay Tank Vent Line Rad Monitor (2RITS-2429). The selected 2T-18 is discharged via GRW Release Hdr Pressure Control valve (2PCV-2417), WG Decay Tank Disch 2FIT-2430 Isol (2GZ-15), Rad Monitor (2RITS-2429, and Waste Gas Decay Tanks Discharge to Vent Plenum (2CV-2428). 2CV-2428 is interlocked with 2VEF-8A/B such that one fan must be in operation to open 2CV-2428 and valve will close if fan is secured. It is also interlocked with radiation monitor (2RITS-2429) and will close if adjustable setpoint of monitor is exceeded. The gas is discharges to the Auxiliary Building Radwaste Exhaust Fans (2VEF-8A/B) suction where it is diluted by low activity gases collected by the Gas Collection Header and then released to atmosphere via the Vent Plenum. The Vent Plenum is monitored by 2RITS-8542 and SPING 6 which alarm to indicate unexpected activity release.

A bypass line around the Waste Gas compressors to the Vent Plenum can be used to purge air or nitrogen from components directly to the Aux Building Ventilation. It shall not be used for VCT venting operations at power or purging operations during which activity is high. Samples shall be taken to determine activity before using this bypass line.

The GCH collects gases from process equipment in CCW, Solid Radioactive Waste BMS, Waste Management, CVCS and Fuel Pool Systems and discharges directly to the Vent Plenum via the suction of 2VEF-8A/B. Because of the dilution provided by 2VEF-8A/B and low activity level from the sources, the gases are routed directly to the Vent Plenum and are monitored by the Vent Plenum radiation monitors (2RITS-8542 and SPING 6) which alarm to indicate unexpected activity release.

The GSH discharges to the Gas Surge Tank (2T-17) however, the GSH currently has no gas input. 2T-17 is currently used to provide relief volume for 2T-18A/B/C and Waste Gas Compressors (2C-75A/B).

The H2O2 Gas Analyzer (2C102) is available for monitoring O2 for a potentially explosive mixture in the GRW System. It monitors Waste Gas Decay Tanks or Waste Gas Compressor Discharge stream whenever the Waste Gas System is in operation. However, due to startup time required and difficulties in operation of the analyzer, Chemistry prefers the alternative Grab sample method. If the H2O2 Gas Analyzer is inoperable or not being used during degasification operations Chemistry shall obtain gas samples for analysis to verify Tech Spec compliance. Potential O2 sources are Vacuum Degasifier, VCT, QT, RDT and the Regenerative Heat Exchanger. These components are maintained at a positive pressure with a cover gas of hydrogen or nitrogen so O2 will not enter. However, O2 could enter these tanks during maintenance periods and purging tanks, piping, and components with nitrogen after maintenance should be considered to reduce the possibility of O2 entering GWS.

4.0 REFERENCES

4.1 References Used in Procedure Preparation:

- ANO-2 Tech Specs 3/4.11.2 and 3/4.11.3
- Offsite Dose Calculation Manual (ODCM) App 2
- Action Item # NQ-87-00794, Unplanned Gaseous Release
- 0-NRCM-90-04-19, Decay Time placards are installed on tank isolation valves. A written justification is required for releases within 30 days Decay Time
- CR-2-92-0017, Do not adjust potentiometer setpoint below 0.00 or above 10.0 and test alarms/interlocks
- CR-C-94-0007, The limit of 300,000 Ci was recalculated using the same methodology in Tech Spec bases and was found to be 82,400 Ci. LIC-00-010 (TS Amendment 211) implemented this same limit
- CR-1-94-0068, Unplanned Liquid and Gaseous Release
- TM B310.0040 Waste Gas Compressor Tech Manual
- ER-ANO-2002-0325-000, Replace 2PCV-2427 with 2PCV-2404.
- CR-2-2003-0753, Erroneous background radiation setpoint entered
- CR-ANO-2-2007-00089, Cross Contamination of CAMS 2RITS-8231-1 During 2T-18 Release
- CR-ANO-2-2008-0427, Explosive H2/O2 mixture detected during RCS Degassification via the Quench Tank.
- CR-ANO-2-2010-2031, Conflict resolution between Chemistry procedure 2607.018, and this procedure over control of sample valves

4.2 References Used in Conjunction with this Procedure:

- Annunciator 2K11 Corrective Action (2203.012K)
- Chemical and Volume Control (2104.002)
- Vacuum Degasifier Operation (2104.016)
- Unit 2 Waste Gas Sampling and Analyzer Operation (2607.018)
- Analysis of Gaseous Waste Decay Tanks (1604.016)
- EN-LI-102, Corrective Action Process

5.0 LIMITS AND PRECAUTIONS

5.1 If GRW Gas Decay Tank Rad Monitor (2RITS-2429) automatically closes 2CV-2428, another sample shall be analyzed for radioactivity to determine if actuation is due to high activity or instrument mis-calibration or malfunction. If high activity is the source of alarm, discharging at a higher level from that particular Waste Gas Decay Tank shall be justified or additional decay of contents shall be allowed.

5.2 An unplanned release is defined as the unintended discharge of a volume of liquid or airborne radioactivity to the environment. Detailed definition is in Chemistry procedure 1604.016 (Analysis of Gaseous Waste Decay Tanks). If an unplanned release occurs, a condition report is required and it may be reportable per ODCM App 2, L3.4.1.

5.3 Radiation Protection should be contacted for air samples and to monitor radiation level changes when opening any vent or drain due to effluent being radioactive.

5.4 Components should be purged with N2 and sampled for H2 whenever possible before opening system or performing maintenance due to potentially explosive mixtures.

5.5 If H2O2 Gas Analyzer being used, WG Decay tanks (2T-18A/B/C) must be maintained > 35 psig to ensure proper analyzer operation.

5.6 If WG Compressor in operation and sample results indicate compressor discharge has entered Region B of Exhibit 1, sample shall be realigned to monitor the on-line Waste Gas Decay Tank (2T-18A/B/C).

5.7 Waste Gas Decay Tank H2/O2 concentration shall be limited to Region A of Exhibit 1.

5.8 If H2/O2 concentration in any WG Decay tank enters Region B of Exhibit 1 then corrective action shall be taken to return concentration to Region A within 24 hours.

5.9 If H2O2 Gas Analyzer <u>NOT</u> in use, Waste Gas System operation may continue provided grab samples are taken every 4 hours during degassing operations and daily during other operations. The analysis of these samples shall be completed within 8 hours of taking the sample. (Tech Spec 3.11.3, Table 3.11-3, Action 1)

5.10 WHEN in-service WG Decay tank pressure approaches 250 psig OR sample indicates total activity approaching 82,400 curies, THEN transfer waste gas processing to another WG Decay tank to allow sufficient volume for N2 dilution and to prevent exceeding relief valve setpoint (380 psig) during (~ 1.5 times) pressure rise in event of a H2 burn.

5.11 The Gaseous Radwaste Treatment System, consisting of a means to collect off gases and provide for decay, shall be used when degasifying the RCS.

5.12 When degasification of the RCS in progress with RCS activity exceeding Tech Spec 3.4.8 limit, the WG Decay tanks shall be sampled, using Analysis of Gaseous Waste Decay Tanks (1604.016), at least once every 24 hours per Tech Spec 3.11.2

5.13 CAMS 2RITS-8231-1 and 2T-18 tanks discharge to a common header. During a 2T-18 release, cross contamination can occur if CAMS unit is secured. Consider running CAMS unit 2RITS-8231-1 during a 2T-18 release. (Reference CR-ANO-2-2007-00089)

6.0 SETPOINTS

6.1 WG Decay tank (2T-18A/B/C) Press High > 360 psig

6.2 Waste Gas compressors 2C-75A/B trips:

Discharge Pressure High (2PS-2407A/B)	> 250 psig
Discharge Pressure High (2PS-2409A/B)	> 350 psig
Discharge Gas Temperature High (2TS-2407A/B)	> 350°F
Suction Pressure Low (2PS-2408A/B)	< 0 psig
Oil Pressure Low (2PS-2406A/B)	< 15 psig

2.5 Waste Gas Surge Tank

The Waste Gas Surge Tank (2T-17), located in the Reactor Auxiliary Building (RAB) on the 335 ft elevation, was designed to receive gasses from the Gas Surge Header and Containment Vent Header, but as discussed earlier the Gas Surge Header has no gas input at this time and the Containment Vent header now is directed to the suction of the Waste Gas Compressors. Presently the sole purpose of the Waste Gas Surge Tank is to provide a relief volume in the event that a Waste Gas Decay Tank (2T-18A/B/C/D) relief or a Waste Gas Compressor discharge relief should lift. 2T-17 is equipped with a drain line to remove any water that accumulates in the tank from condensation. A level switch (2LS-2407), located on the tank, will actuate an alarm at a switch setpoint of 1.75 inches that corresponds to a tank level of 6 inches, giving the operator indication when condensation should be drained. The relief valve 2PSV-2402 and a rupture disc 2PSE-2402, both in series, provide over pressurization protection and relieve to the Hold Up Tanks (2T-12A/B/C/D). Rupture disc 2PSE-2402, which provides a positive sealing device, will rupture at 19 psig and relief valve 2PSV-2402 will lift at 20 psig. Local pressure indicator (2PI-2403) is also provided. Indication for tank temperature and pressure are located on the Gaseous Radwaste Control Panel (2C-115). An alarm on high Waste Gas Surge tank (2T-17) pressure will come in at 15 psig on 2C-115. 2C-115 is located on elevation RAB354 and any alarm actuated on this panel will bring in a common alarm on 2C-14 (2K-11 F-9) in the Control Room.

A 0.5 psig nitrogen blanket is maintained on the tank to prevent air inleakage. The tank can also be purged with nitrogen using 2PCV-2435 to regulate Nitrogen Header pressure at 2 psig. Purges are done after any evolution, such as maintenance, which might introduce oxygen into the tank.

2.6 Waste Gas Compressors

The Waste Gas Compressors (2C-75A/B) are the Blackmer model HDL373C two stage, 7.5 horsepower, water cooled, triple seal, oil free, reciprocating type and are powered from 2B31-C5 & 2B41-C5. The compressors have stainless steel valves, viton o-rings, suction valve unloaders, and an oversized flywheel for low speed operations. The compressors are equipped with a triple sealed feature with a nitrogen purge system that routes any leakage past the piston rings back to the compressor suction.

The compressors are designed to move 10 scfm with a suction pressure of 5 psig and have a maximum discharge pressure of 350 psig. The capacity of the compressors increases with increasing suction pressure. The compressors are protected from overpressurization by relief valves 2PSV-2403A/B, 2PSV-2404A/B, 2PSV-2410/2PSV-2413 all set at 350 psig. Each compressor skid has three heat exchangers. The Component Cooling Water (CCW) supplied precooler (2E-101A/B), interstage cooler (2E-102A/B) and aftercooler (2E-103A/B) cool the compressed gas before it enters the Waste Gas Decay Tanks. The compressors are also provided with amount of supply gas to the compressor suction from the Nitrogen seal system (and normally from the Waste Gas Analyzer). The regulator should prevent Oxygen from entering the suction of the compressor since the suction pressure should always be maintained above 0 psig (trip setpoint).

2.7 Waste Gas Decay Tanks

There are three Waste Gas Decay Tanks, each provided with a pressure indicator, local alarm, and temperature indication at the Waste Gas Control and Instrumentation Panel (2C-115). The decay tanks have sufficient storage capacity for an average 30-day holdup. After radioactivity has decayed to a level consistent with the design objective and verified by Nuclear Chemistry laboratory analysis, the gas is released to the environment via the Vent Plenum at a controlled flow rate. The flow rate is determined in the pre-release report conducted by chemistry after a release permit has been submitted. Flow is indicated at 2FIT-2430 in GRW valve gallery and on 2C14 at 2FR-2431 in the Control Room. 2FIT-4230 has to be operable in accordance with ODCM L2.2.1 Table 2.2.1.

When the decay tanks are being filled, only one tank is lined up to the compressor discharge. When the pressure in the tank increases to ~250 psig, the tank is isolated and tagged. The limit of 250 psig is established in order to provide a volume for nitrogen dilution in the waste gas tank and to accommodate a rise in pressure in the tanks in the event of a hydrogen burn without exceeding the tank relief valve setting of 380 psig. The lineup is then manually switched over to an empty tank. The gas in the isolated tank is allowed to decay as long as practical (preferably at least 30 days) to remove short lived activity such as Xe^{133}. Releases may be performed at any time if plant conditions warrant, as long as Tech Spec release limits are not exceeded.

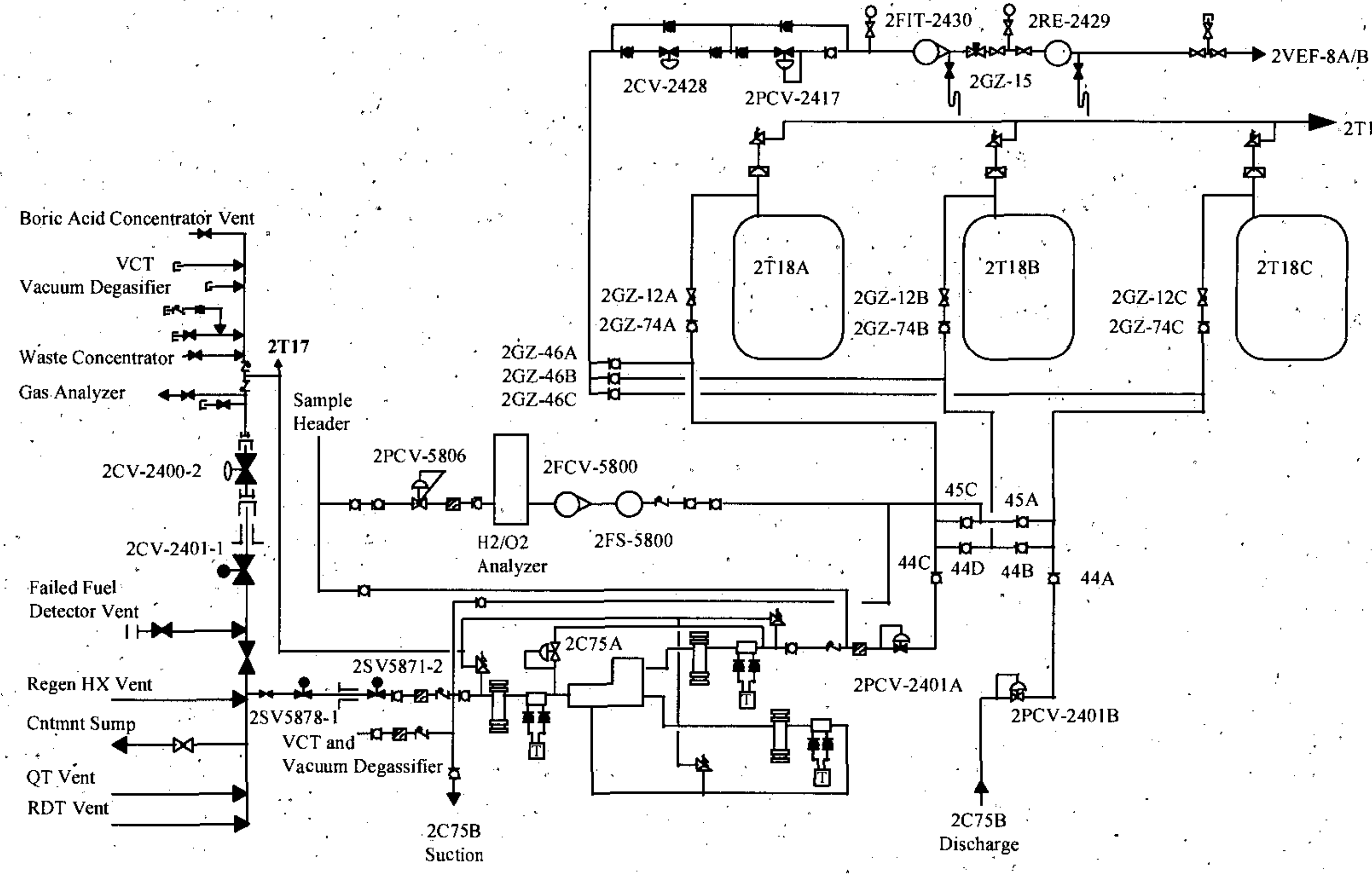
2.8 Waste Gas Release Discharge Flowpath

The Waste Gas Decay Tanks Discharge to Vent Plenum control valve (2CV-2428) is interlocked to the Aux Bldg Radwaste Exhaust Fans (2VEF-8A/B). One exhaust fan must be operating for 2CV-2428 to open. This interlock will prevent an undiluted radioactive gas release to the environment or the possibility of back flow into the Aux Building. 2CV-2428 will automatically close if the operating radwaste exhaust fan stops for any reason. Before the release, the required release flow rate is determined, and the set point on the GRW Gas Decay Tank Vent Line radiation monitor (2RITS-2429) is established. 2CV-2428 is interlocked with 2RITS-2429 and will close automatically on a high radioactivity level alarm. This alarm annunciates in the Control Room (2K11-D10).

The Gaseous Radioactive Waste Monitoring System continuously monitors the gaseous activity levels released to the Plant Vent Plenum from the Waste Gas Decay Tanks. Waste Gas Decay Tank Vent Line Radiation Monitor (2RIT-2429) is an in-line sampler and a beta-gamma GM tube detector. The system is capable of detecting 1E(-5) uCi/cc of Xe-133 in a 2.5 mr/hr background. (See STM-2-63 for more information on radiation monitors.)

Figures

Gaseous Radwaste System Drawing



QID:	0060	**Rev:**	000	**Rev Date:**	6/28/1998 9:	**RO Select:**		**SRO Select:**		**Points:**	1.00
Lic Level:	RS	**Difficulty:**	3	**Taxonomy:**	C	**Source:**	New	**Originator:**	Hatman		
10CFR55_41:	41.7	**10CFR55_43:**	NA	**Section:**	3.9	**Type:**	Plant Systems				
System Title:	Waste Gas Disposal System (WGDS)	**System Number**	071	**K/A:**	K4.05						
RO Tier:	2	**RO Group:**	1	**RO Imp:**	2.7	**SRO Tier:**		**SRO Group:**		**SRO Imp:**	3.0
Description:	Knowledge of design feature(s) and/or interlock(s) for the Waste Gas Disposal System which provide for point of release.										

Question:

Which one (1) of the following describes the effect of a Waste Gas Decay Tank pressure increasing to 400 psig?

A. A rupture disc will relieve pressure to Containment.

B. A rupture disc will relieve pressure to the Waste Gas Surge Tank.

C. A rupture disc will unisolate a relief valve and relieve pressure to Containment.

D. A rupture disc will unisolate a relief valve and relieve pressure to the Waste Gas Surge Tank.

Answer:

D. A rupture disc will unisolate a relief valve and relieve pressure to the Waste Gas Surge Tank.

Notes:

The rupture disc is in series with the relief valve and the relief valve relieves to the Waste Gas Surge Tank.

References:

2104.022, Rev 30, Step 6.2 (Gaseous Radwaste System)
2203.012P, Rev 12, Page 6 (Annunciator 2K16 Corrective Actions)
P&ID M2215, Rev 70, Sheet 1, F-4, (Waste Gas System)
ANO-2-LP-WCO-GRW Obj 5.0

Historical Comments:

PARENT

Bank:	1885	**Rev:**	0	**Rev Date:**	5/17/2012 4:07:46	**QID #:**	64	**Author:**	Foster	
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW			
Search	072000A202	**10CFR55:**	41.5 / 41.7 / 43.1	**Safety Function**	7					
System Title:	Area Radiation Monitoring (ARM) System			**System Number**	072	**K/A**	A2.02			
Tier:	2	**Group:**	2	**RO Imp:**	2.8	**SRO Imp:**	2.9	**L. Plan:**	A2LP-RO-CRVNT	**OBJ** 6

Description: Ability to (a) predict the impacts of the following malfunctions or operations on the ARM system and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: - Detector failure

Question:

Consider the following:

- Unit 2 is operating at 100% power
- All Equipment is Operable and in a normal 100% power lineup
- Unit 1 Area Rad Monitor, RI-8001, has been placed in check source and comes into high alarm

The required actions (if any) per OP-2104.007, Control Room Emergency Air Conditioning And Ventilation system, should be:

A. No actions required, RI-8001, Unit 1 Area Rad Monitor, does not actuate any emergency control room ventilation equipment

B. Check Unit 1 emergency ventilation supply fan [VSF-9] has Auto started and verify proper response of emergency ventilation equipment

C. Check Unit 2 emergency ventilation supply fan [2VSF-9] has Auto started and verify proper response of emergency ventilation equipment

D. Secure either Unit 1emergency ventilation supply fan [VSF-9] or Unit 2 emergency ventilation supply fan [2VSF-9] to prevent exceeding control room hability limits

Answer:

B. Correct; RI-8001 will auto start the Unit 1 supply fan VSF-9 and the follow-up actions per the ACA is to verify proper actuation of the system

Notes:

A. Incorrect; Unit 1 Area Rad monitor coming into alarm will cause an auto actuation of emergency control room ventilation and actions are required.
C. Incorrect; RI-8001 only actuates the Unit 1 supply fan [VSF-9]
D. Incorrect; RI-8001 only actuates the Unit 1 supply fan [VSF-9] the control room hability with 2 supply fans running is a concern but does not apply in this condition (only one fan running)

References:

OP-2203.012-H ACA, Rev. 34, window A-4 step 2.5 [page 29]
OP-2104.007,Control Room Emergency Air Conditioning And Ventilation, Rev. 047, section 3.0 [page 3 and 4] section 7.2 [pages 13, 16, and 17]
STM 2-47-3, Control Room Ventilation, Rev. 23, section 3.4.2 [page 35] section 3.4.2.1 [page 35]
A2LP-RO-CRVNT, Rev. 9, Obj. 6, Explain how the major components of the emergency control room ventilation system are controlled, including: status and indication location, power sources, automatic actuation signals (chlorine, smoke, radiation, system isolation), interface between VSF-9 and 2VSF-9, methods to restore system operation following actuation, surveillance testing

Historical Comments:

New Question

1.0 PURPOSE

This procedure addresses operation of Control Room Emergency Air Conditioning and Ventilation System.

2.0 SCOPE

This procedure addresses normal and emergency operation of Control Room Emergency Ventilation System (CREVS), common to Unit 1 and 2. It provides descriptions and testing of components for both Units. This procedure contains requirements for assessing conformance with Unit 1 and Unit 2 Tech Specs. The following surveillances are satisfied: for Unit 1, SR 3.3.16.2, SR 3.7.9.1, SR 3.7.9.3, SR 3,7.10.1, and TR 3.3.1.2; for Unit 2, TS 4.3-3.2.b, TRM 4.3.3.7, channel functional test, TS 4.7.6.1.2.a and TS 4.7.6.1.2.d.2.

3.0 DESCRIPTION

Unit 1 and Unit 2 Control Room Emergency Ventilation Systems are interrelated concerning system design and functions and are not completely isolable from each other. The systems share automatic protective isolation and radiation filtration functions to permit a habitable atmosphere for Control Room personnel during radiation and chlorine atmospheric hazards. Control Room Ventilation System provides independent automatic isolation and purging functions for protection and relief of smoke hazards. Attachment B provides a cross-reference of Tech Specs for each unit and affected components.

The common Control Room Emergency Air Conditioning and Ventilation System includes the following:

Unit 1 Emergency Fan/Filter (VSF-9)
Unit 2 Emergency Fan/Filter (2VSF-9)
Control Room Emergency coolers (2VUC-27A AND 2VUC-27B)
Emergency Control Room Chillers (2VE-1A AND 2VE-1B)

Unit 1 Control Room Supply damper (CV-7905)
Unit 1 Control Room Return damper (CV-7907)
Unit 2 Control Room Supply damper (2UCD-8683)
Unit 2 Control Room Return damper (2PCD-8685)

Unit 1 Control Room Area Rad Monitor (RI-8001) (Does NOT satisfy Tech Specs)
Unit 1 Control Room Inlet Air Rad Monitors (2RITS-8001A AND 2RITS-8001B)
Unit 2 Control Room Inlet Air Rad Monitors (2RITS-8750-1A AND 2RITS-8750-1B)

Smoke Detectors, Chlorine Detectors and Radiation Monitors

Automatic protection from smoke, chlorine and radiation is provided by Control Room Emergency Ventilation System. When Control Room is in Emergency Recirculation mode of operation, operability of individual sensors is NOT required. However, these sensors are required to be operable to allow the Control Room to be removed from Emergency Recirc. Otherwise, entry in to the associated units T.S. 3.0.5/3.0.6 is required. (CR-ANO-C-2001-0207-004)

Control Room supply and return air ductwork is equipped with ionization tube smoke detectors to alarm in Control Room with presence of combustion products in ventilation system. If smoke present in Unit 1 supply duct, QS-7905 will close Unit 1 Control Room isolation dampers, stop Unit 1 supply fans and will prevent auto-start of VSF-9. If smoke present in Unit 2 supply duct, 2XSH-8741A/B will close Unit 2 Control Room isolation dampers and stop supply fans 2VSF-8A/B and exhaust fans 2VEF-43A/B.

If smoke present in Unit 1 return ducting after isolation, QS-7907 will actuate to isolate return duct, open Control Room makeup air damper, start VEF-43 and open its suction damper. These actions may be taken manually if QS-7907 does not actuate. If smoke present in Unit 2 exhaust ducting after isolation, 2XSH-8740A/B will actuate to open exhaust damper, open outside air supply and close recirc damper. 2VEF-43 must be started manually.
If 2XSH-8740A/B do not actuate, dampers may be positioned manually.

Two quick acting chlorine detectors (2CLS-8760-2 AND 2CLS-8761-1) are provided in supply air duct for Unit 1 Control Room and two detectors (2CLS-8762-2 AND 2CLS-8763-1) in Unit 2 supply air duct. Any one of these detectors will initiate automatic isolation of Control Room supply and return isolation dampers for both Control Rooms. 2CLS-8761-1 OR 2CLS-8763-1 stops 2VSF-8A/B, VSF-8A/B, 2VEF-43A/B AND starts **2**VSF-9. 2CLS-8760-2 OR 2CLS-8762-2 stops VSF-8A/B AND starts VSF-9.

Each chlorine detector is equipped with a local amber power indicating light, Red alarm light and RESET pushbutton. If chlorine gas content in air reaches alarm setpoint of detector, Red alarm light illuminates and local alarm sounds. Alarm may be silenced by pushing Alarm Silence pushbutton. Once condition clears, detector alarm can be cleared by pressing local RESET pushbutton. Pressing RESET button with no alarm present will cause a Control Room Isolation.

Chlorine detectors are powered from Unit 2 emergency power supplies.
If these power supplies are removed from service (i.e., during a Unit 2 Shutdown), then chlorine detectors may be bypassed using Unit 2 Chlorine Bypass handswitches on C141A AND C141B in Unit 1 Computer Room. Bypassing these detectors prevents spurious alarms in Unit 1 circuitry.

Two Radiation monitors (2RITS-8750-1A AND 2RITS-8750-1B) are located in supply duct for Unit 2 Control Room. Unit 1 Control Room contains an area radiation monitor (RI-8001) AND two radiation monitors (2RITS-8001A AND 2RITS-8001B) in supply duct. RI-8001 does not satisfy EITHER Unit 1 OR Unit 2 Tech Specs. One monitor on Unit 1 (2RITS-8001A OR 2RITS-8001B) AND one monitor on Unit 2 (2RITS-8750-1A OR 2RITS-8750-1B) are required to be operable to satisfy each units T.S. If high radiation detected by any monitor, isolation dampers for both Control Rooms close. 2RITS-8750-1A/B will stop VSF-8A/B, 2VSF-8A/B AND 2VEF-43A/B AND start **2**VSF-9. RI-8001, 2RITS-8001A OR 2RITS-8001B will stop VSF-8A/B AND start VSF-9.

If power supply for 2RITS-8750-1A/B is removed from service (i.e., during Unit 2 Shutdown), the monitors may be bypassed using Unit 2 Radiation Bypass handswitch on C141A to prevent spurious alarms in Unit 1 circuitry.

5.0 LIMITS AND PRECAUTIONS

5.1 Smoking, welding, or cutting should be avoided in the areas of the chillers. When heated sufficiently, Freon breaks down into phosgene gas, which is lethal in small dosages.

5.2 Do NOT operate an air conditioning unit that has any safety devices inoperable.

5.3 In the event of Control Room isolation on high chlorine, all Control Room operators should don SCBAs within 2 minutes of determination that actual high chlorine concentration caused the isolation.

5.4 In the event of Control Room isolation on high airborne radiation, Emergency Fan/Filter Units (VSF-9 AND **2**VSF-9) may be running simultaneously which will lead to operator exposure to greater whole body and skin doses than from single train operation due to the raised pressurization air flow. Per CR-ANO-C-2001-0271 CA08, "A review of the results of CR dose evaluations shows that the control room operator thyroid dose is limiting and controlling, and that the limiting configuration at ANO is the analyzed condition of VSF-9 operating. Operation with EITHER **2**VSF-9 by itself OR with both units (VSF-9 AND **2**VSF-9) running simultaneously would result in lower thyroid doses, but the thyroid dose would still be more limiting than CR operator whole body or skin dose. Unit 1 and Unit 2 SARs assume only one unit is continually in operation during accident conditions, and Design Engineering proposes one unit be secured when the control room is isolated. Therefore, continuous operation of both VSF-9 and **2**VSF-9 is not preferred, and securing one of the emergency recirculation fans is consistent with the license basis and Engineering recommendations."

5.5 When Control Room is in emergency recirculation mode of operation, one of the emergency filtration fans may have its handswitch placed in STOP OR OFF, and its outside air damper placed in RESERVE, without affecting its operability. Emergency filtration fan operability is not affected in this case because Control Room isolation system has already performed its design safety function and the non-running filtration fan becomes manually actuated thereafter. (CR-ANO-C-2001-0271) **FOR THIS TO APPLY, CONTROL ROOM MUST BE IN EMERGENCY RECIRCULATION!**

5.6 If normal air conditioning for Control Rooms is lost AND Emergency Chillers NOT available, VSF-9, **2**VSF-9 and 2VUC-27A/B may be run as necessary to provide air mixing for Control Rooms.

5.7 2VE-1A&B Heating Thermostats (2TC-8665-1 & 2TC-8666-2) should be set at 60-78°F AND at least 2°F lower than Cooling Thermostats.

5.8 Inform opposite Control Room when Control Room Emergency Ventilation System components are removed from service.

NOTE

This procedure section establishes the Emergency Fan/Filter Units (VSF-9/**2**VSF-9) lineup as one fan in service/one fan in OFF/STOP with Outside Air damper in RESERVE - the "actuated state" for Control Room Ventilation with Chlorine or Radiation present.

7.0 RADIATION AND CHLORINE DETECTOR ALARM RESPONSE ACTIONS

7.1 IF ANY of the following monitors/detectors are actuated:

- Unit 2 Control Room Radiation monitor (2RITS-8750-1A)
- Unit 2 Control Room Radiation monitor (2RITS-8750-1B)
- Unit 1 Control Room Supply Vent Chlorine detector (2CLS-8761-1)
- Unit 2 Control Room Supply Vent Chlorine detector (2CLS-8763-1)

THEN perform the following:

* 7.1.1 IF actual high chlorine condition exists, THEN don SCBAs within two minutes of determination. (This applies to all Control Room Operators.)

7.1.2 Verify the following isolation dampers closed:

A. Unit 1 dampers:

- CV-7905, Unit 1 Control Room Supply damper (Green light ON at C141A/B in Unit 1 Computer Room)
- CV-7907, Unit 1 Control Room Return damper (Green light ON at C141A/B in Unit 1 Computer Room)

B. Unit 2 Dampers:

- Place Unit 2 Control Room Supply damper 2UCD-8683 (2HS-8683-1) on 2C33 in CLOSE.
  1. Check Green light ON above 2HS-8683-1 on 2C33.
- Place Unit 2 Control Room Return damper 2PCD-8685 (2HS-8685-2) on 2C33 in CLOSE.
  1. Check Green light ON above 2HS-8685-2 on 2C33.

7.2 IF ANY of the following monitors/detectors are actuated:

- Unit 1 Control Room Area Radiation monitor (RI-8001)
- Unit 1 Control Room Supply Vent Radiation monitor (2RITS-8001A)
- Unit 1 Control Room Supply Vent Radiation monitor (2RITS-8001B)
- Unit 1 Control Room Supply Vent Chlorine detector (2CLS-8760-2)
- Unit 2 Control Room Supply Vent Chlorine detector (2CLS-8762-2)

THEN perform the following:

* 7.2.1 IF actual high chlorine condition exists, THEN don SCBAs within two minutes of determination. (This applies to all Control Room Operators.)

7.2.2 Verify the following isolation dampers closed:

A. Unit 1 dampers:

- CV-7905, Unit 1 Control Room Supply damper (Green light ON at C141A/B in Unit 1 Computer Room)
- CV-7907, Unit 1 Control Room Return damper (Green light ON at C141A/B in Unit 1 Computer Room)

B. Unit 2 Dampers:

- Place Unit 2 Control Room Supply damper 2UCD-8683 (2HS-8683-1) on 2C33 in CLOSE.
  1. Check Green light ON above 2HS-8683-1 on 2C33.
- Place Unit 2 Control Room Return damper 2PCD-8685 (2HS-8685-2) on 2C33 in CLOSE.
  1. Check Green light ON above 2HS-8685-2 on 2C33.

7.2.3 Perform the following:

A. Verify Unit 1 Control Room Supply fans stopped:

- VSF-8A
- VSF-8B

B. IF actual high chlorine or high radiation condition exists,
THEN verify the following fans stopped AND place HS in OFF:

- Unit 1 Control Room Supply fans:
  - VSF-8A (HS-7820 on B1544)
  - VSF-8B (HS-7821 on B4161)
- Unit 2 Control Room Supply fans (non-actuated):
  - 2VSF-8A (2HS-8601 on 2C22)
  - 2VSF-8B (2HS-8602 on 2C22)
- Unit 2 Control Room Exhaust fans (non-actuated):
  - 2VEF-43A (2HS-8693 on 2C22)
  - 2VEF-43B (2HS-8694 on 2C22)
- Control Room Smoke Exhauster VEF-43, (non-actuated) (HS-7840) on C19

NOTE

If both Control Room isolation channels tripped, then VSF-9 may already be manually secured per step 7.1. In this case, step 7.2.4 may be N/A.

7.2.4 Verify Unit 1 Emergency Fan/Filter (VSF-9) running as follows:

- VSF-9 fan running.
- VSF-9 Outside Air damper CV-7910 open.
- VSF-9 Air flow by ONE of the following:
  - Red light ON above (FS-7806) on C19.
  - Air flow from duct in Unit 1 Control Room.

7.2.5 IF ANY of the following conditions exist:

- VSF-9 can NOT be started.
- VSF-9 Air flow NOT adequate with fan in service.
- VSF-9 NOT operable.

THEN perform the following:

A. Close VSF-9 Outside Air damper CV-7910 by placing (HS-7910) on C19 in RESERVE.

B. Obtain 2nd person verification.

ANNUNCIATOR 2K08

A-4

CR ISOL ACTUATION/TROUBLE

NOTE

This window has multiple inputs and no reflash capability.

1.0 CAUSES

1.1 Control Room Isolation dampers (2UCD-8683 or 2PCD-8685) NOT closed with ANY of the following:

- Unit 1 Control Room area radiation high
- Unit 2 Control Room vent radiation high
- Unit 2 high chlorine
- Control Room ventilation (2XSH-8741A/B) smoke detector actuated
- Loss of AC power to any radiation or chlorine auxiliary relay
- Loss of AC power to 2XSH-8741A/B auxiliary relay

2.0 ACTION REQUIRED

2.1 Inform Unit 1 Control Room.

2.2 Verify doors between S/M Offices and Control Rooms closed.:

- Unit 1 Door 64
- Unit 2 Door 450

2.3 IF actual high chlorine condition exists,
THEN Control Room personnel should don SCBAs within 2 minutes.

* 2.4 IF desired for Control Room habitability,
THEN start Emergency Control Room Chiller using applicable section of 2104.007, Control Room Emergency Air Conditioning and Ventilation.

2.5 Verify proper response of Unit 1 and Unit 2 dampers and fans using Control Room Emergency A/C and Ventilation (2104.007).

2.6 Check breakers 2RS1-8, 2RS2-8 and 2Y2-9 closed.

2.7 IF 2RS1-8, 2RS2-8 or 2Y2-9 tripped,
THEN refer to Tripped Breakers and Thermal Overloads section of Electrical System Operations (2107.001).

2.8 Review 2104.007 Attachment B for TS applicability.

3.0 TO CLEAR ALARM

3.1 Close Control Room Isolation dampers.

4.0 REFERENCES

4.1 E-2456-1

3.4.2 Control Room Ventilation Radiation Detectors

It is necessary to limit control room dose to operators in a post accident situation. The control room envelope is monitored for excessive radiation by five detectors. These radiation detectors are RI-8001, 2RE-8001A, 2RE-8001B, 2RE-8750-1A, and 2RE-8750-1B.

3.4.2.1 Unit-1 Radiation Detectors (RI-8001, 2RE-8001A and 2RE-8001B)

A Unit-1 area radiation monitor (RI-8001) is provided in the Unit-1 operating area for general area radiation monitoring. It is a geiger-muller (GM) type detector

To satisfy technical specification requirements, at least one of two Unit-1 duct mounted monitor and one of two Unit-2 duct mounted monitor must be operable.

Radiation monitors 2RE-8001A and 2RE-8001B are mounted in the ductwork for the Unit-1 supply air in the Unit-1 PMS computer room. They function identically to the Unit-2 duct mounted radiation detectors.

2RE-8001A and 2RE-8001B are scintillation type detectors with associated pre-amplifiers (2RY-8001A and 2RY-8001B) and rate meters (2RITS-8001A and 2RITS-8001B). The rate meters are wall mounted in the Unit-1 PMS computer room. The rate meters automatically select the correct range for display.

Mounted below the rate meters is C474 that contains two key operated switches. The BYPASS position permits maintenance or repair of any component on one detector string while the other detector string performs the design radiation monitoring and protection functions. One of the detector strings is normally in service with the other detector bypassed. Both strings are configured so that either detector string performs the safety function upon detection of a high radiation signal when that string is NOT bypassed.

The Unit-1 control room normal supply duct radiation monitors also output to the Unit-1 PMS computer as PID R8001A and R8001B.

Actuation of RI-8001, 2RITS-8001A, or 2RITS-8001B closes the isolation dampers for both control rooms, stops supply fans VSF-8A/B, and starts VSF-9. Circuit failure of 2RITS-8001A or 2RITS-8001B also results in the associated protective actuations. These monitors alarm in the Unit-1 control room to warn operators of this event. The contacts for the Unit-1 detectors are normally open with the associated protective relay deenergized. A high radiation condition closes the contact and energizes the protective relay. This closes the related contact in the appropriate actuation circuit.

The power supply for 2RITS-8001A and 2RITS-8001B comes from the power supply for C141B. Normally the power supply to these components is Y02-32. However, the power supply for C141B can be selected to an "ALTERNATE" power supply using a keyswitch located on C141B. It is important to recognize that making the power supply swap for C141B also changes the power

Bank:	1886	**Rev:**	0	**Rev Date:**	4/27/2012 4:26:12	**QID #:**	65	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW		
Search	075000K401	**10CFR55:**	41.7	**Safety Function**	8				
System Title:	Circulating Water System	**System Number**	075	**K/A**	K4.01				
Tier:	2	**Group:**	2	**RO Imp:**	2.5	**SRO Imp:**	2.8	**L. Plan:**	A2LP-RO-CWS **OBJ** 4

Description: Knowledge of Circulating Water System design feature(s) and/or interlock(s) which provide for the following: - Heat sink

Question:

Consider the following:

- Unit 2 is operating at 60% power
- The ATC has been directed to secure the "A" Circulating Water Pump (2P-3A)

The securing sequence for a Circ Water Pump, as described in OP-2104.008, Circulating Water System Operation NOP section 13.0, is based on:

A. Preventing loss of cooling flow to the Main Condenser

B. Minimize differential pressure across the discharge valve

C. Minimize hydraulic forces on Circ Water Piping Expansion joints

D. Preventing running "A" Circulating Water Pump (2P-3A) at shutoff head

Answer:

A. Correct, Circ Water Pump securing sequence is based on not short cycling cooling water to the main condenser which will prevent/minimize the chance of losing vacuum. (AOP-2203.019 step 4 basis)

Notes:

B. Incorrect, the closing sequence will close the discharge valve prior to the pump securing, therefore by design there will be maximum differential pressure across the valve
C. Incorrect, this is a concern when isolating a water box at power. There is a sequence for shutting the Water box isolation valves.
D. Incorrect, by procedure, the Circ pump is placed at shutoff head. There is a note not to stay at shutoff for >5 minutes due to the possibility of pump damage. (OP-2104.008, section 17.0 CAUTION before step 17.1.8)

References:

OP-2104.008, Circulating Water System Operation, Rev. 053, section 13.0 [page 26]
STM 2-40-1, Circulating Water System, rev. 30, section 2.3.1.1, pump start, [page 20], section 2.4.2.2, valve close logic [page 30], section 4.2.3.1, stopping one pump with two pumps running [page 55]
A2LP-RO-CWS, Rev. 9, Obj. 4, State the interlocks associated with the CWS pumps and valves

Historical Comments:

New Question

13.0 SHUTDOWN OF CIRC WATER PUMP (2P-3B) WITH BOTH PUMPS OPERATING

13.1 Adjust Reactor power using Power Operation (2102.004) to less than shown in the table below OR as directed by System Engineering:

Circ Water inlet Temperature °F	% Power level to maintain Condenser vacuum <5.15" HgA
100	54%
95	62%
90	70%
85	78%
80	85%
70	100%
60	100%

13.2 Notify Chemistry that Circ Water pump (2P-3B) will be secured.

13.3 IF Condenser Tube Cleaning System in service,
THEN remove from service using Condenser Tube Cleaning (2104.042).

13.4 IF plant in Mode 1,
THEN dispatch operator with radio to Cooling Tower (2M-30) to locally monitor operation of Circ Water 2P-3B Disch valve (2CV-1215).

13.5 Verify pump and discharge valve indicating lights (red and green) on 2C14 NOT burned out:

- Circ Water pump (2P-3B)
- 2P-3B Discharge valve(2CV-1215)

NOTE

- Placing 2P-3B handswitch in PULL TO LOCK position will cause 2P-3B to stop after 30 seconds time delay, regardless of Discharge valve position.
- Placing 2P-3B handswitch in STOP initiates signal to close Discharge valve and seals-in until valve fully closed. When Discharge valve fully closed, it does NOT re-open automatically. To remove seal-in, either pump must be secured and re-started, or discharge valve feeder breaker must be opened and reclosed.

13.6 Perform the following to stop Circ Water pump (2P-3B):

13.6.1 Place 2CV-1215 handswitch on 2C14 in CLOSE position.

13.6.2 Check 2CV-1215 indicates intermediate.

CAUTION

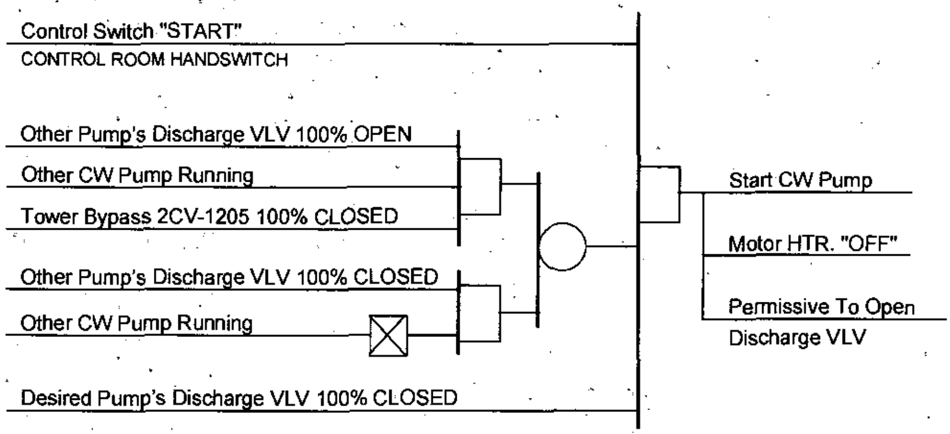
If 2P-3B run more than five minutes with discharge valve closed, pump damage could occur.

13.6.3 WHEN 2CV-1215 indicates full closed,
THEN place 2HS-1212A (2P-3B) in STOP OR PULL TO LOCK to stop pump (no time delay).

13.6.4 Verify pump Circ Water pump (2P-3B) stopped.

It is important to note that cell switches (169 contacts) prevent a circulating water pump from being started or stopped using its power supply breaker handswitch.

2.3.1.1 Pump Start



Referring to the start logic diagram below it can be seen that in order to start a circulating water pump the following logic is applied:

- the associated discharge valve must be fully closed,
- the control switch on panel 2C14 placed in START

AND

- if the other pump is running the other pump's discharge valve must be fully open and the cooling tower bypass valve 2CV-1205 fully closed,

OR

- if the other pump is NOT running, then the other pump's associated discharge valve must be fully closed.

Starting the circulating water pump de-energizes the associated motor heater and provides a permissive signal to allow opening of the associated discharge valve.

2.4.2.2 Valve Close Logic

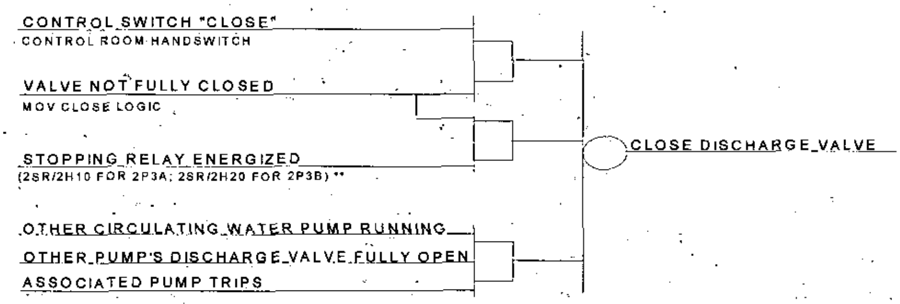
The discharge valve close logic is programmed to prevent excessive runout and reverse pump rotation during a pump shut down or an accidental trip of the pump. In the close direction the valve motor runs at a high speed until the valve is only 17% open. It then travels in slow speed until the valve is fully closed. The initial fast speed is to prevent a main turbine trip due to high condenser backpressure (low vacuum).

The table below list the approximate stroke time for a discharge valve closure.

TIME	VALVE CLOSING
0 seconds	Fully open
10 seconds	5/6 closed (17% open)
25 seconds	Fully closed

The MOV CLOSE logic for the circulating water pump discharge valves includes contacts from a torque switch and valve position limit switches. The closing torque switch is provided to interrupt the control circuit if mechanical overload occurs during any valve closing cycle. The torque switch operates in parallel with a valve limit switch. This limit switch is closed when the valve is fully open essentially bypassing the torque switch. This ensures that when required the valve will move in the closed direction even with potentially higher torque requirements to get the valve off its open seat. Another valve position limit switch operates in series with the torque switch. This contact opens when valve position is 100% closed interrupting the control circuit and stopping valve motion.

Similarly, the discharge valve can be closed using its respective handswitch on panel 2C14. Once valve closure is initiated, it seals in. Valve travel cannot be stopped nor can the valve be re-opened once travel in the closed direction begins unless the associated pump breaker is opened OR the power supply breaker for the valve is opened and reclosed to reset the "Block Open Arming" circuit.



CIRCULATING WATER PUMP DISCHARGE VALVE CLOSE LOGIC ** (2SR/2H10 AND 2SR/2H20 WILL ONLY ENERGIZE IF THE OPPOSITE PUMP IS RUNNING AND THE OPPOSITE PUMP DISCHARGE VALVE IS FULL OPEN)

When the associated circulating water pump is stopped by placing its respective handswitch on panels 2C14 or 2C125 to STOP, distribution in the cooling tower, and appropriate chemistry following start up. Cooling tower blowdown will be initiated at the direction of the Chemistry department.

The remaining circulating water pump will be started when required to support power operations. Once the second pump is started, the circulating water will be ready for full power operation. The discharge valve for the second pump does not wait at 17% open but travels full open in slow speed.

4.2.2 Winter Operation

Winter operation causes particular hazards for cooling tower operation especially at low power levels.

When ice starts to form on the bottom outside edge of the tower, the Operating crew should initiate inspections of the Circ pump screens and underside of the fill for ice formation. At this time, the cooling tower is also placed in "DE-ICE" by closing both de-ice valves. Once ambient conditions warrant, the de-ice valves may be re-opened to return to normal operation.

If reactor power is less than 20% and circ water return temperature lowers to less than 45°F, then all available Circ Water pumps should be operated to minimize ice formation. If circ water return temperature continues to lower AND ice forms on the fill or Circ Water pump screens, then one of the Circ Water pumps should be secured, de-ice valves opened, and the bypass valve opened. This lineup minimizes heat removed from the circ water and allows temperature to rise. If continued operation at low loads with extremely low ambient temperatures is desired, then the Operating crew should alternate between bypass operation and normal operation to control ice formation on the fill. However, the cooling tower should not be operated on bypass for extended periods of greater than 24 hours during freezing weather. The reason for this is the water remaining inside the cooling tower could freeze which would cause damage to the tower.

If the Circ Water System will be out of service for an extended period during freezing weather, the basin should be drained to prevent damage.

4.2.3 System Shutdown

4.2.3.1 Stopping One Pump with Two Pumps Running

Plant Power should be reduced below 90% to remove one Circulating Water Pump from service.

If in service, the condenser tube cleaning system should be secured per 2104.042.

Operating experience has shown the most critical part of securing a circulating water pump is to ensure the discharge valve shuts as designed. If in Mode 1, an operator should be dispatched with a radio to observe discharge valve operation on the pump being secured.. The discharge MOV hand switch is taken to close for the circulating water pump to be secured. When the discharge valve indicates full closed, the circulation water pump is secured. Pump damage could occur if circulating water pump is run more than five minutes with the discharge valve closed.

Data for 2012 NRC RO/SRO Exam

05-Jul-12

Bank:	1887	**Rev:**	0	**Rev Date:**	4/27/2012 3:21:51	**QID #:**	66	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NEW				
Search	1940012120	**10CFR55:**	41.10	**Safety Function**							
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.1.20						
Tier:	3	**Group:**	1	**RO Imp:**	4.6	**SRO Imp:**	4.6	**L. Plan:**	ASLP-RO-PRCON	**OBJ**	6

Description: Conduct of Operations - Ability to interpret and execute procedure steps.

Question:

Bulleted procedural steps ________________________.

A. should only be performed if conditions are met

B. are required to be performed in order as written

C. should be performed in any sequence or in parallel

D. should be performed at anytime the procedure is in use

Answer:

C. Correct, as per EN-HU-106

Notes:

A. Incorrect, defines a conditional (or IF/THEN) step
B. Incorrect, defines normal (numbered) steps
D. Incorrect, defines a floating (EOP/AOP) step

References:

EN-HU-106, Procedure and Work Instruction Use and Adherence, Rev. 0, Step 5.2.2 [2] and [3] [pages 8 and 9]
OP-1015.021, EOP/AOP Users Guide, rev. 011, section 4.0 step 4.7 (conditional steps), and step 4.20 (floating steps) [pages 3 and 5]
ASLP-RO-PRCON, Rev. 7, Obj. 6, Describe the expectationd for procedural adherence

Historical Comments:

New Question

4.4 BRANCHING

Directs the user to exit the current procedure or step and enter another procedure or step. The words "GO TO" and "RETURN TO" are used to indicate a branch (See Defined EOP/AOP Words, Section 4.34).

4.5 CAUTION

Calls attention to a condition that could result in damage to equipment, personnel hazard, or otherwise adversely affect plant operations.

4.6 COMMUNICATIONS STRATEGIES

Discussions, Transient Briefs and Update Announcements are communications tools employed during implementation of EOPs/AOPs. Definitions and implementation strategy for these tools are found in Operations Expectations and Standards, COPD-001.

4.7 CONDITIONAL STATEMENTS AND LOGIC SEQUENCES

Used in EOPs/AOPs to describe a set of conditions or express complex combinations of conditions. Logic terms include IF, WHEN, THEN, AND, OR and NOT.

4.8 CONTINGENCY ACTION STEPS

Action steps performed if the instruction or expected response is not achieved.

4.9 CONTINUOUS ACTION STEPS

Procedure steps performed on a continuing basis AFTER they are presented. Actions are taken by the operator when needed. Continuous action steps are prefaced by an asterisk (*) in front of the step number.

4.10 CONTINUING ACTIONS

Actions which are implemented after all success paths for a safety function have been attempted and all safety function acceptance criteria are NOT met for a particular safety function (safety function is NOT satisfied). The operator is required to continue to work on this safety function and to peruse other jeopardized or challenged safety functions simultaneously.

4.11 DECISION TREES

Flowcharts which provide the operator with a quick method to determine the appropriate success path to use in the functional recovery procedures.

4.20 FLOATING STEPS

Procedure steps that allow performance of that step at any time the specified conditions exist once the operator has entered that procedure. FLOATING STEPS are prefaced by a solid rectangle (■) in front of the step number.

4.21 FLOWCHARTS

A printed format in which procedures or processes are depicted in graphic form emphasizing decision points and links between decision points.

4.22 FUNCTIONAL RECOVERY PROCEDURE (FRP) and LOWER MODE FUNCTIONAL RECOVERY PROCEDURE (LMFRP)

The ANO-2 plant specific FUNCTIONAL RECOVERY procedures are used by the operator to verify the satisfactory control or restoration of all safety functions, and to provide actions to restore and maintain those safety functions when degraded. 2202.009, FUNCTIONAL RECOVERY PROCEDURE or 2202.011, LOWER MODE FUNCTIONAL RECOVERY PROCEDURE is written such that the user need not diagnose an event in order to establish and maintain the plant in a safe, stable condition.

4.23 IMMEDIATE ACTION STEPS

Steps taken without delay when there are indications of an emergency. These actions are to stop further degradation of existing conditions, to mitigate the consequences and to allow the operators to assess the situation. These actions may be performed simultaneously by different operators and are not sequence dependent unless specifically stated. All IMMEDIATE ACTION STEPS are completed even if a previously listed IMMEDIATE ACTION STEP results in a branching instruction.

IMMEDIATE ACTION STEPS are designated by a circle around the step designator. All sub-steps under the circled step are also IMMEDIATE ACTION STEPS.

4.24 INSTRUCTION STEPS

Action statements describing either the action to be performed or an expected plant response.

4.25 LONG-TERM ACTIONS

Actions which are implemented once all safety function acceptance criteria have been met for a particular safety function (safety function is satisfied). These long term actions shall help ensure that the operator continues to periodically verify adequate maintenance of safety functions, assess the status of the plant, implement the appropriate Optimal Recovery Procedure or ORP if conditions warrant, and determine whether it is possible to cooldown to shutdown cooling conditions.

- Stopping a Procedure or Work Instruction activity if a deficiency is identified and activities cannot proceed per the Procedure or Work Instruction.
- Initiate the applicable programmatic correction process to improve the quality of a Procedure or Work Instruction.
- Procedures might not specify every detailed action required to complete an activity. The required level of detail is established by minimum qualification standards for the procedure user. Accordingly, procedure users may take specific actions that are "within the skill-of-the-craft" when those actions are required to complete a general instruction in a procedure.
- The user of a procedure is responsible for replacing or cleaning marked up pages of controlled documents when appropriate. This may require preplanning for placekeeping during the pre-job brief, job walk-down, or work package review. The marking method is determined by the user and the appropriate tools taken to the job site.

5.0 DETAILS

5.1 PRECAUTIONS AND LIMITATIONS

None

5.2 PROCEDURE OR WORK INSTRUCTION ADERANCE

5.2.1 Actions Prior To Procedure or Work Instruction Use

[1] Prior to use, Procedure Users shall verify that the Continuous Use, Reference Use, or Multi-Use procedure to be used is the correct revision. Refer to EN-AD-103, "Document Control and Records Management Activities" for revision verification practices.

[2] Procedure or Work Instruction Users should review the Procedure or Work Instruction prior to use and obtain supervisor clarification of any steps not understood.[P-17727]

5.2.2 Actions While Procedure or Work Instruction Is In Use

[1] Procedure or Work Instruction users shall maintain a questioning attitude when performing the Procedure or Work Instruction and recognize that the Procedure or Work Instruction may contain inaccuracies or plant conditions may arise that were not anticipated during Procedure or Work Instruction development.

[2] Procedure or Work Instruction users shall strictly adhere to the Procedure or Work Instruction. The Procedure or Work Instruction user must recognize that there may be other Procedure or Work Instruction/Policies that are not prescribed within the Procedure or Work Instruction being performed, but must still be adhered to (e.g., safety policies, this Procedure, corporate policies).

[3] Technical Procedure users shall perform the Procedure or Work Instruction steps in the sequence written unless specific allowance to skip sections/steps is permitted in the Procedure or Work Instruction. Steps identified as bulleted steps rather than numbered or lettered steps can be performed in any sequence or in parallel.

[4] In the event of an emergency situation not covered by a Procedure or Work Instruction, the personnel involved shall take action to minimize personnel injury and damage to the facility.

[5] Before performing a procedural step, the Procedure or Work Instruction user should ensure that:

- Action to be performed is on the correct component.
- The appropriate monitoring method has been identified.
- Expected response has been anticipated.

[6] When indicating a step is complete:

- Perform placekeeping in accordance with this procedure.
- When work conditions prevent the performer from physically signing or initialing a step as it is performed (e.g., in a contaminated area), the step shall be signed off as soon as work conditions make signing possible. In no case shall this be later than the end of the shift in which the step was completed.
- If an incorrect entry is made to a Procedure or Work Instruction (i.e., data entry, initial, etc.), draw a single line through the entry and initial and date the line through. Locate the initial and date to minimize the likelihood that they are misconstrued as the intended data entry. Do not use White-Out, correction tape, or Liquid Paper type products to make corrections.

[7] If a Procedure or Work Instruction is stopped and cannot be resumed during the same shift (other than shift turnover), prior to restarting, ensure that all Prerequisites and any Initial Conditions necessary for performance are satisfied.

Bank:	1888	**Rev:**	0	**Rev Date:**	5/18/2012 6:52:44	**QID #:**	67	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NEW		
Search	1940012103	**10CFR55:**	41.10 / 43.1	**Safety Function**					
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.1.3				
Tier:	3	**Group:**	1	**RO Imp:**	3.7	**SRO Imp:**	3.9	**L. Plan:**	ASLP-RO-OPSPR
OBJ	4e								
Description:	Conduct of Operations - Knowledge of shift or short-term relief turnover practices.								

Question:

As the off going (watchstander that is being relieved) watchstander, as a minimum, you are required to perform/verify all of the following EXCEPT:

A. Inform your relief of any evolutions that are in progress

B. Inform your relief of LCO entered and exited during your shift

C. Ensure your relief is physically and mentally fit to assume the watch

D. Verify the on coming watchstander "Active Status" is in good standing

Answer:

D. Correct; per EN-OP-115 it is the responsibility of the on coming watchstander to ensure their active status is in good standing prior to assuming duty

Notes:

A, B, and C, are Incorrect; these are requirements as listed in EN-OP-115-3 section 5.0

References:

EN-OP-115-03, Shift Turnover and Relief, Rev. 0, section 5.0 step 5.1[4] and step 5.1[6] {page4 and step 5.1[8] [page 5]
ASLP-RO-OPSPR, Rev. 12, Obj. 4e,-For procedure OP-1015.001, Conduct of Operations and EN-OP-115, Conduct of Operations: (e) Describe the requirements associated with: Shift turnover

Historical Comments:

New Question

5.0 DETAILS

5.1 SHIFT TURNOVER GENERAL

[1] Shift relief and turnover is conducted in a manner such that the on-coming shift has the knowledge to continue safe and efficient operation of the plant. Plant specific turnover documents are utilized to facilitate turnover.

[2] All shift personnel are responsible for reviewing and understanding the shift narrative log for the previous shift and turnover checklists applicable to their shift position before assuming the shift.

[3] The on-coming Control Room Operators and SROs will conduct control board walk downs with an off-going operator.

[4] Prior to turning over duties to the on-coming shift personnel, the on duty shift personnel inform their relief of the following as a minimum:

- Overall plant status
- Evolutions in progress or planned
- LCO entries and exits
- Existing or potential problems with areas, equipment, or processes
- Pertinent activities conducted during the past shift
- Abnormal system lineups
- Out of spec log readings

[5] The off going operator will not leave their work area until they are satisfied that their relief has assumed the shift.

[6] Each individual is personally responsible for ensuring their "Active Status" is in good standing prior to assuming duty. This status includes proper number of shifts / hours worked per quarter, training qualifications, respirator qualifications, proper eyewear and up to date medical status.

[7] No person should assume a shift position unless they are physically and mentally fit to competently assume the responsibilities.

5.1 cont.

[8] No person should permit their relief to assume the shift if any doubt exists concerning the on coming persons alertness, coherence and capability of performing their assigned duties.

[9] The off going operator should not be relieved until the equipment for which he/she is responsible is stable or the condition has been discussed and understood by the on-coming operator.

[10] If a plant evolution/transient is in progress, the on-coming Operation Supervisors should review the evolution and determine the need for a pre-evolution brief. The brief may be conducted by the off-going or on-coming shift and only needs to include appropriate Watch Standers and Supervision. The following factors should be considered in determining the need for a brief and level of detail of the brief.

- Plant condition
- Status of evolution
- Items of significance from previous shift
- Required interface with other departments/disciplines
- Complexity and frequency of the activity
- Potential impact on plant safety and availability
- Qualifications/experience of the individuals performing the activity
- Operating experience (site and industry)
- Safety hazards (industrial, radiological, electrical, etc) associated with the task.

[11] The off-going shift manager (or designated SRO) will review all CRs written on their watch to ensure no operability issues are missed.

[12] At the conclusion of the shift turnover, the CRS shall conduct an update brief of Control Room personnel to establish that they have assumed their assigned watch stations and identify who has the command and control function.

Bank:	1889	**Rev:**	0	**Rev Date:**	5/18/2012 10:43:5	**QID #:**	68	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	Modified NRC bank 1583				
Search	1940012215	**10CFR55:**	41.10 / 43.3 / 45.13	**Safety Function**							
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.2.15						
Tier:	3	**Group:**	1	**RO Imp:**	3.9	**SRO Imp:**	4.3	**L. Plan:**	ASLP-RO-OPSPR	**OBJ**	4.i.3

Description: Equipment Control - Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, line-ups, tagouts, etc.

Question:

Consider the following:

- Unit 2 has completed a plant shutdown due to a Primary to Secondary leak in "A" Steam Generator

Regarding plant configuration controls, which of the following describes the method used for maintaining component configuration control?

A. The Primary to Secondary Leakage AOP, 2203.038, is reviewed by the CRS after the event to ensure any equipment operated is returned to normal or documented in the proper log.

B. The CRS keeps a handwritten list of components placed out of position and enters them in the COOP Log as time allows during the event.

C. The Primary to Secondary Leakage AOP, 2203.038, has proper restoration steps in it to return all manipulated components to a normal configuration.

D. Complete valve lineups for the affected systems are required to be performed after the event.

Answer:

A. The Primary to Secondary Leakage AOP, 2203.038, is reviewed after the event to ensure any equipment operated is returned to normal or documented in the proper log.

Notes:

During normal plant evolutions, configuration control is maintained by the normal methods of COOP log, Tagging sheets, etc. However, during emergency situations, due to the importance of timely EOP/AOP execution, it is NOT OPS management's expectation that every component manipulation directed by EOP/AOP be documented in COOP log, Station log, etc.
However, to ensure that configuration control is regained at conclusion of an event, the EOP/AOP is reviewed step by step by the CRS to ensure that any equipment that was operated by procedure is returned to its required position or documented in its' out of normal position. The normal configuration controls and emergency configuration controls are normally updated and reviewed by the CRS.

References:

OP 1015.021, ANO-2 EOP/AOP Users Guide, Rev. 011, Step 9.1.6
ASLP-RO-OPSPR, Rev. 12, Obj. 4.i.3, For procedure OP-1015.001, Conduct of Operations and EN-OP-115, Conduct of Operations: [3] describe the steps taken when Establishing Plant / System Configuration Controls for the following condition: [a] Re-Establishing Configuration Control

Historical Comments:

Modified NRC bank question 1583, used on the 2008 NRC SRO Exam

9.1.6 **QUESTION** 6

How is configuration control maintained during EOP/AOP events?

ANSWER:

Due to the importance of timely EOP/AOP execution, it is not OPS management's expectation that every component manipulation directed by EOP/AOP be documented in COOP log, Station log, etc. However, to ensure that configuration control is regained at conclusion of an event, the following items should be reviewed to ensure status of equipment is identified and controlled.

1. Annunciator Corrective Actions (ACAs) are reviewed and actions taken or component out of normal status is recorded for any alarm(s) still locked in at end of event (governing procedure meets exit conditions). This will ensure that the component(s) returned to normal configuration or the abnormal status is recorded.

2. Review EOP/AOP step by step to ensure that any equipment that was operated by procedure is returned to its required position or documented in its' out of normal position.

3. At direction of Shift Manager (SM) all or portions of applicable shift turnover checklist should be performed and the status of any component(s) found out of position is resolved.

4. Any procedure deviations incurred during procedure implementation should be documented in station log and dispositioned via condition reporting system at this time.

QID: 1583 **Rev:** 0 **Rev Date:** 11/21/2007 **RO Select:** **SRO Select:** **Points:** 1.00

Lic Level: S **Difficulty:** 2 **Taxonomy:** F **Source:** ık ANO-OpsUnit2 **Originator:** Coble

10CFR55_41: **10CFR55_43:** **Section:** **Type:**

System Title: Generic **System Number** ːNER **K/A:** 2.2.15

RO Tier: 3 **RO Group:** 1 **RO Imp:** 2.2 **SRO Tier:** **SRO Group:** 1 **SRO Imp:** 2.9

Description: Equipment Control - Ability to identify and utilize as-built design and configuration change documentation to ascertain expected current plant configuration and operate the plant.

Question:

Which of the following describes the method of maintaining component configuration control when responding to a SG tube leak event?

A. The CRS keeps a handwritten list of components placed out of position and enters them in the COOP Log as time allows during the event.

B. Complete valve lineups for the affected systems are required to be performed after the event.

C. The Primary to Secondary Leakage AOP, 2203.038, is reviewed by the CRS after the event to ensure any equipment operated is returned to normal or documented in the proper log.

D. The Primary to Secondary Leakage AOP, 2203.038, has proper restoration steps in it to return all manipulated components to a normal configuration.

Answer:

C. The Primary to Secondary Leakage AOP, 2203.038, is reviewed after the event to ensure any equipment operated is returned to normal or documented in the proper log.

Notes:

During normal plant evolutions, configuration control is maintained by the normal methods of COOP log, Tagging sheets, etc. However, during emergency situations, due to the importance of timely EOP/AOP execution, it is NOT OPS management's expectation that every component manipulation directed by EOP/AOP be documented in COOP log, Station log, etc.
However, to ensure that configuration control is regained at conclusion of an event, the EOP/AOP is reviewed step by step by the CRS to ensure that any equipment that was operated by procedure is returned to its required position or documented in its' out of normal position. The normal configuration controls and emergency configuration controls are normally updated and reviewed by the CRS.

References:

OP 1015.021, ANO-2 EOP/AOP Users Guide, Step 9.1.6

Historical Comments:

PARENT

Bank: 1890	**Rev:** 0	**Rev Date:** 5/29/2012 2:32:06		**QID #:** 69		**Author:** Foster			
Lic Level: R	**Difficulty:** 4	**Taxonomy:** F		**Source:** Bank ANO-OpsUnit2-09575					
Search 1940012240	**10CFR55:** 41.10 / 43.2 / 43.5 / 45			**Safety Function**					
System Title: Generic				**System Number** GENERIC		**K/A** 2.2.40			
Tier: 3	**Group:** 1	**RO Imp:** 3.4	**SRO Imp:** 4.7	**L. Plan:** A2LP-RO-TS		**OBJ** 4, 4b			

Description: Equipment Control - Ability to apply Technical Specifications for a system.

Question:

Consider the following:

- Unit 2 is operating at 100% power
- At 1430 on August 23rd,The Refueling Water Tank (RWT) has been declared INOPERABLE due to concerns with the seismic qualifications of the tank

At what time must Unit 2 be in HOT STANDBY.

A. August 23rd at 1530

B. August 23rd at 2030

C. August 24th at 0230

D. August 24th at 2030

Answer:

B. Correct; with the RWT declared Inoperable the unit will not met the RWT T.S.

Notes:

A, C and D are Incorrect based on time requirements of T.S.3.5.4 .

References:

T.S. 3.5.4, amendment 244, RWT requirements
A2LP-RO-TS, Rev. 11, Obj. 4; Given a set of plant conditions, evaluate anyTS LCO applicability and associated actions.
ASLP-RO-TS, Rev. 11. Obj. 4b; From memory, discuss the LCOs and action statements for all LCO with action statements less than or equal to one hour associated with the

Historical Comments:

Bank question, ANO-OpsUnit2-09575

REFUELING WATER TANK

LIMITING CONDITION FOR OPERATION

3.5.4 The refueling water tank shall be OPERABLE with:

a. An available borated water volume of between 384,000 and 503,300 gallons

b. Between 2500 and 3000 ppm of boron,

c. A minimum solution temperature of 40°F, and

d. A maximum solution temperature of 110°F

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With the refueling water tank inoperable, restore tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.5.4 The RWT shall be demonstrated OPERABLE:

a. At least once per 7 days by:

1. Verifying the contained borated water volume in the tank, and

2. Verifying the boron concentration of the water.

b. At least once per 24 hours by verifying the RWT temperature.

 ANO-OpsUnit2-09575

The plant is at normal full power operation at 1230 on 10 March, when a Condition Report Operability declares the Refueling Water Tank INOPERABLE due to concerns with seismic qualifications of the tank. At what time would the plant have to be in HOT STANDBY if the issue could not be resolved?

A. 1330, 10 March
B. 1830, 10 March
C. 1930, 10 March
D. 0030, 11 March

Answer: B

Question Comments:

Image Reference: None

QuestionID: ANO-OpsUnit2-09575

Objectives:

1. CourseID: A2LP-RO-SPRAY Objective: 8

KA References:

References:

1. TS 3.5.4

Training Programs:

1. Reactor Operator
2. Senior Reactor Operator

Categories:

Systems:

Task References:

Cognitive Level: 2: Comprehension or Analysis

Point Value: 1.0

Exam Bank: OpsUnit2

Review Status: Not Reviewed

Comments:

PARENT

Bank:	1891	**Rev:**	0	**Rev Date:**	5/19/2012 7:32:41	**QID #:**	70	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NEW		
Search	1940012312	**10CFR55:**	41.12 / 45.9 / 45.10	**Safety Function**					
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.3.12				
Tier:	3	**Group:**	1	**RO Imp:**	3.2	**SRO Imp:**	3.7	**L. Plan:**	ASLP-RO-RADP
OBJ	7								

Description: Radiological Controls - Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.

Question:

Consider the following:

- Unit 2 is operating at 100% power
- A Containment power entry is planned inside the "D" Rings

All of the following are required to enter into a Very High Radiation Area (VHRA) EXCEPT:

A. Have RP manager/or designee and Shift Manager approval

B. At least 2 persons for the entry, one must be an Operator

C. Special RWP for entry into a VHRA

D. Continuous RP coverage

Answer:

B. Correct; 2 person s per entry is required but EN-RP-100 section 5.3.[18] states that one of the 2 must be a RP Technician

Notes:

A, C, and D are Incorrect. All are listed as requirements to enter into a VHRA

References:

EN-RP-100, Radiation Worker Expectations, Rev. 7, section 5.3.[18] [page 14]
ASLP-RO-RADP, Rev. 5, Obj. 7, Define the posting/control and entry requirements for radiological hazard areas: Radiation Areas (RA, HRA, LHRA, VHRA)

Historical Comments:

New Question

5.3[17], continued

- Ensure hoses, cables, etc. are run through a LHRA or VHRA entrance such that the integrity of the barricade is not compromised.
- Ensure equipment and material does not prop open, wedge open **OR** is positioned between the door and frame of a LHRA entrance without prior approval from Radiation Protection.
- Be under continuous RP coverage, in accordance with EN-RP-141.
- Ensure that a door guard (normally supplied by the work group) is provided for all entries into LHRAs unless another EN-RP-101 control is in place. The guard should meet the requirements of EN-RP-101, "Access Control to Radiologically Controlled Areas".
- Ensure that the access to the LHRA is closed and locked upon exit.

[18] To enter a **Very High Radiation Area (VHRA),** the radiation worker must:

- Be briefed and on a VHRA Specific RWP
- Have RPM/designee and the Shift Manager approval for the VHRA entry.
- Have at least two persons for VHRA entries, one of whom must be an RP Technician.
- Have an alarming, self-reading dosimeter.
- Have continuous coverage in accordance with EN-RP-141.
- Have a door guard (normally supplied by the work group) for all entries into VHRAs. The door guard should meet the requirements of EN-RP-101, "Access Control to Radiologically Controlled Areas".
- After all persons have exited, ensure that the doors to the VHRA are verified to be closed and locked.

Bank:	1892	**Rev:**	0	**Rev Date:**	4/27/2012 11:03:3	**QID #:**	71	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	Modified ANO-OpsUnit2-10170		
Search	1940012315	**10CFR55:**	41.12 / 43.4	**Safety Function**					
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.3.15				
Tier:	3	**Group:**	1	**RO Imp:**	2.9	**SRO Imp:**	3.1	**L. Plan:**	A2LP-RO-RMON
OBJ	10								

Description: Radiological Controls - Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.

Question:

Containment High Range Radiation monitors (2RE-8925-1 and 2RE-8925-2) are ____________ type detectors and if a large temperature change occurred inside the Containment Building (example, Main Steam Line Break) the Radiation monitors would initially read ____________.

A. Scintillation; high

B. Scintillation; low

C. Geiger-Mueller; high

D. Geiger-Mueller; low

Answer:

C. Correct, STM 2-62 section 2.1.2 states the detectors type and explains temperature effects on the Rad monitors output due to high temperatures

Notes:

A, B, and D are Incorrect due to detector type (A. and B.) of effect of Rad Monitor output (B. and D.) also, there is a NOTE in the ACA explaining that Rad Monitor output is effected by temperature changes in the containment building (in both directions) the student should determine a rise in Containment temperature from a MSLB inside the Containment.

References:

STM 2-62, Radiation Monitoring System, Rev, 19, section 2.1.2 first paragraph (page 11)
OP-2203.012-J, ACA, Rev. 037, 2K10 window A-6, Containment Radiation HI, section 2.0, Note above step 2.1 [page 55]
A2LP-RO-RMON, Rev. 14, Obj. 10, Describe operation of the containment high range radiation monitors

Historical Comments:

Modified question from ANO Test Bank, ANO-OpsUnit2-10170

ANNUNCIATOR 2K10

A-6

CNTMT RADIATION HI

1.0 CAUSES

1.1 Containment High Range Radiation monitor (2RITS-8925-1 or 2RITS-8925-2) greater than alarm setpoint of 1000 R/hr.

2.0 ACTION REQUIRED

NOTE

Rising or lowering CNTMT High Range Radiation may be due to rising and then lowering CNTMT Temperature causing thermally induced current (TIC) that leads to false positive and then negative indication/trend. Trends should be validated against Containment Area Radiation Low Range monitors (2RITS-8905/8909/8912). (CR-ANO-C-1998-0054)

2.1 Check CNTMT High Range Radiation monitors on 2C336-1 and 2C336-2.

2.2 Check CNTMT High Range Rad recorder (2RR-8925) on 2C363.

2.3 Check CAMS (2RITS-8231-1 and 2RITS-8271-2).

2.4 IF CNTMT Area Radiation High Range monitor > 1000 R/hr,
AND any Containment Area Radiation Low Range monitor (2RITS-8905/8909/8912) available,
THEN perform the following:

2.4.1 Verify Valid Containment Hi Radiation by comparing High Range response to Low Range response.

2.4.2 IF Containment Hi Radiation alarm NOT valid,
THEN GO TO step 2.6.

2.4.3 Obtain SM concurrence.

2.4.4 Verify CIAS actuated.

2.5 IF CNTMT Area Radiation High Range monitor > 1000 R/hr,
AND Containment Area Radiation Low Range monitor (2RITS-8905/8909/8912) NOT available,
THEN perform the following:

2.5.1 Obtain SM concurrence.

2.5.2 Verify CIAS actuated.

2.6 Refer to Emergency Action Level Classification (1903.010).

2.7 Refer to Tech Spec 3.3.3.1.

(A-6 Continued on next page)

2.1.2 Post Accident Containment High Range Area Monitors

Two high range Area Radiation Monitors serve as the Post Accident Containment High Range Area Monitors. These monitors, designated 2RE-8925-1 and 2RE-8925-2, are gamma sensitive Geiger-Mueller tubes with a range of 1 Roentgen per hour to 10^8 per hour. They are used to assess the conditions in the Containment Building following a postulated accident event occurring inside the Containment Building. The detector for each monitor is encased in stainless steel to protect it from harsh conditions such as Containment Spray and high temperatures. The maximum design temperature for the detectors is 350° F. However, NRC Information Notice 97-045 Supplement 1 identified the potential for erratic indications from the high range radiation monitors (HRRMs) as a result of a problem with their associated coaxial cables. These cables have been identified as being susceptible to thermally induced currents which may cause the HRRM to read falsely high (for approximately 15 minutes) on a rapid temperature increase, and fail low intermittently on a rapid temperature decrease. These conditions could be expected following a LOCA or main steam line break inside containment. Additionally, the Information Notice states that when accident temperature conditions stabilize and/or significant dose rate exists, indicated dose rates would be more accurate. Because of this phenomenon, any trends or alarms on the HRRM's are always validated by comparison to the containment low range radiation monitors and CAMS trends before actions are taken. Also, the high alarm setpoint was raised to 1000 R/hr (ref ER-ANO-2001-0743).

Both detectors have an internal Uranium-234 source that is used as an instrument check. The U-234 source should provide a reading of 1 Roentgen per hour dose rate indication. Should the indication read less than 1 R/Hr then a possible circuit problem exists.

The detectors for the Post Accident High Range Containment Area Monitors are located in the Containment Building on two different elevations. High Range monitor 2RE-8925-1 is mounted on the 426' elevation southeast next to Containment Building Recirculation Fan 2VSF-31A. 2RE-8925-2 is located on the 354' elevation near Containment Cooling Fan 2VSF-1A on the west side of the Containment.

2.1.2.1 Control Modules

The indication and controls for the Post Accident High Range Containment Area Monitors are located in the Unit 2 Control Room on panels 2C336-1 and 2C336-2 for Area Monitors 2RITS-8925-1 and 2RITS-8925-2 respectively. Each Control module has an ammeter that is graduated in R/Hr from 10^0 to 10^8. These modules also provide signals to chart recorder, 2RR-8925-1N. This chart recorder is also located in the back of Unit 2 control room on panel 2C363.

The Control modules have three alarm lights which also function as alarm reset switches. The alarm resets are built into the alarm lights. The OPERATE light is green and is normally lit. The OPERATE light will go out if loss of DC voltage is sensed, if input signal is lost or if the high voltage power supply voltage is too low.

 ANO-OpsUnit2-10170

The Post Accident Containment High Range Area Monitors are ______________ detectors that will cause an alarm to notify the control room of high radiation conditions in the containment at ________ R/hr.

A. Geiger-Mueller; 1000
B. Scintillation; 1000
C. Geiger-Mueller; 10
D. Scintillation; 10

Answer: A

Question Comments: QID 0467, Unit 2

The setpoint for high radiation alarm on the post accident monitors was recently changed from 10 R/hr to 1000 R/hr to prevent false alarms due to high containment temperature. (ER-ANO-2001-0743)

This alarm when in is a direct input to isolate containment IAW the annunciator corrective actions.

Distracters C and D have the wrong Setpoint for the Radiation Monitor.
Distracters B and D have the wrong Detector type.;
Image Reference: None
QuestionID: ANO-OpsUnit2-10170
Objectives:
1. CourseID: A2LP-RO-RMON Objective: 6

KA References:
1. 061 AK2.01 Detectors at each ARM system location [3/3]

References:
1. 2203.012J
2. STM 2-62

Training Programs:
1. Reactor Operator
2. Senior Reactor Operator

Categories:

 ANO-OpsUnit2-10170

Systems:

Task References:

Cognitive Level: 1: Fundamental Knowledge or Memory

Point Value: 1.0

Exam Bank: OpsUnit2

Review Status: Not Reviewed

Comments:

Bank:	1893	**Rev:**	0	**Rev Date:**	4/27/2012 9:52:02	**QID #:**	72	**Author:**	Foster
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NEW		
Search	1940012307	**10CFR55:**	41.12	**Safety Function**					
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.3.7				
Tier:	3	**Group:**	1	**RO Imp:**	3.5	**SRO Imp:**	3.6	**L. Plan:**	ASLP-RO-RADP
OBJ	7								

Description: Radiological Controls - Ability to comply with radiation work permit requirements during normal or abnormal conditions.

Question:

Consider the following:

- A Fire is reported inside the turnstiles at CA-1
- The Fire Brigade is dispatched and is entering the Auxiliary Building thought the doorway at CA-2

The Fire Brigade members ______ required to be logged onto a RWP due to ________________ the Auxiliary Building.

A. are; emergency conditions in

B. are; entry into

C. are not; emergency conditions in

D. are not; entry into

Answer:

C. Correct

Notes:

A, B, and D are Incorrect based on EN-RP-105 section 5.0 step 5.1 [4] states " during emergency which threaten personnel or plant safety and immediate action is required, personnel may enter areas without being signed in on an RWP"

References:

EN-RP-105, Radiological Work Permits, Rev. 11, section 5.0 step 5.1 [4] [page 8]
EN-RP-101, Access Control for Radiologically Controlled Areas, Rev. 6, section 5.0 step 5.1 [12] [page 10]
ASLP-RO-RADP, Rev. 5, Obj. 7, Define the posting/control and entry requirements for radiological hazard areas: Radiation Areas (RA, HRA, LHRA, VHRA)

Historical Comments:

New Question

4.0, continued

[4] Responsible (Craft) Supervisor:

- Responsible for reviewing the RWP.
- Responsible for assisting in the ALARA planning for work involving High Radiological Risk Evolutions.

[5] Radiation Worker is responsible for reviewing the RWP and complying with the requirements.

[6] ALARA Managers Committee:

- Reviewing required Attachment 9.8, "RWP Revision/In Progress Review".

5.0 DETAILS

5.1 PRECAUTIONS AND LIMITATIONS

NOTE

Computer-generated equivalent to the attachments of this procedure may be used as long as they satisfy the requirements of this procedure.

For Entergy Nuclear, the terms Radiological Work Permit and Radiation Work Permit are equivalent.

[1] Since the RWP process is normally performed electronically, the actual forms may vary from those used for manual entry and is acceptable as long as manual and electronic forms are equivalent.

[2] RWP documentation SHALL be maintained as QA records per EN-AD-103, "Document Control and Records Management Activities" and applicable site procedures.

[3] The steps in this procedure are presented in a logical sequence, but may be performed in any sequence.

[4] During emergencies which threaten personnel **OR** plant safety **AND** where immediate action is required, personnel may enter areas without being signed in on an RWP. In such cases, all exposures should be recorded on an appropriate RWP as soon as possible and the event documented on a condition report.

5.1, continued

[7] **WHEN** removing or relocating installed shielding in an HRA or LHRA,

THEN establish appropriate posting, barricades, and other required controls for the anticipated increase in dose rates prior to beginning work.

[8] No ladders, equipment or material shall be stored around or used in a manner that would allow access over the enclosure of a LHRA.

[9] An individual who is using manual dose tracking should not re-enter the RCA once computer access is restored until the electronic dose tracking system is updated with the data from the dose tracking card unless RP Supervision authorizes otherwise.

[10] For entry into an area that is a HRA/LHRA/VHRA and posted 'Hearing Protection Required" area, issuance of additional monitoring such as a PEA is required.

- Individuals entering a HRA/LHRA/VHRA who have demonstrated difficulty in hearing electronic dosimetry alarms require additional monitoring such as a PEA.
- Use Attachment 9.1, "Questions for High Noise Entry" as an additional planning/briefing tool to ensure adequate controls.

[11] During an emergency, individuals qualified in radiation protection procedures **OR** personnel continuously escorted by such individuals may be exempted from the requirement for an RWP or equivalent while performing their assigned duties provided that they are otherwise following plant RP procedures for entry to, exit from, and work in such areas.

[12] During an emergency (e.g. medical, security, plant):

- Dosimetry should still be worn.
- Plant personnel may bypass the normal RCA entry / exit process. In such cases, all exposures should be recorded on an appropriate RWP as soon as possible after the event and a condition report generated to document the event.

[13] Access to "Very High Radiation Areas" SHALL normally be prohibited. In the event it is necessary to enter a "Very High Radiation Area", the entry SHALL be controlled in accordance with this procedure which complies with NRC Regulatory Guide 8.38, "Control of Access to High and Very High Radiation Areas in Nuclear Power Plants" with the exception of entries into a VHRA for the purpose of verification surveys to downgrade posting. These entries will be controlled in accordance with step 5.6[14].

Bank:	1894	**Rev:**	0	**Rev Date:**	4/27/2012 9:08:10	**QID #:**	73	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	1940012401	**10CFR55:**	41.7 / 41.10	**Safety Function**							
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.4.1						
Tier:	3	**Group:**	1	**RO Imp:**	4.6	**SRO Imp:**	4.8	**L. Plan:**	A2LP-RO-ESPTA	**OBJ**	10, 11

Description: Emergency Procedures/Plan - Knowledge of EOP entry conditions and immediate action steps.

Question:

Consider the following:

- Unit 2 is operating at 100% power
- A valid RPS setpoint has been exceeded
- The ATC depressed both reactor trip pushbuttons on 2C03
- The reactor did not trip

The above condition _______ an entry condition for OP-2202.001, Standard Post Trip Actions (SPTAs)

The required immediate action steps for the above condition (in order) are:

A. is; DSS, Reactor Trip pushbuttons on 2C14, open 2B712 and 2B812 on 2C10

B. is not; DSS, Reactor Trip pushbuttons on 2C14, open 2B712 and 2B812 on 2C10

C. is; DSS, open 2B712 and 2B812 on 2C10, Reactor Trip pushbuttons on 2C14

D. is not; DSS, open 2B712 and 2B812 on 2C10, Reactor Trip pushbuttons on 2C14

Answer:

A. Correct, a reactor is warranted in this condition and it is an entry condition for SPTAs (entry section step 2) the order is correct (step 3.A. contingency column 3.A.1) for the order DSS and Reactor Trip Pushbuttons and 2) 2B712 and 2B812 on 2C10

Notes:

B, C, and D are incorrect for reasons stated above.

References:

OP-2202.001, Standard Post Trip Actions, rev. 013, entry section, step 2 and the order is correct (step 3.A. contingency column 3.A.1) for the order DSS and Reactor Trip Pushbuttons and 3.A.2) 2B712 and 2B812 on 2C10 [page 3]
EOP-2202.001, Standard Post Trip Actions Tech Guide, Rev. 12, step 3 [page 8]
A2LP-RO-ESPTA, Rev. 9, Obj. 10, List the required entry/exit conditions for SPTA Procedure and Obj. 11, Describe the major actions taken during the performance of SPTA and the basis for each .

Historical Comments:

New Question

INSTRUCTIONS	CONTINGENCY ACTIONS
3. **Check Reactivity Control established as follows:**	
_____A. Reactor power lowering.	A. Perform the following: 1) Perform the following as needed to manually trip CEAs: • Depress BOTH Reactor Trip pushbuttons on 2C03. • Depress DSS Emergency Reactor Trip pushbutton on 2C03. • Depress BOTH Manual Reactor Trip pushbuttons on 2C14. 2) IF reactor power NOT lowering, THEN perform the following: a) Open the following breakers on 2C10 to de-energize BOTH MG sets: • 2B712 • 2B812 b) WHEN breakers have been open 10 seconds, THEN close 2B712 and 2B812.
_____B. ALL CEAs fully inserted by observing ANY of the following: 1) CEA Rod bottom lights illuminated. 2) CEAC 1 indicates ALL CEAs fully inserted. 3) CEAC 2 indicates ALL CEAs fully inserted.	_____B. Verify emergency boration in progress using Exhibit 1, Emergency Boration.

EOP STEP:

3. **Check Reactivity Control established as follows:**

EPG STEP:

1.

DEVIATION? Yes

BASIS FOR DEVIATION:

The EOP enhances the contingency actions contained in the EPG such that plant specific actions required to manually trip CEAs are delineated. These actions are defined as IMMEDIATE ACTIONS. The circle around the step letter designator designates this portion of the procedure as such. They include depressing the Normal and Diverse SCRAM System pushbuttons on the Reactor Reactivity System Control Panel, or depressing the manual trip pushbuttons on the Plant Auxiliary System Panel. EOP Step 3 does not utilize "open the reactor trip breakers" as a method of tripping CEAs, because the trip circuit breakers are not physically located in the control room. A significant delay would result if an operator were dispatched to perform local trip circuit breaker operations. Instead, the EOP relies on de-energization of the CEA motor generator sets. This action can be readily performed from the control room without significant effort. In the remote possibility that CEAs remain energized following attempts to manually trip the reactor, de-energizing the CEA motor generator sets (1) will cause the CEA Drive Mechanisms to disengage, allowing the CEAs to drop.

The EOP does not utilize the EPG step checking for a "negative startup rate" as an indication of establishing reactivity control. Past experience has shown that the SUR indication fluctuates too widely to provide a reliable indication of reactor power trends. Additionally, the SUR meter can not be used to accurately determine negative startup rates. The meter's scale was designed to show positive startup rates, and was intended for use primarily during startups.

Bank:	1895	**Rev:**	0	**Rev Date:**	4/27/2012 8:09:30	**QID #:**	74	**Author:**	Foster
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	F	**Source:**	NEW		
Search	1940012442	**10CFR55:**	41.10	**Safety Function**					
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.4.42				
Tier:	3	**Group:**	1	**RO Imp:**	2.6	**SRO Imp:**	3.8	**L. Plan:**	ASLP-RO-EPLAN
OBJ	11								
Description:	Emergency Procedures/Plan - Knowledge of emergency response facilities.								

Question:

Consider the following:

- Unit 2 has tripped due to a large break LOCA
- Chemistry reports indications of an on going radiation release offsite
- A General Emergency (GE) has been declared
- Emergency Response Organization (ERO) is fully staffed

The ______________________ directs recovery and re-entry team activities and the ______________________ is responsible for Emergency Direction and Control.

A. Operational Support Center (OSC); Technical Support Center (TSC)

B. Operational Support Center (OSC); Emergency Operations Facility (EOF)

C. Technical Support Center (TSC); Operational Support Center (OSC)

D. Unit 2 Control room; Emergency Operations Facility (EOF)

Answer:

B. Correct, The Control room is in change of all plant activities and Emergency Direction and Control until the ERO is manned, then the Shift Manager will transfer Emergency Direction and Control to TSC/EOF as they become fully manned. (in this case the TSC and EOF will both be fully manned) the OSC is the assembly and briefing area for extra personnel and the OSC will also maintain accountability of work teams.

Notes:

A, C, and D are Incorrect for reasons stated above

References:

OP-1903.011, Emergency Response/Notifications, Rev. 042, section 4.0 step 4.4 [page 6] and 4.20 [page 8]
ASLP-RO-EPLAN, Rev. 1, Obj. 11, Using references, discuss Responsibility and Authorities section of OP-1903.011

Historical Comments:

New Question

3.4.14 0CAN059701 (P-15456) - Emergency response/notifications procedure emphasizes the Shift Superintendent (currently Shift Manager) review of the plant evacuation checklist. Forms 1903.011(J,M,P,Q,S,T).

3.4.15 0CAN098206 (P-9466) - Provide adequate assurance of prompt response time under normal circumstances. Attachment 9, Form 1903.011Y step 4 and Form 1903.011Z step 5.

3.4.16 1CAN088308 (P-9589) - Revise procedure to delineate responsibilities for report preparation and submittal of unusual events. Step 6.2.1

3.4.17 0CAN108213 (P-10823) - Provide adequate assurance of prompt response time. Attachment 9, Form 1903.011Y step 4 and Form 1903.011Z step 5.

3.4.18 SOER 99-1, Loss of Grid - Items in this procedure designated with "SOER 99-01" are actions that ANO has taken to meet the INPO SOER 99-01, Loss of Grid, recommendations. (LO-ALO-2009-00027 CA-00026)

4.0 DEFINITIONS

4.1 Alert - Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

4.2 Courtesy Call - A notification to the Arkansas Department of Health and follow-up notification to the NRC for conditions/events other than those constituting an Emergency Class as listed in procedure 1903.011, "Emergency Response/Notifications", Section 6.3.

4.3 Emergency Action Level - A plant or onsite condition which has exceeded pre-determined limits which would categorize the situation into one of the following four Emergency Classes:

Notification of Unusual Event
Alert
Site Area Emergency
General Emergency

(P-9875) 4.4 Emergency Direction and Control - Overall direction of facility response which must include the non-delegable responsibilities for the decision to notify and to recommend protective actions to Arkansas Department of Health personnel and other authorities responsible for offsite emergency measures. With activation of the EOF, the EOF Director typically assumes the responsibility for Emergency Direction and Control. The management of on-site facility activities to mitigate accident consequences remains with the TSC Director in the Technical Support Center. The Shift Manager retains responsibility for the Control Room and plant systems operation.

4.5 Emergency Operations Facility (EOF) - A near-site emergency response facility located approximately 0.65 miles northeast of the reactor buildings (the ANO Training Center).

4.17 Notification of Unusual Event - Events are in process or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

4.18 Onsite - The area within the Exclusion Area Boundary.

4.19 Onsite Assembly Area - All floors of the Administration Building used to shelter non-essential personnel in the event there are impediments to a plant evacuation.

4.20 Operational Support Center - Emergency response center within the ANO maintenance facility where support is coordinated for the following functions: Onsite Radiological Monitoring, Maintenance, Nuclear Chemistry, Emergency Medical Support and Fire Fighting Support. The OSC serves as the assembly point and briefing area for recovery/reentry teams and is located in the maintenance facility.

4.21 Owner Controlled Area (OCA) - The external area contiguous to the designated reactor site Protected Area over which site Security exercises control. The OCA extends outward to the Entergy site property lines.

4.22 Probable Airliner Threat - This is an airliner that meets the Airliner Threat criteria and is within 30 minutes but greater than 5 minutes of the ANO site.

4.23 Protective Action Recommendation (PAR) - Recommendations of actions to be taken by offsite authorities which are based on plant conditions / radiological releases and resulting Emergency Classes.

4.24 Protective Action Zone (PAZ) - An area of the 10-mile EPZ with readily identifiable geographical or political boundaries used for control of protective actions for the general public.

4.25 Puff Release - Predictable release duration for short time period (< 1 hour).

4.26 Radiological Release - For emergency response purposes, a radiological release is defined as ANY detectable discharge of radioactive material to the environment that is due to the classified event.

4.27 REAM (Radiological/Environmental Assessment Manager) - Responsible for managing radiological dose assessment and field monitoring activities. Provides offsite Protective Action Recommendations (PARs) to the EOF Director and coordinates the ANO offsite radiological monitoring effort with the Arkansas Department of Health (ADH) and the NRC. The Offsite Team Coordinator and the Dose Assessment Supervisor report to the REAM.

Bank:	1896	**Rev:**	0	**Rev Date:**	5/16/2012 3:18:12	**QID #:**	75	**Author:**	Foster		
Lic Level:	R	**Difficulty:**	2	**Taxonomy:**	H	**Source:**	NEW				
Search	1940012447	**10CFR55:**	41.10 / 43.5	**Safety Function**							
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.4.47						
Tier:	3	**Group:**	1	**RO Imp:**	4.2	**SRO Imp:**	4.2	**L. Plan:**	A2LP-RO-ESPTA	**OBJ**	18

Description: Emergency Procedures/Plan - Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.

Question:

Considering OP-2202.010, Standard Attachments, Exhibit 8 flow chart.

Plant conditions that would cause the CRS to implement an EOP over an AOP are all of the following EXCEPT:

A. Main Steam Isolation Signal

B. Safety Injection Actuation Signal

C. Loss of Offsite Power

D. Loss of one DC Bus

Answer:

D. Correct; exhibit 8 has 3 conditions (is Main Steam Isolation actuated, is Safety Injection actuated, and is there a Loss of Offsite Power) that will direct the use of an EOP over a AOP. The loss of a DC bus is addressed in the flowpath but will only direct the higher EOP [functional Recovery] if BOTH DC buses are lost.

Notes:

A, B, and C are Incorrect for reasons stated above

References:

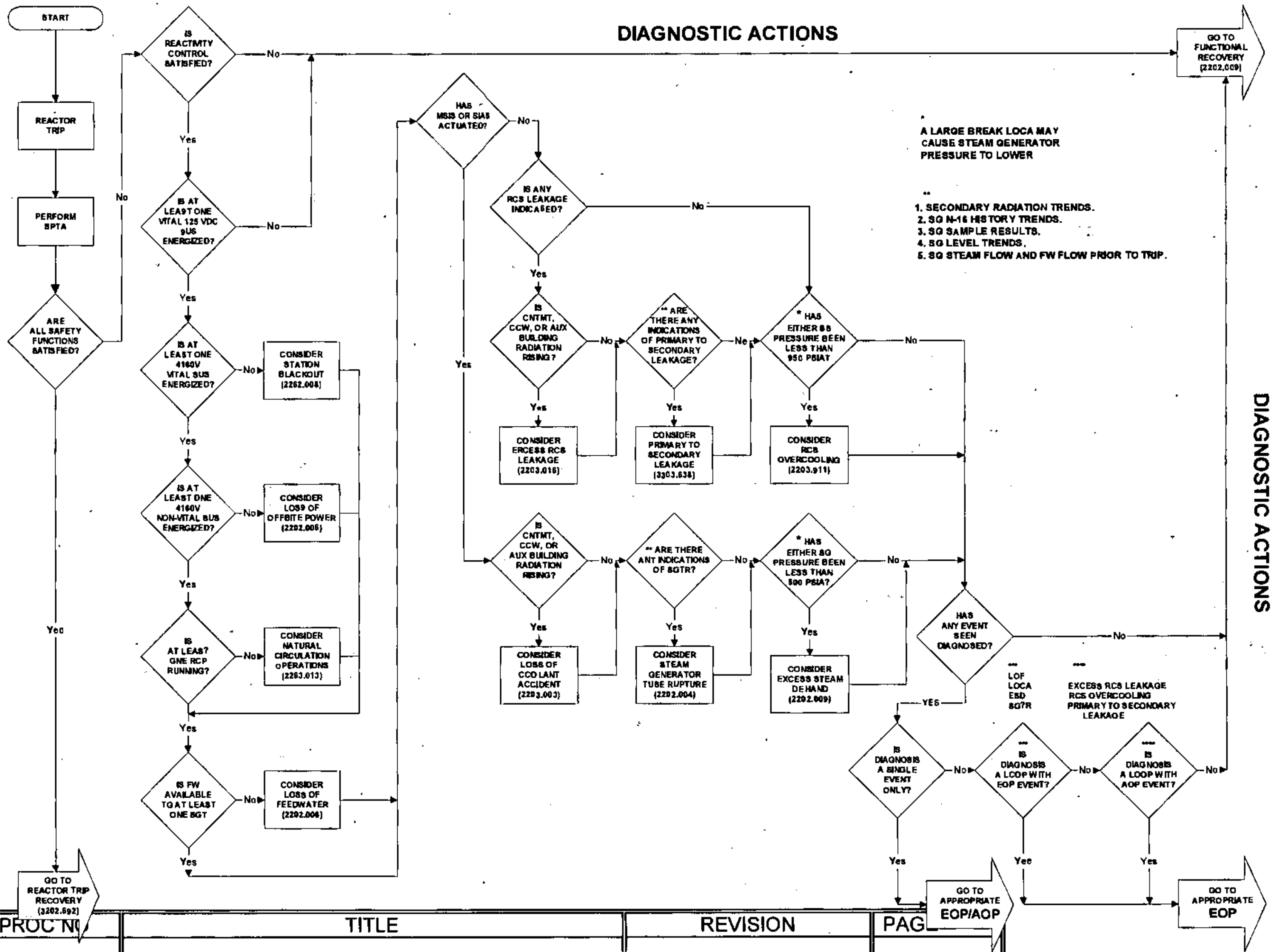
OP-2202.010, Standard Attachments, Rev. 019, Exhibit 8 [page 166]
A2LP-RO-ESPTA, Rev 9, Obj. 18, Given a list of information obtained from the performance of SPTA, diagnose and determine which Optimal Recovery Procedure, or if the Functional Recovery procedure should be used to mitigate the event in question

Historical Comments:

New Question

EXHIBIT 8

DIAGNOSTIC ACTIONS



Bank:	1897	**Rev:**	0	**Rev Date:**	4/20/2012 7:13:09	**QID #:**	76	**Author:**	Foster		
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	000007A202	**10CFR55:**	41.7 / 41.10 / 43.5	**Safety Function**	1						
System Title:	Reactor Trip - Stabilization	**System Number**	007	**K/A**	EA2.02						
Tier:	1	**Group:**	1	**RO Imp:**	4.3	**SRO Imp:**	4.6	**L. Plan:**	A2LP-RO-RPS	**OBJ**	3

Description: Ability to determine and interpret the following as they apply to a reactor trip: - Proper actions to be taken if the automatic safety functions have not taken place

Question:

Consider the following:

- Unit 2 is operating at 100% power
- An event has occurred
- PZR Level is 63% and rising
- RCS pressure is 2424 psia and trending up rapidly
- All available SDBCS Dump valve are OPEN
- No operator actions have been taken

The event in progress is a (an) ____________, AND based on the event, the action(s) required to be performed is (are) ________________________________.

A. Excess Steam Demand; Take Manual control of the Pressurizer Spray valves and lower RCS pressure

B. Excess Steam Demand; Take Manual control and close the Steam Dump and Bypass Valves

C. Loss of Turbine Load; Commence Emergency Boration from a Boric Acid Makeup Tank

D. Loss of Turbine Load; Manually Trip the Reactor and verify reactivity

Answer:

D. Correct, EN-OP-115, Conduct of Operations section 5.2 requires action to be taken for a Reactor Trip setpoint is exceeded (RPS setpoint for Reactor trip on high RCS pressure (2362#) T.S 2.2.1, table 2.2-1

Notes:

A. Incorrect, Pressurizer Spray valves would be full open in response to the high RCS pressure with the control system in automatic

B. Incorrect, the Steam Dump and Bypass valves are responding to the load rejection and should be full open.

C. Incorrect, adding negative reactivity is required due to this event but the reaction time for Emergency Boration to effect the RCS would not be sufficient to turn Reactor power before and automatic trip occurred.

References:

EN-OP-115, Conduct of Operations, Rev. 012, section 5.2 [page 20]
T.S. 2.2.1 with table 2.2-1, Rev. 48
OP-2203.024, Loss of Turbine Load, Rev. 008, entry section [page 1]
A2LP-RO-RPS, Rev. 10, Obj. 3, List the Reactor Trips and their setpoints

Historical Comments:

New Question

5.0 DETAILS

5.1 PRECAUTIONS AND LIMITATIONS

None

5.2 CONDITIONS REQUIRING AN IMMEDIATE MANUAL REACTOR SCRAM

[1] Licensed operators SHALL immediately insert a manual scram whenever any of the following conditions occurs:

- Safety of the reactor is in jeopardy.
- Operating parameters exceed any of the reactor protection set points and an automatic shutdown does not occur.
- Prior to taking any manual action that will result in an automatic scram.
- Core thermal-hydraulic instability is observed.
- As directed by plant procedures.

2.2 LIMITING SAFETY SYSTEM SETTINGS

REACTOR TRIP SETPOINTS

2.2.1 The reactor protective instrumentation setpoints shall be set consistent with the Trip Setpoint values shown in Table 2.2-1.

APPLICABILITY: As shown for each channel in Table 3.3-1.

ACTION:

With a reactor protective instrumentation setpoint less conservative than the value shown in the Allowable Values column of Table 2.2-1, declare the channel inoperable and apply the applicable ACTION statement requirement of Specification 3.3.1.1 until the channel is restored to OPERABLE status with its trip setpoint adjusted consistent with the Trip Setpoint value.

TABLE 2.2-1

REACTOR PROTECTIVE INSTRUMENTATION TRIP SETPOINT LIMITS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUES
1. Manual Reactor Trip	Not pplicable	Not Applicable
2. Linear Power Level – High		
a. Four Reactor Coolant Pumps Operating	≤ 110% of RATED THERMAL POWER	≤ 110.712% of RATED THERMAL POWER
3. Logarithmic Power Level – High (1)	≤ 0.75%	≤ 0.819%
4. Pressurizer Pressure – High	≤ 2362 psia	≤ 2370.887 psia
5. Pressurizer Pressure – Low	≥ 1650 psia (2)	≥ 1618.9 psia (2)
6. Containment Pressure – High	≤ 18.3 psia	≤ 18.490 psia
7. Steam Generator Pressure – Low	≥ 751 psia (3)	≥ 738.6 psia (3)
8. Steam Generator Level – Low	≥ 22.2% (4)	≥ 21.5% (4)

LOSS OF TURBINE LOAD

PURPOSE

This procedure provides actions for a Loss of Turbine Load.

ENTRY CONDITIONS

TWO or MORE of the following conditions exist:

1. Switchyard breakers or Main Generator Output breakers (5130/5134) open.
2. Lowering Generator megawatt output.
3. "GEN PROT CIRCUIT ENERGIZED" annunciator (2K02-A4) in alarm.
4. RCS pressure and PZR level rising.

EXIT CONDITIONS

ALL of the following conditions exist:

1. T_{AVE} within 2°F of T_{REF}.
2. IF Turbine NOT tripped,
   Then Turbine load stable.
3. Reactor power stable.
4. PZR level within 5% of setpoint.
5. RCS pressure 2025 to 2275 psia.

Bank:	1898	**Rev:**	0	**Rev Date:**	4/25/2012 4:58:55	**QID #:**	77	**Author:**	Foster		
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	F	**Source:**	NEW				
Search	0000222236	**10CFR55:**	41.7 / 41.10 / 43.2	**Safety Function**	2						
System Title:	Loss of Reactor Coolant Makeup	**System Number**	022	**K/A**	2.2.36						
Tier:	1	**Group:**	1	**RO Imp:**	3.1	**SRO Imp:**	4.2	**L. Plan:**	A2LP-RO-CVCS	**OBJ**	12

Description: Equipment Control - Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.

Question:

Consider the following:

- Unit 2 is in Mode 6
- GREEN TRAIN is protected
- "B" Shutdown Cooling train is in service
- Core reload is in progress
- The heaters have been removed from "A" and "C" Coolant Charging Pump (CCPs) for testing
- "B" CCP is available
- "B" HPSI pump is aligned as a makeup source
- WCO reports "B" CCP Feeder Breaker, 2B62-A5, is in the trip free condition

Which ONE (1) of the following actions should be performed first:

A. Secure testing and replace the heaters in "C" CCP

B. Secure testing and replace the heaters in "A" CCP

C. Suspend loading irradiated fuel in the core

D. have the WCO reset and close 2B62-A5

Answer:

C. Correct, TRM 3.1.3 directs suspending the loading of irradiated fuel in the core without at least ONE CCP in the boron injection flowpath.

Notes:

A. and B are Incorrect, Securing testing and replace the CCP heaters would be a follow up action to restore at least ONE CCP in the boron injection flowpath to resume fuel movement but it is not the first thing that should be performed. Also the "A" CCP is a RED Train component, GREEN Train equipment is protected.
D. Incorrect, conditions have not been met (IAW OP-2107.001 section 14.0 Step 14.4.3) to have the WCO reclose the breaker.

References:

TRM 3.1.3 for Reactivity control systems Mode 5-6, Rev. 49
STM 2-04, Chemical & Volume Control system, Rev: 28, section 2.2.3 [pages 22 and 23]
OP-2107.001 Electrical Systems Operations, Rev. 91, section 14.0 resetting tripped breakers and thermal overloads, step 14.4.3 requirements for closing in a tripped breaker page 54]
A2LP-RO-CVCS, Rev. 13, Obj. 12, Identify and describe the technical specification / technical requirements associated with CVCS

Historical Comments:

New Question

REACTIVITY CONTROL SYSTEMS

CHARGING PUMPS – SHUTDOWN

TECHNICAL REQUIREMENT FOR OPERATION

3.1.3 At least one charging pump in the boron injection flow path required to be FUNCTIONAL pursuant to TRO 3.1.1 shall be FUNCTIONAL and capable of being powered from an OPERABLE or FUNCTIONAL emergency bus.

APPLICABILITY: MODES 5 and 6.

ACTION:

With no charging pump FUNCTIONAL, suspend loading irradiated fuel in the core or operations that could introduce into the RCS, coolant with boron concentration less than required by Technical Specification 3.1.1.2 or 3.9.1 as applicable until at least one of the required pumps is restored to FUNCTIONAL status.

TEST REQUIREMENTS

4.1.3 No additional Test Requirements other than those required by the Inservice Testing Program.

diagram on page 72 and the electrical scheme for 2CV-4873-1 on page 72).

Located in the VCT room on the 354' elevation of the auxiliary building, 2CV-4873-1 is powered from 2B54-D4. The valve can also be manipulated from the front of breaker 2B54-D4 using 2HS-4873-1A. For the valve to be operated from the handswitch on panel 2C09, 2HS-4873-1A must be in the "remote" position. The valve will close and cannot be re-opened if a SIAS #1 signal is present.

2.2.2 RWT to Charging Pump Suction Isolation Valve 2CV-4950-2

The RWT to charging pump isolation valve, 2CV-4950-2, is provided to align the RWT to charging pump suction. This valve is controlled by a three-position handswitch located on panel 2C09. Whenever this handswitch is in "auto", 2CV-4950-2 will automatically position based on VCT level. 2CV-4950-2 will open on a low-low VCT level signal of 5% as sensed by 2LT-4861. This 5% level signal also closes VCT outlet valve 2CV-4873-1, discussed in the previous section. As mentioned in the discussion of the VCT outlet valve above when VCT level rises to 7%, 2CV-4950-2 will close while 2CV-4873-1 re-opens. (Refer to VCT level diagram on page 72 and electrical scheme for 2CV-4950-2 on page 73)

2CV-4950-2 is powered from 2B62-F2 and is located in the "A" charging pump room along the west wall. An additional handswitch, 2HS-4950-2A, is located on the breaker for local operation of the valve and must be in remote for the valve to be operated from panel 2C09.

2.2.3 Charging pumps 2P-36A, 2P-36B and 2P-36C

As discussed earlier, RCS water is diverted to the letdown system to provide filtering and purification for the RCS. The charging pumps serve to send the water that was removed back to the RCS in order to maintain RCS inventory at desired levels. During steady state operation, total letdown plus controlled bleed-off flows are equal to total charging flow going back to the RCS[8].

The charging pumps are positive displacement pumps having three plungers (Triplex). Each pump is driven by a 480 vac, 100 horsepower motor. Each pump has its own integral leakage collection system. The internals of the pumps are austenetic stainless steel. Each charging pump has its own seal lubrication provided by a separate pump with its own subsystem.

Suction and discharge dampeners are provided to reduce pulsations/vibrations produced by triplex plungers. The discharge dampener N_2 charge (or overpressure) may be adjusted to lower values than normal when the charging pumps are used during low

FOOTNOTES:

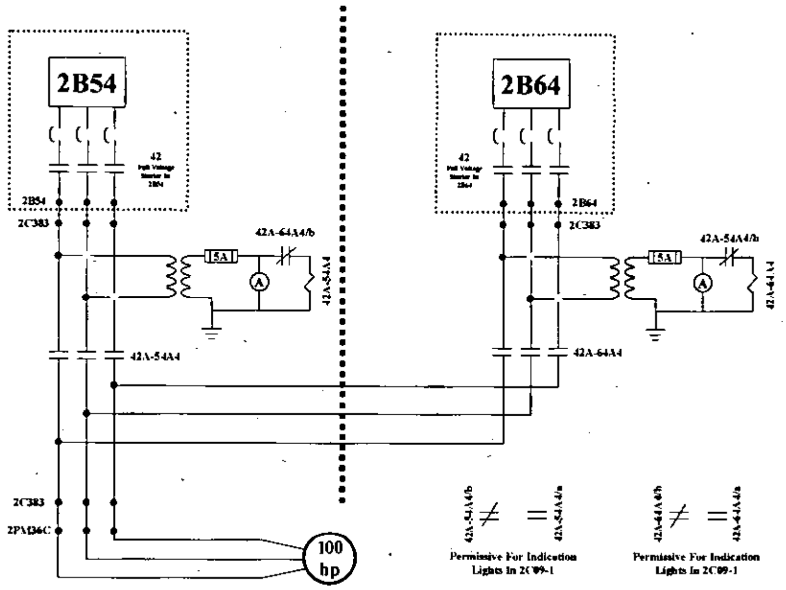
[8] During power operations the control board operator can use this concept to identify any leakage that exists in the reactor coolant system. If charging flow is greater than the total letdown plus controlled bleed-off flows then a leak equating to the difference in the flows may exist. Load transients or any perturbation causing a change in RCS temperature will mask any leakage that may be present. Other methods are available to the control room staff to determine actual leakage values.

RCS pressure conditions. The decision to lower the dampener pressure will be determined by system engineering based on flow instrumentation concerns.

The charging pumps suction header can be supplied from any of the following sources:

- VCT
- blending tee
- refueling water tank (RWT)
- boric acid makeup tank (BAMT)

Each charging pumps suction piping is equipped with a thermal relief valve that lifts if suction pressure reaches 150 psig. These valves are designated 2PSV-4834, 2PSV-4844, and 2PSV-4854 for 2P36A, 2P36B, and 2P36C respectively. Charging pump discharge relief valves provide over-pressure protection for the positive displacement pumps. These valves, 2PSV-4835 (2P36A), 2PSV-4845 (2P36B), and 2PSV-4855 (2P36C), all lift at 2735 psig.



A low oil pressure alarm is provided for each charging pump. It is set at ≤ 10 psig 7 seconds after pump start. The annunciator for 2P-36A is 2K12-D3, "PUMP A OIL PRESS LO". Annunciator 2K12-E3, "PUMP B OIL PRESS LO" is for 2P-36B and 2K12-F3, "PUMP C OIL PRESS LO" for 2P-36C. The associated handswitch in "stop" or the control circuit de-energized also actuates these alarms.

The charging pumps are controlled by handswitches located on panel 2C09. Handswitch 2HS-4832-1 controls 2P-36A and 2HS-4842-2 controls 2P36B.

The swing charging pump, 2P-36C can be powered from either a "red" or "green" motor control center. There are two handswitches on 2C09 for this pump, one is for the 'red" circuit and the other is for the "green" circuit. The red and green motor control center breakers are both normally closed. In order to prevent cross-connecting the red and green motor control centers panel 2C383 was installed in the Lower South Electrical Penetration Room. This panel is divided into two sections that are separated by a qualified barrier to meet single failure and Appendix R criterion.

When the red or green logic circuit causes the full voltage starter to energize for the respective motor control center, voltage is supplied to the respective red or green section of 2C383 and a control circuit is energized via a control power transformer. This energizes an amber light on the front of that section of 2C383 and a

14.0 TRIPPED BREAKERS AND THERMAL OVERLOADS

CAUTION

- When reclosing a breaker previously tripped on a fault, operator should be aware there is a greater possibility of electrical flash.
- Reclosure of any breaker that tripped due to instantaneous overcurrent should only be attempted in an emergency.

14.1 WHEN status of breaker has been determined,
THEN verify condition report initiated for any tripped breaker.

14.2 IF Tech Spec or TRM equipment affected,
THEN refer to applicable Tech Spec/TRM.

14.3 IF remote HS with PTL capability,
THEN place HS in PTL.

14.4 Load Center and High Voltage Breakers

14.4.1 Check affected load for possible cause of breaker trip (overheated, smoke, physical damage, etc.) as practical.

14.4.2 IF breaker equipped with protective relays,
THEN perform the following:

A. Check for tripped overcurrent relays.

B. Record in eSOMS Narrative Log.

CAUTION

Do NOT stand directly in front of breaker when it is being closed.

14.4.3 IF EITHER of the following conditions applies:

- An emergency condition exists AND permission given by CRS OR SM.
- Cause of breaker trip known AND corrected.

THEN reclose breaker ONE time.

A. IF breaker trips after re-closure,
THEN initiate WR/WO.

Step 14.4 continued on next page.

Bank:	1899	**Rev:**	0	**Rev Date:**	5/17/2012 10:16:2	**QID #:**	78	**Author:**	Foster
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW		
Search	000027A204	**10CFR55:**	41.7 / 41.10 / 43.5	**Safety Function**	3				
System Title:	Pressurizer Pressure Control (PZR PCS) Malfun	**System Number**	027	**K/A**	AA2.04				
Tier:	1	**Group:**	1	**RO Imp:**	3.7	**SRO Imp:**	4.3	**L. Plan:**	A2LP-RO-APZRM
OBJ	2, 5								

Description: Ability to determine and interpret the following as they apply to the Pressurizer Pressure Control Malfunctions: - Tech-Spec limits for RCS pressure

Question:

Consider the following:

- Unit 2 is operating at 100% power
- RCS pressure is 2200 psia
- RCS temperature is 580.23°F
- The "A" spray valve [2CV-4651] has been cycled open and closed for maintenance
- 5 minutes later the ATC reports RCS pressure is 2175 psia and trending down

Considering the current RCS pressure and rate of change, the MINIMUM Tech Spec limit for Pressurizer Pressure should be reached in __________ minutes and the FIRST course of action directed by op-2203.028, Pressurizer System Malfunction AOP, should be to

____________________.

A. 30; close the "A" spray valve block valves

B. 30; place "A" Spray valve in manual and closed

C. 35; close the "A" spray valve block valves

D. 35; place "A" Spray valve in manual and closed

Answer:

B. Correct; minimum RCS pressure per T.S. is 2025 psia. the rate of change is 5 psia/minute, from the current pressure to the minimum T.S. pressure is 150 psia therefore it would take 30 minutes to reach. Pressurizer Systems Malfunction AOP should be entered due to RCS pressure lowering after the cycling of a spray valve, and step 2 sequence has the operator first close the spray valve then isolate the spray valve.

Notes:

A. Incorrect; time is right but action is out of sequence
C. Incorrect; time is based on pressure lowering to the directed trip setpoint as listed in the AOP [2000 psia], the action is out of sequence
D. Incorrect; time is based on pressure lowering to the directed trip setpoint as listed in the AOP [2000 psia]

References:

OP-2203.028, PZR systems malfunction AOP, Rev. 010, entry conditions [page 1] step 2.A, take manual control of spray valve and go closed [page 3] and step 2.B.3, will close the spray valve block valves [page 4] step 2.B.4) b) directs tripping the plant if RCS lowers to 2000 psia [page 4]
T.S. 3.2.8, PZR Pressure, Rev. 48
A2LP-RO-APZRM, Rev. 0, Obj. 2, Describe the mitigation strategy and instructions for OP-2203.028, Pressurizer Systems Malfunction AOP and Obj. 5, Discuss the Unit 2 Technical Specification that are associated with the pressurizer Systems

malfunction AOP

Historical Comments:

New Question

PRESSURIZER PRESSURE

LIMITING CONDITION FOR OPERATION

3.2.8 The average pressurizer pressure shall be maintained between 2025 psia and 2275 psia.

APPLICABILITY: MODE 1.

ACTION:

With the average pressurizer pressure exceeding its limits, restore the pressure to within its limit within 2 hours or reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

4.2.7 The average pressurizer pressure shall be determined to be within its limit at least once per 12 hours.

PZR SYSTEMS MALFUNCTION

PURPOSE

This procedure provides actions for a PZR System Malfunction.

ENTRY CONDITIONS

ANY of the following conditions exist:

1. PZR level deviating from setpoint during steady state operations.
2. RCS pressure deviating from setpoint during steady state operations.
3. "CNTRL CH 1/2 PRESSURE HI/LO" annunciator (2K10-E6/E7) in alarm.
4. "CNTRL CH 1/2 LEVEL LO" annunciator (2K10-G6/G7) in alarm.
5. "CNTRL CH 1/2 LEVEL HI" annunciator (2K10-J6/J7) in alarm.
6. PZR Spray valve failed open or closed.

EXIT CONDITIONS

ANY of the following conditions exists:

1. Unaffected PZR level control channel has been selected and Letdown restored.
2. Unaffected PZR pressure control channel has been selected and RCS pressure restored to 2025 to 2275 psia.

INSTRUCTIONS	CONTINGENCY ACTIONS
2. **<u>IF</u> ANY PZR Spray valve failed open, <u>THEN</u> perform the following:** A. Place affected PZR Spray valve in MANUAL and close: • 2CV-4651 • 2CV-4652	

(Step 2 continued on next page)

INSTRUCTIONS **CONTINGENCY ACTIONS**

2. (continued)

B. IF affected PZR Spray valve did NOT close, THEN perform the following:

1) Place associated PZR Spray valve handswitch to OPEN for 1 second:

- 2CV-4651
- 2CV-4652

2) WHEN 5 seconds have elapsed, THEN place handswitch in CLOSE until green indicating light flashes.

3) IF affected PZR Spray valve will NOT close, THEN close associated energized Block valves:

- 2CV-4655
- 2CV-4656
- 2CV-4653
- 2CV-4654

4) IF associated energized PZR Spray Block valves will NOT close, THEN perform the following:

a) Verify ALL PZR heaters ON.

b) IF RCS pressure lowers to 2000 psia, THEN perform the following:

1. IF plant in mode 1 or 2, THEN trip Reactor.

2. Stop RCP in loop with failed PZR Spray valve.

3. **GO TO** 2202.001, Standard Post Trip Actions.

Bank: 1900	**Rev:** 1	**Rev Date:** 6/27/2012 10:39:2		**QID #:** 79		**Author:** Foster			
Lic Level: S	**Difficulty:** 3	**Taxonomy:** H		**Source:** NEW					
Search 0000582447		**10CFR55:** 41.7 / 41.10 / 43.2		**Safety Function** 6					
System Title: Loss of DC Power				**System Number** 058		**K/A** 2.4.47			
Tier: 1	**Group:** 1	**RO Imp:** 4.2	**SRO Imp:** 4.2	**L. Plan:** A2LP-RO-ED125		**OBJ** 2, 9			

Description: Emergency Procedures/Plan - Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.

Question:

REFERENCE PROVIDED

Consider the following:

- Unit 2 is operating at 100% power
- 2D31A battery charger is being placed on an equalize charge to restore 2D01 battery voltage
- 2K01, E-10, Bus 2D01 Charger Trouble, is in alarm
- The IAO reports there is no output from the online Battery Charger 2D31A
- Electricians report 2D01 pilot cell voltage has dropped 0.2 volts in the last 45 minutes
- Current 2D01 pilot cell voltage is 2.36 volts

At the current rate of discharge, the MINIMUM amout of time that can elaspe before the RED BATTERY MUST be declared inoperable is _______ minutes.

A. 54

B. 60

C. 65

D. 120

Answer:

A. Correct; based on T.S. 3.8.2.3 table 4.8-2 Category A limits for battery voltage. the student will calculate the change in cell voltage based on given discharge rate, apply T.S. 3.8.2.3 action b [sends you to Table 4.8-2 for limiting condition for battery operability based on pilot cell voltage] and declare the battery inoperable when pilot cell voltage drops 2.12 volts

Notes:

B. Incorrect; 60 minutes is based on T.S. 3.8.2.3 action b time limit
C. Incorrect; time based on cat B limiting voltage (2.07)
D. Incorrect; 120 minutes is based on T.S. 3.8.2.3 action a time limit

T.S.3.8.2.3 with Table 4.8-2, Rev. 48 [PROVIDED TO STUDENT] [page 210-212]

References:

OP-2203.012-A ACA, amendment 94, window E-10 [pages 89 and 90]
T.S.3.8.2.3 with Table 4.8-2, Rev. 48 [PROVIDED TO STUDENT] [page 210-212]
T.S. 3.8.2.3 bases, Rev. 48, [page 312]
A2LP-RO-ED125, Rev. 7, Obj 2, Describe the Design Basis of the DC Distribution System and Obj. 9, Evaluate a set of plant conditions that is causing an alarm on the 125VDC Distribution System and determine the cause of the alarm and any action required to be taken

Historical Comments:

New Question
Rev. 1: changed current voltage in stem (from 2.32 to 2.36) for a less direct math conversion.
reworded question to clairify the minimum amount of time (makes only one answer correct)
cleanup stem (added the word "an" before equalize, and the before IAO)

ANNUNCIATOR 2K01

E-10

BUS 2D01 CHARGER TROUBLE

NOTE

This window has multiple inputs and reflash capability from RIS unit.

1.0 CAUSES

1.1 Any of the following alarms on RIS unit for either 2D-31A or 2D-31B:

- Low DC Float voltage
- High DC Float voltage
- Fan failure
- AC Power failure
- DC Output breaker (B302) open
- Charger in Lower Current Limit

2.0 ACTION REQUIRED

2.1 Check Battery chargers (2D-31A and 2D-31B) for cause of alarm.

2.2 IF alarm caused by standby charger,
THEN place Alarm to Control Room Disable/Enable switch in DISABLE.

- For 2D-31A (2HS-9113)
- For 2D-31B (2HS-9112)

2.3 IF High or Low DC Float voltage,
THEN perform the following:

2.3.1 Check 2D-11 Battery voltage on Fuse and Relay Cabinet (2D-41).

2.3.2 IF battery voltage < 110 volts or > 145 volts,
THEN refer to Tech Spec Surveillance Requirement 4.8.2.3.b. (CR-ANO-2-2007-1214)

2.3.3 Contact Electricians to check float settings.

2.3.4 Shift chargers using DC Electrical System Operations (2107.004).

(E-10 Continued on next page)

ANNUNCIATOR 2K01

E-10

BUS 2D01 CHARGER TROUBLE
(Continued)

2.4 IF Fan failure,
THEN perform the following:

2.4.1 Open front panel and check fan operation.

2.4.2 IF standby charger available,
THEN shift chargers using DC Electrical System Operations (2107.004).

2.4.3 IF standby charger NOT available,
THEN monitor room temperature using portable thermometer AND contact System Engineering.

2.5 IF either of the following:

- AC Power Failure
- DC Output Breaker Open

THEN refer to DC Electrical System Operations (2107.004).

2.6 IF necessary to shift chargers,
THEN use DC Electrical System Operation (2107.004).

2.7 Refer to Tech Specs 3.8.2.3 and 3.8.2.4.

* 2.8 Monitor battery condition once per hour per Tech Spec 4.8.2.3.a.1 until charger returned to service and battery recharged.

3.0 TO CLEAR ALARM

3.1 Restore 2D01 battery charger to normal.

4.0 REFERENCES

4.1 E-2451-2A

4.2 DCP 96-3242D201

D.C. DISTRIBUTION – OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.3 As a minimum, the following D.C. electrical sources shall be OPERABLE:

TRAIN "A" consisting of 125-volt D.C. bus No. 1, 125-volt D.C. battery bank No. 1 and a full capacity charger.

TRAIN "B" consisting of 125-volt D.C. bus No. 2, 125-volt D.C. battery bank No. 2 and a full capacity charger.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one of the required battery banks inoperable, restore the inoperable battery bank to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With one of the required full capacity chargers inoperable, demonstrate the OPERABILITY of its associated battery bank by performing Surveillance Requirement 4.8.2.3.a.1 within one hour and at least once per 8 hours thereafter. If any Category A limit in Table 4.8-2 is not met, declare the battery inoperable.

SURVEILLANCE REQUIREMENTS

4.8.2.3. Each 125-volt battery bank and charger shall be demonstrated OPERABLE:

a. At least once per 7 days by verifying that:

1. The parameters in Table 4.8-2 meet the Category A LIMITS, and

2. The total battery terminal voltage is greater than or equal to 129 volts on float charge for a 60 cell battery bank and greater than or equal to 124.7 volts on float charge for a 58 cell battery bank.

b. At least once per 92 days and within 7 days after a battery discharge with battery terminal voltage below 110 volts, or battery overcharge with battery terminal voltage above 150 volts, by verifying that:

1. The parameters in Table 4.8-2 meet the Category B LIMITS,

SURVEILLANCE REQUIREMENTS (Continued)

2. There is no visible corrosion at battery terminals and connectors, or the connection resistance of these items is $\leq 150 \times 10^{-6}$ ohm, and

3. The average electrolyte temperature of 12 of the connected cells is above 60°F.

c. At least once per 18 months by verifying that:

1. The cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration,

2. The cell-to-cell and terminal connections are clean, tight, and coated with anti-corrosion material,

3. The resistance of each cell-to-cell and terminal connection is less than or equal to 150×10^{-6} ohm, and

4. The battery charger will supply $\geq$ 300 amperes at $\geq$ 125 volts for $\geq$ 8 hours.

d. At least once per 18 months, during shutdown, by verifying that the battery capacity is adequate to supply and maintain in OPERABLE status all of the actual or simulated emergency loads for the design duty cycle when the battery is subjected to a battery service test.

e. At least once per 60 months, during shutdown, by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a performance discharge test. Once per 60-month interval this performance discharge test may be performed in lieu of the battery service test.

f. At least once per 18 months, during shutdown, performance discharge tests of battery capacity shall be given to any battery that shows signs of degradation or has reached 85% of the service life expected for the application. Degradation is indicated when the battery capacity drops more than 10% of rated capacity from its average on previous performance tests, or is below 90% of the manufacturer's rating.

TABLE 4.8-2

BATTERY SURVEILLANCE REQUIRMENTS

	CATEGORY A[1]	CATEGORY B[2]	
Parameter	LIMITS for each designated pilot cell	LIMITS for each connected cell	ALLOWABLE[3] VALUE for each connected cell
Electrolyte	> Minimum level indication mark, and ≤ ¼" above maximum level indication mark	> Minimum level indication mark, and ≤ ¼" above maximum level indication mark	Above top of plates, and not overflowing
Float Voltage	≥ 2.13 volts	≥ 2.13 volts[c]	> 2.07 volts
Specific Gravity[a]	≥ 1.195[b]	≥ 1.190 Average of all connected cells > 1.200	Not more than .020 below the average of all connected cells Average of all connected cells ≥ 1.190[b]

(a) Corrected for electrolyte temperature and level.

(b) Or battery charging current is less than 2 amps when on charge.

(c) Corrected for average electrolyte temperature.

(1) For any Category A parameter(s) outside the LIMIT(S) shown, the battery may be considered OPERABLE provided that within 24 hours all the Category B measurements are taken and found to be within their ALLOWABLE VALUES, and provided all Category A and B parameter(s) are restored to within LIMITS within the next 6 days.

(2) For any Category B parameter(s) outside the LIMIT(S) shown, the battery may be considered OPERABLE provided that the Category B parameters are restored to within LIMITS within 7 days.

(3) Any Category B parameter not within its ALLOWABLE VALUE indicates an inoperable battery.

TS 3.8.1.1 ACTION c.4 is entered when one of the inoperable A.C. Sources is restored to an OPERABLE status as required by ACTION c.3 and requires restoration of the remaining inoperable A.C. Source to an OPERABLE status. The allowable restoration time in ACTION c.4 for the remaining inoperable A.C. source began when the component initially became inoperable. If not restored within the AOT, then a plant shutdown is required. The requirement associated with the AACDG (reference Action b.3 Note 1) is applicable to the EDG AOT.

TS 3.8.1.1 ACTION e.3 requires restoration of the remaining inoperable EDG to an OPERABLE status. The time allowed for restoration is based on the time at which the remaining inoperable EDG was initially declared inoperable. If not restored within the AOT, then a plant shutdown is required. The requirement associated with the AACDG (reference ACTION b.3, Note 1) is applicable to the EDG AOT.

Note that if a plant shutdown is required in accordance with TS 3.8.1.1 ACTIONS b.3, c.3, c.4, e.2, or e.3 (due to one or more EDGs remaining inoperable), TS 3.4.4 ACTION (b) requires the plant to be in HOT SHUTDOWN within 12 hours.

TS 4.8.1.2.c.3 demonstrates the EDG load response characteristics and capability to reject the largest single load without exceeding predetermined voltage and frequency while maintaining a specified margin to the overspeed trip. For ANO-2, the single load for each EDG is the Service Water pump, rated at 800 HP (636.9 KW).

TS 3.8.2.3 ACTION b requires the performance of SR 4.8.2.3.a.1 within one hour and at least once per 8 hours thereafter for a loss of one of the required full capacity chargers. If any Category A limit in Table 4.8-2 is not met while a charger is inoperable, the associated battery bank shall be declared inoperable and ACTION a entered. The Category A limits in Table 4.8-2 specify the normal limits for electrolyte level, float voltage and specific gravity for each designated pilot cell. When TS 3.8.2.3 ACTION b is entered without the associated battery bank being on float (i.e. charger not connected to the bus), pilot cell float voltage is determined by measuring pilot cell voltage. The term "full capacity charger" as used in TS 3.8.2.3 is defined as a charger that is capable of supplying an output of ≥ 300 amperes.

Cascading to other TSs is not required solely due to a single station battery inoperability. In accordance with TS 3.0.5, the DC bus remains OPERABLE if its redundant power source (vital AC source via its battery charger) is OPERABLE and the redundant DC bus is fully OPERABLE (both vital AC and DC are available to supply the bus). Therefore, all DC loads associated with the affected train, including the respective EDG, remain OPERABLE. The 2-hour restoration period sufficiently takes into account the importance of the battery source and the vulnerability of supported equipment when a battery bank is out of service.

The fuel oil day tank volume limit is a nominal value. Instrument uncertainty need not be applied (reference CR-ANO-2-2003-0821, CA 007).

TS 3.8.1.3 ensures sufficient quantity and quality of stored fuel oil is available to support OPERABILITY of the EDGs. Regulatory Guide 1.137 addresses recommended fuel oil practices as supplemented by ANSI N195-1976. The fuel oil properties assessed by these documents are water and sediment content, specific gravity, kinematic viscosity, and impurity level. SAR Section 9.5.4.1 discusses the mission time of the EDGs based on required stored fuel oil capacity. The stored fuel oil supports operation of the EDGs (TSs 3.8.1.1 and 3.8.1.2) and, therefore, satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). The stored fuel oil is required to be within limits when the associated EDG is required to be OPERABLE.

Bank: 1900	**Rev:** 0	**Rev Date:** 5/18/2012 10:41:5		**QID #:** 79		**Author:** Foster			
Lic Level: S	**Difficulty:** 3	**Taxonomy:** H		**Source:** NEW					
Search 0000582447		**10CFR55:** 41.7 / 41.10 / 43.2		**Safety Function** 6					
System Title: Loss of DC Power				**System Number** 058		**K/A** 2.4.47			
Tier: 1	**Group:** 1	**RO Imp:** 4.2	**SRO Imp:** 4.2	**L. Plan:** A2LP-RO-ED125		**OBJ** 2, 9			

Description: Emergency Procedures/Plan - Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.

Question:

REFERENCE PROVIDED

Consider the following:

- Unit 2 is operating at 100% power
- 2D31A battery charger is being placed on Equalize charge to restore 2D01 battery voltage
- 2K01, E-10, Bus 2D01 Charger Trouble, is in alarm
- AO reports there is no output from the online Battery Charger, 2D31A
- Electricians report 2D01 pilot cell voltage has dropped 0.2 volts in the last 45 minutes
- Current 2D01 pilot cell voltage is 2.32 volts

At the current rate of discharge, the RED battery will be declared inoperable in ________ minutes.

A. 43

B. 59

C. 86

D. 118

QID use History

	RO	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☐	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

Answer:

A. Correct; based on T.S. 3.8.2.3 table 4.8-2 Category A limits for battery voltage. the student will calculate the change in cell voltage based on given discharge rate, apply T.S. 3.8.2.3 action b [sends you to Table 4.8-2 for limiting condition for battery operability based on pilot cell voltage] and declare the battery inoperable when pilot cell voltage drops 2.12 volts

Notes:

B, C, and D are incorrect for reason stated above

References:

OP-2203.012-A ACA, Rev. 040, window E-10 [pages 89 and 90]
T.S.3.8.2.3 with Table 4.8-2, Rev. 48 [PROVIDED TO STUDENT] [page 210-212]
T.S. 3.8.2.3 bases, Rev. 48, [page 312]
A2LP-RO-ED125, Rev. 7, Obj 2, Describe the Design Basis of the DC Distribution System and Obj. 9, Evaluate a set of plant conditions that is causing an alarm on the 125VDC Distribution System and determine the cause of the alarm and any action required to be taken

Historical Comments:

New Question

Bank:	1901	**Rev:**	0	**Rev Date:**	5/8/2012 10:08:38	**QID #:**	80	**Author:**	Foster		
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	F	**Source:**	NEW				
Search	000062A205	**10CFR55:**	41.7 / 41.10 / 43.5	**Safety Function**	4						
System Title:	Loss of Nuclear Service Water	**System Number**	062	**K/A**	AA2.05						
Tier:	1	**Group:**	1	**RO Imp:**	2.4	**SRO Imp:**	2.5	**L. Plan:**	A2LP-RO-ESPTA	**OBJ**	11

Description: Ability to determine and interpret the following as they apply to the Loss of Nuclear Service Water: - The normal values for SWS-header flow rate and the flow rates to the components cooled by the SWS

Question:

Consider the following:

- Unit 2 is operating at 40% power
- "B" and "C" Service Water pumps are in service
- Annunciator 2K06 A-6, SW Header Loop 1 Press LO, is in alarm
- Loop 1 Service Water Header pressure is 45 psig
- The IAO reports water gushing from the piping upstream of the Stator Water Cooling Skid

The CRS should enter ____________________ and direct ________________

A. Loss of Service Water AOP; tripping the Reactor

B. Loss of Turbine Load AOP; commence Emergency Boration

C. Loss of Condenser Vacuum; commence Emergency Boration

D. Loss of Spent Fuel Cooling; prepare for SFP boiling

Answer:

A. Correct, student should conclude from the initial SW pump lineup that ACW is aligned to Loop 1 SW, system knowledge of SW/ACW piping with the given location of the rupture is unisolable without securing ACW main supply isolations and a reactor trip is directed by the AOP

Notes:

B. Incorrect, with the loss of cooling [ACW] a main turbine runback is possible but it is a symptom of the real event, therefore not the correct AOP to enter or action to take. The Loss of SW AOP encompass taking the turbine off line [reactor trip will initiate a turbine trip]
C. Incorrect, with the loss of cooling [ACW] to the vacuum pump seal cooler over time will cause a loss of condenser vacuum but this would be a symptom of the real event, therefore not the correct AOP to enter or action to take. The Loss of SW AOP encompass taking the turbine off line [reactor trip will initiate a turbine trip]
D. Incorrect, entry conditions are not met for Loss of SFP cooling AOP the Loss of SW AOP will isolate SFP cooling [step 3, page] but it also directs the realignment of SW to the SFP cooler [step 18 page]

References:

OP-2203.022, Loss of Service Water AOP, Rev. 012, entry conditions [page 1], step 3 [page 2], Step 17, contingency 17.F.1) [page 21], step 20 [page 22]
A2LP-RO-ESPTA, Rev. 9, obj. 11, Describe the major actions taken during the performance of SPTA and the basis for each

Historical Comments:

New Question

LOSS OF SERVICE WATER

PURPOSE

This procedure provides actions for a Loss of Service Water.

ENTRY CONDITIONS

ANY of the following conditions exist:

1. "2P4A/B/C BREAKER TRIP" annunciator (2K06-B5/2K05-B4/2K05-B5) in alarm.
2. "A/B/C SW BAY WATER LEVEL LO" annunciator (2K08-A6/2K09-A6/ 2K09-B6) in alarm.
3. "SW HEADER LOOP 1/2 PRESS LO" annunciator (2K06-A6/2K05-A6) in alarm.
4. "ACW PRESS LO" annunciator (2K06-E6) in alarm.
5. "2P4A/B/C DISCH PRESS HI" annunciator (2K06-D5/2K05-D4/2K05-D5) in alarm.
6. "2P4A/B/C STRAINER ΔP HI" annunciator (2K06-E5/2K05-E4/2K05-E5) in alarm AND affected SW loop inoperable per 2104.029A, Service Water Flow vs Strainer DP.

EXIT CONDITIONS

WHEN ALL appropriate actions completed, THEN exit this procedure.

INSTRUCTIONS	CONTINGENCY ACTIONS

NOTE

- **Steps marked with (*) are continuous action steps.**
- **Service Water System Drawing (Attachment A) provided as operator aid.**

INSTRUCTIONS	CONTINGENCY ACTIONS
***1. Check the following criteria satisfied:**	
A. Breaker trip annunciators clear (2K06-B5/2K05-B4, B5).	A. **GO TO** Step 7.
B. Strainer ΔP annunciators clear (2K06-E5/2K05-E4, E5).	B. **GO TO** Step 10.
C. Running pumps sluice gate open from lake or ECP.	C. **GO TO** Step 11.
D. Return path aligned.	D. **GO TO** Step 12.
***2. Check for indications of SW rupture by ANY of the following:** • Sump levels rising or in alarm. • Waste Tank 2T20A/B level rising. • Room Level annunciators in alarm. • SW or ACW rupture reported.	***2. IF SW system intact, THEN GO TO Step 7.**
3. Separate SW loops by performing the following:	
A. Close BOTH Fuel Pool HX SW Inlet valves: • 2CV-1526-2 • 2CV-1525-1	
B. Close SW To CCW /Main Chiller Supply valve on loop supplying ACW:	

LOOP 1	LOOP 2
2CV-1530-1	2CV-1531-2

INSTRUCTIONS	**CONTINGENCY ACTIONS**
17. (continued)	

C. IF only Loop 2 SW pumps available AND ACW aligned to Loop 1 SW, THEN perform the following:

1) Close Loop 1 SW Crosstie valves:

- 2CV-1418-1
- 2CV-1419-1

2) WHEN Loop 1 SW Crosstie valves show intermediate position, THEN open Loop 2 SW Crosstie valves:

- 2CV-1421-2
- 2CV-1422-2

3) Close Loop 1 SW Supply to CCW/Main Chiller (2CV-1530-1).

D. Verify ACW Bypass valve (2CV-1650) closed.

E. Locally verify "CCW HEAT EXCHANGER BYPASS" valve (2SW-132) closed.

F. IF ACW can NOT be restored OR ACW supply inadequate due to unisolable ACW rupture, THEN perform the following:

1) IF in Mode 1 or 2, THEN trip Reactor.

2) Verify BOTH SW to ACW Isolation valves closed:

- 2CV-1425-1
- 2CV-1427-2

3) Secure ALL operating ACW components using 2202.010, Attachment 6, Securing CCW and ACW.

4) IF Reactor tripped, THEN **GO TO** 2202.001, Standard Post Trip Actions.

INSTRUCTIONS	CONTINGENCY ACTIONS
18. Verify SW pump 2P4B fully aligned to intact SW Loop using 2104.029, Service Water System Operations.	
19. Check SW Suction to Lake valves open: • 2CV-1470-1 • 2CV-1472-5 • 2CV-1474-2	**19. Perform the following:** A. IF lake available, THEN align SW pump suctions to lake. Refer to 2104.029, Service Water System Operations. B. IF ANY running SW pump bay aligned to ECP, THEN perform the following: **CAUTION** **Continuous operation on the ECP may result in loss of ECP level due to ACW and CCW returning to the lake or cooling tower.** 1) Verify SW Return to ECP valves open on associated SW loop: • 2CV-1541-1 • 2CV-1560-2 2) Notify Unit 1 to monitor ECP level AND makeup as needed. 3) IF ECP Level less than 5.2 feet, THEN refer to U1 TS 3.7.8 AND U2 TS 3.7.4.1, Emergency Cooling Pond.
20. Verify SW aligned to Fuel Pool HX by performing the following: A. Verify ONE Fuel Pool HX SW Inlet valve Open: • 2CV-1526-2 • 2CV-1525-1	***20. Commence monitoring Spent Fuel Pool level and temperature for boiling concerns (INPO IER 11-2 Rec 4).** • IF necessary, THEN perform 2203.002, Spent Fuel Pool Emergencies, in conjunction with this procedure.

END

Bank:	1902	**Rev:**	0	**Rev Date:**	4/25/2012 4:08:02	**QID #:**	81	**Author:**	Foster
Lic Level:	S	**Difficulty:**	4	**Taxonomy:**	H	**Source:**	NEW		
Search	0000652242	**10CFR55:**	41.7 / 41.10 / 43.2 / 43	**Safety Function**	8				
System Title:	Loss of Instrument Air	**System Number**	065	**K/A**	2.2.42				
Tier:	1	**Group:**	1	**RO Imp:**	3.9	**SRO Imp:**	4.6	**L. Plan:**	A2LP-RO-EAOP
OBJ	16								

Description: Equipment Control - Ability to recognize system parameters that are entry-level conditions for Technical Specifications.

Question:

Consider the following:

- Unit 2 is in Mode 4
- OP-2104.004, Shutdown Cooling System section 8.0 (establishing SDC), has JUST been completed
- The manual valves for 2CV-5091 and 2CV-5093 have not been throttled as directed by OP-1015.008, Unit 2 SDC control, Attachment B
- A Loss of Instrument Air occurs

The CRS should enter ________________________________ and the entry conditions for Tech Spec 3.1.1.3 (RCS Flow Rate) __________ been met.

A. OP-2203.029, Loss of Shutdown Cooling AOP; have

B. OP-2202.011 Lower Mode Functional Recovery EOP; have

C. OP-2203.029, Loss of Shutdown Cooling AOP; have not

D. Op-2202.011, Lower Mode Functional Recovery EOP; have not

Answer:

C. Correct, Loss of IA is an entry condition for Loss of SDC AOP. On the SDC system at this point will cause RCS flowrate to go up due to 2CV-5091 (flow control valve) failing open therefore T.S. entry is not require (RCS flow will be >2000 gpm) and Temperature to go up due to 2CV-5093 (temperature control valve) failing closed and reducing the RCS flow through the SDC heat exchanger. The Lower Mode Functional Recovery EOP entry condition have not been met without SM direction in this case and entry into this EOP would not be a prudent action since the Loss of SDC AOP deals directly with a loss of IA.

Notes:

A, B, and D are Incorrect for reasons stated above

References:

T.S.3.1.1.3 RCS Flow Rate, Rev. 48
STM 2-14, Shutdown Cooling, Rev. 11, section 2.5 2CV-5091 (flow control valve), section 2.5 2CV-5093 (temperature control valve) section 2.6.2 (loss of IA mitigation) [page 17] and simplified drawing on page 48
OP-2203.029, Loss of Shutdown Cooling AOP, Rev. 015, step 12 will control RCS flowrate, step 13 will control RCS temperature. [pages 8 and 9]
A2LP-RO-EAOP, Rev. 17, Obj. 16, Discuss the Mitigation strategy, Entry Conditions, Instructions and Exit Conditions (as per AOP and Tech Guide) of OP-2203.021, Loss of instrument Air

Historical Comments:

New Question

REACTIVITY CONTROL SYSTEMS

BORON DILUTION

LIMITING CONDITION FOR OPERATION

3.1.1.3 The flow rate of reactor coolant through the reactor coolant system shall be ≥ 2000 gpm whenever a reduction in Reactor Coolant System boron concentration is being made.

APPLICABILITY: ALL MODES.

ACTION:

With the flow rate of reactor coolant through the reactor coolant system < 2000 gpm, immediately suspend all operations involving a reduction in boron concentration of the Reactor Coolant System.

SURVEILLANCE REQUIREMENTS

4.1.1.3 The flow rate of reactor coolant through the reactor coolant system shall be determined to be ≥ 2000 gpm within one hour prior to the start of and at least once per hour during a reduction in the Reactor Coolant System boron concentration by either:

a. Verifying at least one reactor coolant pump is in operation, or

b. Verifying that at least one low pressure safety injection pump or containment spray pump is in operation as a shutdown cooling pump and supplying ≥ 2000 gpm through the reactor coolant system.

INSTRUCTIONS	CONTINGENCY ACTIONS

NOTE

LPSI Discharge Header valve (2CV-5091) fails open on loss of IA.

12. Check LPSI Header discharge flow control as follows:

- Flow within 500 gpm of setpoint.
- IA pressure greater than 65 psig.

12. Perform the following:

A. IF high flowrate, THEN perform any of the following to restore flow within 500 gpm of setpoint:

1) Throttle LPSI Injection MOVs.

2) Operate 2FIC-5091 in manual.

3) Throttle "LPSI HEADER CV INLET" valve (2SI-5091-1) or "LPSI HEADER CV OUTLET" valve (2SI-5091-2).

4) Locally operate "LPSI DISCHARGE HEADER" valve (2CV-5091) using 2104.040, LPSI System, Exhibit 1.

B. IF low flowrate, THEN perform any of the following to restore flow within 500 gpm of setpoint:

1) Operate 2FIC-5091 in manual.

2) Throttle open "LPSI HEADER CV BYPASS" valve (2SI-5091-3).

3) Locally operate "LPSI DISCHARGE HEADER" valve (2CV-5091) using 2104.040, LPSI System, Exhibit 1.

C. IF SDC flow less than 500 gpm OR SDC pump cavitating, THEN perform the following:

1) Stop SDC pump.

2) **GO TO** 2202.011, Lower Mode Functional Recovery.

INSTRUCTIONS | **CONTINGENCY ACTIONS**

NOTE

SDC HX Return valve (2CV-5093) fails closed on loss of IA.

***13. Check adequate SDC HX flowrate for RCS temperature control as follows:**

- Normal in-service SDC HX CNTMT Spray Header Flowrate by ANY of the following:
  - 2FIS-5610
  - 2FIS-5616
  - SPDS-SFD
- IA pressure greater than 65 psig.

13. Perform the following:

A. IF low flowrate due to SDC HX RETURN VALVE (2CV-5093) closure, THEN perform EITHER of the following to control RCS temperature:

1) Throttle open "SDC HX OUTLET TO SDC FLOW CONTROL BLOCK BYPASS" valve (2SI-5093-3).

2) Locally operate "SDC HX RETURN VALVE" (2CV-5093) using 2104.040, LPSI System, Exhibit 2.

B. IF high flowrate due to SDC HX RETURN VALVE (2CV-5093) failure, THEN perform EITHER of the following to control RCS temperature:

1) Throttle "SDC HX OUTLET TO SDC FLOW CONTROL BLOCK INLET" valve (2SI-5093-2).

2) Locally operate "SDC HX RETURN VALVE" (2CV-5093) using 2104.040, LPSI System, Exhibit 2.

C. Maintain SDC flow greater than 2400 gpm.

* D. Control RCS cooldown rate within TS limits, refer to 2202.010 Attachment 8, RCS Cooldown Table.

the worm gear hub aligns with the semicircular notch in the pointer then inserting a pin to engage the handwheel.

There are two cautions in the procedure for local operations of 2CV-5093.

- 2CV-5093 and 2SI-5093-3 discs do not have a seating surface in the valve body. Attempting to operate either valve after minimal resistance is felt in either direction will damage the valve operating gear teeth.
- Attempting to operate 2CV-5093 remotely with engaging pin installed will damage valve operating stem and gear teeth.

Because there is no hard stop for the disk in the valve seat the valve operator has a hard stop that limits travel of the operating gear. If this gear is operated into its stop with too much force the worm gear will strip the teeth from the operating gear.

2.6.2 Loss of Instrument Air Mitigation

OP-1015.008, Unit 2 SDC Control Attachment B, requires alignment of the manual valves associated with SDC flow control valve 2CV-5091 and temperature control valve 2CV-5093. For 2CV-5091 the inlet (2SI-5091-1) OR outlet (2SI-5091-2) is throttled. For 2CV-5093, the bypass (2CV-5093-3) is throttled.

The purpose of this manual valve alignment is to prevent vortexing due to excessive flow in the LPSI header due to 2CV-5091 failing open on a loss of instrument air. The bypass for 2CV-5093 is also throttled in order to prevent the loss of SDC flow through the SDC heat exchanger due to a loss of instrument air.

Refer to OP-1015.008, Unit 2 SDC Control Attachment B for the procedural requirements for this evolution.

2.7 Over Pressure Protection

This section discusses the over pressure protection provided for the SDC system piping.

2.7.1 Suction Line Relief Valve, 2PSV-5085

Suction line relief valve 2PSV-5085 is installed between the two suction line isolation valves in the containment. It protects against an overpressure condition caused by:

- Suction isolation valve 2CV-5084-1 leaking by (the one closest to the RCS).
- Thermal expansion of the fluid, trapped between the two valves, due to a heatup.

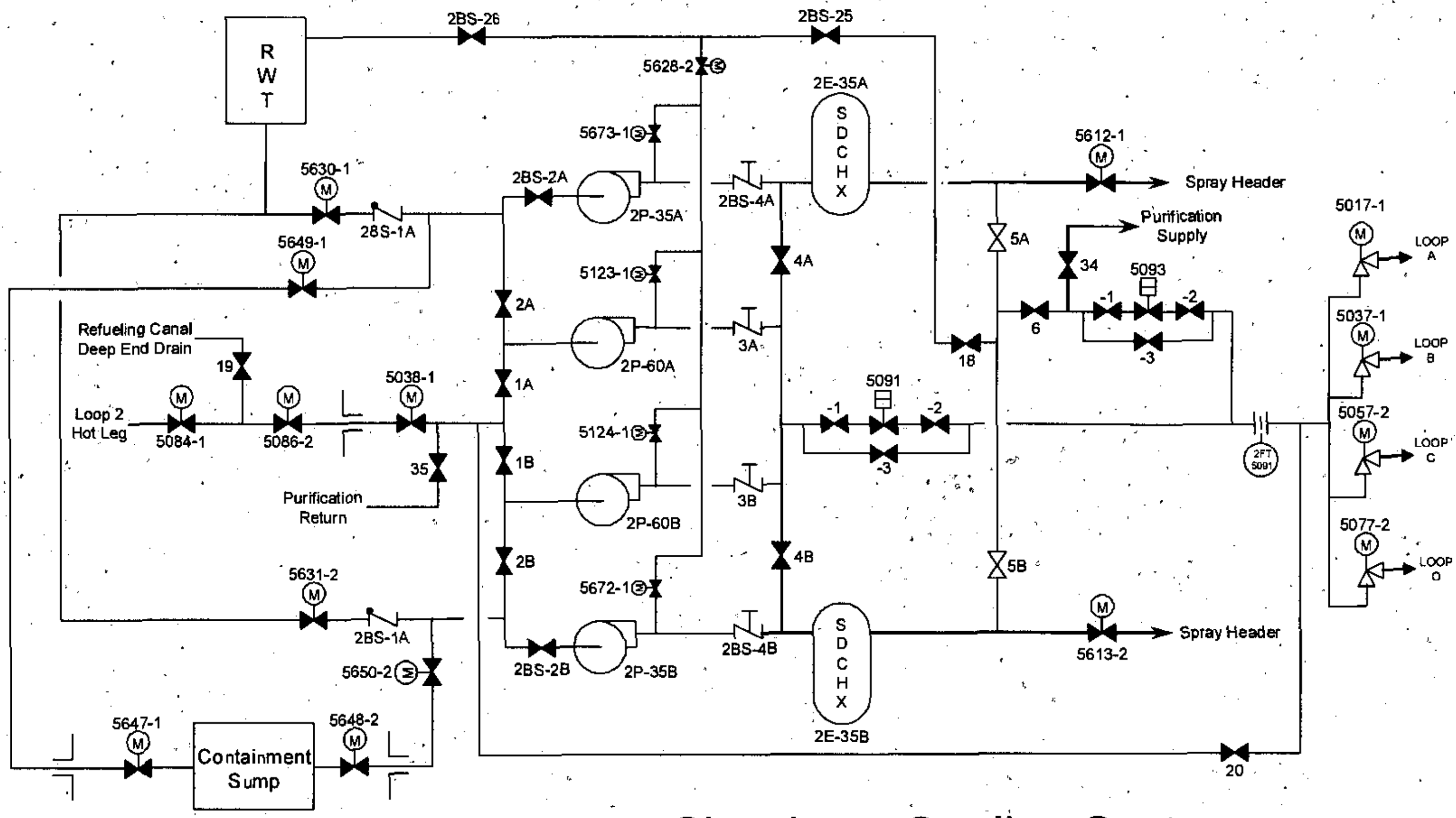
Its setpoint is 2485 psig and it relieves to the reactor drain tank (RDT).

2.7.2 Suction Line Relief Valve, 2PSV-5087

Suction line relief valve 2PSV-5087 is installed between the two suction line isolation valves on either side of the containment penetration. It protects against an overpressure condition caused by:

- Both suction isolation valves in the containment leaking by (2CV-5084-1 and 2CV-5086-2).
- Thermal expansion of the fluid trapped between the two valves due to a heatup.

Figures



Shutdown Cooling System

All valves, unless otherwise noted, start with 2SI-.
All MOVs and AOVs start with 2CV-.

QID:	0983	**Rev:**	0	**Rev Date:**		**RO Select:**		**SRO Select:**		**Points:**	1.00
Lic Level:	R	**Difficulty:**	3	**Taxonomy:**	C	**Source:**		**Originator:**	Coble		
10CFR55_41:		**10CFR55_43:**		**Section:**		**Type:**	OLD				
System Title:	Loss of Instrument Air	**System Number**	065	**K/A:**	AA2.08						
RO Tier:	1	**RO Group:**	1	**RO Imp:**	2.9	**SRO Tier:**		**SRO Group:**	1	**SRO Imp:**	3.3

Description: Ability to determine and interpret the following as they apply to the Loss of Instrument Air: - Failure modes of air-operated equipment

Question:

Given the following plant conditions:

* Plant shutdown and cooldown just completed from 100% power.
* Shutdown Cooling has JUST been established.
* The manual isolations for 2CV-5091 and 2CV-5093 have not been throttled.
* A Loss of Instrument Air occurs.

Which of the following describes the Shutdown Cooling System response?

a. All SDC flow is lost.

b. SDC heat removal is lost.

c. SDC flow is degraded.

d. No significant effect.

Answer:

b. SDC heat removal is lost.

Notes:

References:

2203.029, Loss of Shutdown Cooling , Steps 8 and 9

Historical Comments:

Bank:	1903	**Rev:**	1	**Rev Date:**	6/27/2012 11:02:4	**QID #:**	82	**Author:**	Foster		
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NRC bank 0409				
Search	000005A203	**10CFR55:**	41.7 / 41.10 / 43.5 / 45	**Safety Function**	1						
System Title:	Inoperable/Stuck Control Rod			**System Number**	005	**K/A**	AA2.03				
Tier:	1	**Group:**	2	**RO Imp:**	3.5	**SRO Imp:**	4.4	**L. Plan:**	A2LP-RO-ACEA	**OBJ**	6

Description: Ability to determine and interpret the following as they apply to the Inoperable/Stuck Control Rod: - Required actions if more than one rod is stuck or inoperable

Question:

Consider the following:

- Unit 2 is operating at 100% power
- Annunciator 2K04 J-5, CEAC 1 CEA Deviation, is in alarm
- Annunciator 2K04 J-6, CEAC 2 CEA Deviation, is in alarm

The ATC reports:
- CEA #46 is indicating 110" withdrawn
- CEA # 1 Rod Bottom Light is lit

Which ONE (1) of the following actions should be taken based on these conditions?

A. Continue the power reduction to 60% power and realign the CEAs

B. Continue the power reduction to be in HOT STANDBY conditions in 6 hours

C. Manually trip the Reactor and go to OP-2202.001, Standard Post Trip Actions

D. Stabilize the plant by adjusting turbine load to match T-REF within 2°F of T-AVE

Answer:

C. Correct; the student should recognize the entry conditions have been met for the CEA Malfunction AOP and the action required due to 2 misaligned CEA >19"

Notes:

Distracters A, B and D are actions required in the CEA Malfunction AOP or Technical Specifications based on different misalignment scenarios. However only answer A is the correct action to take if two or more CEAs are misaligned by more than 19 inches.

References:

STM 2-02, Control Element Drive Mechanism Control System, Rev. 20, Section 1.2 [pages 5 and 6]
OP-2203.012-D ACA ,Rev. 034, window J-5 step 2.3 [page 52]
OP-2203.012-D ACA ,Rev. 034, window J-6 step 2.3 [page 63]
OP-2203.003; CEA Malfunction AOP, Rev. 020, entry section [page 1] step 5 [page 2]
A2LP-RO-ACEA, Rev. 0, Obj. 2: Describe the mitigation strategy and instructions for actions directed in OP-2203.003, CEA Malfunctions AOP and Obj. 6: Given a set of plant parameters, DETERMINE if the entry conditions are met for entering the CEA malfunction AOP

Historical Comments:

NRC bank question 0409.
Rev. 1: changed to a "bank" question

When this happens, all CEAs insert fully adding negative reactivity. The drop times to 90% insertion is less than or equal to 3.2 seconds for the average of all CEAs and less than or equal to 3.7 seconds for any individual CEA per Technical Specification 3.1.3.4

1.2 CEA Control Groups

Each CEA is positioned via a magnetic jack control element drive mechanism (CEDM) mounted on the reactor vessel closure head. The extension shaft joins with the CEA spider and connects the CEA to the CEDM. Full-length CEAs may be connected to any extension shaft depending on control requirements. Reactivity control is achieved by positioning groups of CEAs using the CEDMs.

It has been established that CEAs can be inserted to provide reactivity control during power transients, and to provide control of axial power profile. In addition, the CEAs can have their power interrupted (a reactor trip) to rapidly insert negative reactivity into the core.

The insertion of CEAs will affect more than axial power distribution. Because of the strong absorbing properties of the boron carbide pellets, the local power profile in the vicinity of the CEAs is greatly affected by CEA insertion.

The core has been designed symmetrically. It is important that azimuthally symmetric fuel bundles (those opposite each other and equidistant from core center) produce the same amount of power.

To ensure acceptable radial peaking and azimuthal symmetry, the individual CEAs are operated as symmetrically located groups. That is, if the core were divided into quadrants, there would be at least one CEA in each quadrant assigned to a group, and the four CEAs (one per quadrant) would have the same relative position within the quadrant. Some groups may have multiple CEAs in each quadrant, however, the symmetry is always maintained.

The 81 CEAs are divided into 20 subgroups. The 20 subgroups are configured into 9 control groups as shown in the table on page 6. The control groups are comprised of:

- 2 shutdown groups
- 7 regulating groups (1-6 and P)

CEA-1 is located at the center of the core and may be assigned to any subgroup. It is actually assigned to regulating group 6.

Shutdown groups have the highest amount of CEA worth due to the large number of CEAs in those Groups. They are the first to be withdrawn during startup, and the last to be inserted during shutdown. There are two shutdown groups, designated A and B. Each group must be operated individually from the CEDMCS operator's panel.

There are 7 regulating groups, designated 1 through 6 and Group "P". (Group P used to be Part Length CEAs. DCP 94-2017 replaced all of the Part length CEAs with Full length CEAs). The Regulating groups are normally used for power changes due to Axial neutron flux distribution concerns. If not for the CEAs changing the axial power profile in the core when they are inserted, Reactor power changes would be accomplished exclusively by changing boron concentration in the core. Regulating groups 1-5 must be operated in the prescribed sequence and with the required "overlap". The Regulating group sequence for CEA withdrawal is 1, 2, 3, 4 and 5 in manual sequential mode. Then group Group 6 is fully withdrawn in manual group mode. Group P is withdrawn for the approach to criticality using manual group mode with a target of 90 inches withdraw for the critical CEA position. If Reactor shutdown by CEA insertion is desired, then the sequence is Group P in manal group mode, Group 6 in manual group mode, then 5, 4, 3, 2 and 1 in manual sequential mode. Note that Groups 1 - 5 are never inserted into the core when the Reactor is critical since that would result in jeopardizing the required Tech Spec Shutdown Margin requirement.

CEA and Subgroup Assignments

Control Groups	Subgroups	CEAs*			
		Y1	Y2	Y3	Y4
Shutdown Group A	13	50	52	54	56
	14	51	53	55	57
	18	70	73	76	79
	20	72	75	78	81
Shutdown Group B	1	2	3	4	5
	4	14	16	18	20
	5	15	17	19	21
	8	30	32	34	36
	9	31	33	35	37
Regulating Group 1	10	38	40	42	44
	11	39	41	43	45
Regulating Group 2	2	6	7	8	9
	19	71	74	77	80
Regulating Group 3	16	62	64	66	68
	17	63	65	67	69
Regulating Group 4	3	10	11	12	13
Regulating Group 5	15	58	59	60	61
Regulating Group 6	12	46	47	48	49 1
Regulating Group P	6	22	23	24	25
	7	26	27	28	29

* Y1 through Y4 designates the lowest through the highest numbered CEA of each subgroup

ANNUNCIATOR 2K04

J-5

CEAC 1 CEA DEVIATION

1.0 CAUSES

NOTE

Alarm will NOT be generated if either of the following conditions present:

- CEA that is deviating (lowest in subgroup) at or above upper alarm deadband (≥ 140.83")
- CEA that is deviating (highest in subgroup) at or below lower alarm deadband (≤ 9.17").

1.1 CEA deviation within a subgroup > 5 inches.

1.2 CEA RSPT failure which is interpreted by the CEAC to be a deviation within that particular subgroup.

2.0 ACTION REQUIRED

CAUTION

If all of the following conditions exist, a reactor trip may occur:

- CEA between 11.42 and 138.58 inches withdrawn
- CEA failed sensor
- Associated CEAC NOT in INOP

2.1 Use CEAC display and PMS Function N4 to determine affected CEA.

2.2 Compare both CEACs to determine whether an actual deviation exists or the RSPT has failed.

2.3 IF actual deviation has occurred,
THEN refer to 2203.003, CEA Malfunction.

2.4 IF only one CEAC shows deviation,
THEN place affected CEAC in INOP using 2105.001, CPC/CEAC Operations.

2.5 Refer to 2105.001, CPC/CEAC Operations to troubleshoot failure.

2.6 Contact I&C and Computer Support to troubleshoot and repair.

2.7 Refer to Tech Spec Table 3.3-1.

3.0 TO CLEAR ALARM

3.1 Eliminate CEA deviation.

4.0 REFERENCES

4.1 E-2454-1

ANNUNCIATOR 2K04

J-6

CEAC 2 CEA DEVIATION

1.0 CAUSES

NOTE

Alarm will NOT be generated if either of the following conditions present:

- CEA that is deviating (lowest in subgroup) is at or above upper alarm deadband (≥ 140.83")
- CEA that is deviating (highest in subgroup) is at or below lower alarm deadband (≤ 9.17").

1.1 CEA deviation within a subgroup > 5 inches.

1.2 CEA RSPT failure which is interpreted by the CEAC to be a deviation within that particular subgroup.

2.0 ACTION REQUIRED

CAUTION

If all of the following conditions exist, a reactor trip may occur:

- CEA between 11.42 and 138.58 inches withdrawn
- CEA failed sensor
- Associated CEAC NOT in INOP

2.1 Use CEAC display and PMS Function N4 to determine affected CEA.

2.2 Compare both CEACs to determine whether an actual deviation exists or the RSPT has failed.

2.3 IF actual deviation has occurred,
THEN refer to 2203.003, CEA Malfunction.

2.4 IF only one CEAC shows deviation,
THEN place affected CEAC in INOP.

2.5 Refer to 2105.001, CPC/CEAC Operations to troubleshoot failure.

2.6 Contact I&C and Computer Support to troubleshoot and repair.

2.7 Refer to Tech Spec Table 3.3-1.

3.0 TO CLEAR ALARM

3.1 Eliminate CEA deviation.

4.0 REFERENCES

4.1 E-2454-2

CEA MALFUNCTION

PURPOSE

This procedure provides actions for a CEA malfunction.

ENTRY CONDITIONS

Plant in Mode 1 or 2 and ANY of the following exist:

1. "CEAC 1/2 CEA DEVIATION" annunciator (2K04-J5/J6) in alarm.

2. Indications of a dropped or misaligned CEA on any of the following:

   - CEAC Display
   - SPDS Display
   - CEDMCS Insert

3. "MAJOR CEA DEVIATION" annunciator (2K10-C1) in alarm.

4. A CEA is immovable.

5. Uncontrolled CEA motion is occurring.

EXIT CONDITIONS

WHEN ANY of the following exists, THEN exit this procedure:

1. ALL Regulating Group CEAs and ALL Group P CEAs which are inserted in the core, SHALL be operable with each CEA of a given group less than 5 inches outward deviation and 7 inches inward deviation of ALL other CEAs in its group, ALL Shutdown Bank CEAs SHALL be fully withdrawn OR the actions of TS 3.1.3.1, CEA Position are being met.

2. Procedure complete and Plant Shutdown commenced using 2102.004, Power Operation.

3. ALL Regulating Group CEAs and Group P CEAs fully inserted and Reactor startup aborted.

INSTRUCTIONS	CONTINGENCY ACTIONS

> **NOTE**
>
> - **Attachment D provides trip and shutdown criteria.**
> - **Attachment E provides a list of possible Tech Spec actions to be taken within two hours of procedure entry.**
> - **Steps marked with (*) are continuous action steps.**
> - **Steps marked with (■) are floating steps.**

INSTRUCTIONS	CONTINGENCY ACTIONS
1. Open Placekeeping page.	
2. Stop ALL CEA movement.	**2. Perform the following:** A. Trip Reactor. B. **GO TO** 2202.001, Standard Post Trip Actions.
3. Notify Control Board Operators to monitor floating steps.	

> **NOTE**
>
> **CEA misalignment is defined as a CEA misaligned from its associated Group by outward deviation more than 5 inches or inward deviation more than 7 inches.**

*** 4. IF ANY CEAs immovable AND aligned, THEN GO TO Step 36.**

*** 5. IF TWO or MORE CEAs misaligned by greater than 19 inches, THEN perform the following:**

A. Trip Reactor.

B. **GO TO** 2202.001, Standard Post Trip Actions.

QID:	0409	**Rev:**	000	**Rev Date:**	12/8/2001 1	**RO Select:**		**SRO Select:**		**Points:**	1.00
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	Ap	**Source:**	New	**Originator:**	Coble		
10CFR55_41:		**10CFR55_43:**	43.5	**Section:**	4.2	**Type:**	Generic APE				
System Title:	Inoperable/Stuck Control Rod	**System Number**	005	**K/A:**	AA2.03						
RO Tier:		**RO Group:**		**RO Imp:**		**SRO Tier:**	1	**SRO Group:**	1	**SRO Imp:**	4.4

Description: Ability to determine and interpret required actions if more than one rod is stuck or inoperable as they apply to the Inoperable/Stuck Control Rod.

Question:

Given the following:

* A plant down power to <90% is being conducted to repair a Circulating Waterbox tube leak.
* ASI control is implemented by the CBOR using Group P CEAs.
* The CBOR reports that CEA #22 has slipped to 105 inches withdrawn.
* The CBOR also reports that CEA #28 Rod Bottom Light is lit.
* All other CEAs in Group P are at 130 inches withdrawn.

Which ONE of the following actions should be taken based on these conditions?

A. Manually trip the Reactor and go to 2202.001, Standard Post Trip Actions.

B. Stabilize the plant by adjusting turbine load to match T-REF within 2°F of T-AVE.

C. Continue the power reduction to 60% power and realign the CEAs.

D. Continue the power reduction to be in HOT STANDBY conditions in 6 hours.

Answer:

A. Manually trip the Reactor and go to 2202.001, Standard Post Trip Actions.

Notes:

Distracters A, B and D are actions required in the CEA Malfunction AOP or Technical Specifications based on different misalignment scenarios. However only answer C is the correct action to take if two or more CEAs are misaligned by more than 19 inches.

References:

ANO-2-LP-SRO-AOP, Revision 7, Objective 6
STM 2-02, CEDMCS, Revision 8, Section 1.2
OP 2203.003, CEA Malfunction, Revision 014-02-0, Continuous Action Step #4.

Historical Comments:

Bank: 1903	**Rev:** 0	**Rev Date:** 5/22/2012 11:53:3	**QID #:** 82	**Author:** Foster			
Lic Level: S	**Difficulty:** 3	**Taxonomy:** H	**Source:** Modified NRC bank 0409				
Search 000005A203	**10CFR55:** 41.7 / 41.10 / 43.5 / 45	**Safety Function** 1					
System Title: Inoperable/Stuck Control Rod	**System Number** 005	**K/A** AA2.03					
Tier: 1	**Group:** 2	**RO Imp:** 3.5	**SRO Imp:** 4.4	**L. Plan:** A2LP-RO-ACEA	**OBJ** 6		

Description: Ability to determine and interpret the following as they apply to the Inoperable/Stuck Control Rod: - Required actions if more than one rod is stuck or inoperable

Question:

Consider the following:

- Unit 2 is operating at 100% power
- Annunciator 2K04 J-5, CEAC 1 CEA Deviation, is in alarm
- Annunciator 2K04 J-6, CEAC 2 CEA Deviation, is in alarm
- The ATC reports:
  - CEA #46 is indicating 110" withdrawn
  - CEA # 1 Rod Bottom Light is lit

Which ONE of the following actions should be taken based on these conditions?

A. Continue the power reduction to 60% power and realign the CEAs

B. Continue the power reduction to be in HOT STANDBY conditions in 6 hours

C. Manually trip the Reactor and go to OP-2202.001, Standard Post Trip Actions

D. Stabilize the plant by adjusting turbine load to match T-REF within 2°F of T-AVE

QID use History

	RO	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☐	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

Answer:

C. Correct; the student should recognize the entry conditions have been met for the CEA Malfunction AOP and the action required due to 2 misaligned CEA >19"

Notes:

Distracters A, B and D are actions required in the CEA Malfunction AOP or Technical Specifications based on different misalignment scenarios. However only answer A is the correct action to take if two or more CEAs are misaligned by more than 19 inches.

References:

STM 2-02, Control Element Drive Mechanism Control System, Rev. 20, Section 1.2 [pages 5 and 6]
OP-2203.012-D ACA ,Rev. 034, window J-5 step 2.3 [page 52]
OP-2203.012-D ACA ,Rev. 034, window J-6 step 2.3 [page 63]
OP-2203.003, CEA Malfunction AOP, Rev. 020, entry section [page 1] step 5 [page 2]
A2LP-RO-ACEA, Rev. 0, Obj. 2: Describe the mitigation strategy and instructions for actions directed in OP-2203.003, CEA Malfunctions AOP and Obj. 6: Given a set of plant parameters, DETERMINE if the entry conditions are met for entering the CEA malfunction AOP

Historical Comments:

Modified NRC bank question 0409

Bank:	1904	**Rev:**	0	**Rev Date:**	5/14/2012 2:26:56	**QID #:**	83	**Author:**	Foster		
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	0000282236	**10CFR55:**	41.10 / 43.5	**Safety Function**	2						
System Title:	Pressurizer (PZR) Level Control Malfunction	**System Number**	028	**K/A**	2.2.36						
Tier:	1	**Group:**	2	**RO Imp:**	3.1	**SRO Imp:**	4.2	**L. Plan:**	A2LP-RO-A480V	**OBJ**	2

Description: Equipment Control - Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.

Question:

Consider the following:

- Unit 2 is operating at 30% power
- "A", "C", and "D" Condensate pumps are running
- "A" Coolant Charging Pump [CCP] is running
- "A" and "C" Service Water pumps are running
- Planned Electrical maintenance is in progress on 2B61 Vital Load center
- The ATC reports he has indication of a loss of power to 2B61

Letdown flow should ________________ due to the loss of power and the CRS should direct entry into ________________ AOP.

A. go to minimum flow; OP-2203.036, Loss of Charging

B. go to minimum flow; OP-2203.045, Loss of 480 Volt Vital Bus

C. be isolated; OP-2203.036, Loss of Charging

D. be isolated; OP-2203.048, Loss of 480 Volt Vital Bus

Answer:

D. Correct; Letdown flow will go to zero [will be lost] with a loss of power to the Pressurizer level controller [2LIC-4647] entry conditions for the Loss of 480 Volt Vital Bus AOP are met.

Notes:

A. Incorrect; Letdown Flow would go to minimum flow [28 to 32 gpm] it the controller failed low [minimum output]; the Loss of Charging AOP entry conditions are not met [the AOP deals with charging issues not Letdown]

B. Incorrect; Incorrect; Letdown Flow would go to minimum flow [28 to 32 gpm] it the controller failed low [minimum output]

C. Incorrect; Letdown would isolate but the Loss of Charging AOP entry conditions are not met [the AOP deals with charging issues not Letdown]

References:

OP-2203.045, Loss of 480 volt Vital Bus AOP, Rev. 004, entry section [page 1] and section 7 step 4 [page 24]

AOP-2203.045, Loss of 480 volt Vital Bus AOP Tech Guide, Rev. 004,section 7 [page 36] which describes the actions taken referencing section 6, step 5, for restoring Letdown [page 25]

A2LP-RO-A480V, Rev.0 ,Obj. 2, Describe the mitigation strategy and instructions for actions directed in the Loss of 480 Volt Vital Bus AOP, OP-2203.045

Historical Comments:

New Question

LOSS OF 480 VOLT VITAL BUS

PURPOSE

This procedure provides actions for loss of 480 volt vital buses (Load Centers and MCCs).

ENTRY CONDITIONS

ANY of the following conditions exist:

1. "LOAD CENTER 2B5 UNDERVOLT" annunciator (2K08-A3) in alarm.
2. "LOAD CENTER 2B6 UNDERVOLT" annunciator (2K09-A3) in alarm.
3. Loss of power to ANY vital Load Center or MCC.

EXIT CONDITIONS

WHEN the following conditions exist:

1. Power restored to ALL 480 volt vital buses.
2. ALL systems affected by power loss returned to operable status.

THEN exit this procedure.

SECTION 7

LOSS OF 2B61

*1. **<u>IF</u> unable to maintain Steam Generator levels,**
<u>THEN</u> perform the following:

A. Manually trip Reactor.

B. Perform 2202.001, Standard Post Trip actions in conjunction with this procedure.

2. **Place Condensate Pump Recirc (2FIC-0663) in MANUAL and closed.**

NOTE
Condensate pumps 2P-2B and 2P-2D will trip three minutes after 2Y2 power lost.

3. **Verify Condensate pumps 2P-2B and 2P-2D handswitches in PULL-TO-LOCK.**

4. **Perform the following to restore letdown flow:**

A. Place LD Flow Controller (2HIC-4817) in MANUAL with zero output.

B. Select Letdown Backpressure Control Valve (2CV-4810).

C. Verify running Charging pump selected as lead pump on 2HS-4868.

D. Restore letdown using 2104.002, Chemical and Volume Control, Restoring Letdown Flow (After Temporary Isolation).

5. **Perform the following to regain Pressurizer Pressure control:**

A. Place the following handswitches in CHANNEL A position:

- PZR Low Level Cutoff Select (2HS-4642).
- PZR Press Channel Select (2HS-4626).
- PZR Level Channel Select (2HS-4628).

B. Verify the following Pressurizer Heaters restored:

- Proportional Heater Bank #1
- Backup Heater Bank #1
- Backup Heater Bank #3

*6. **Maintain PZR pressure ± 50 psia of setpoint.**

SECTION 6

AOP STEP:

5. Perform the following to restore letdown flow:

BASIS:

Letdown flow is lost due to PZR level controller (2LIC-4627) de-energized and sending zero output to Letdown Flow controller (2HIC-4817). Backpressure control valve 2CV-4811 is powered from 2Y2 and fails closed; therefore backpressure control valve 2CV-4810 must be selected to prevent lifting 600 psig relief valve. Running charging pump selected as lead pump to prevent shutdown on high PZR level signal when 2Y2 power restored.

SOURCE DOCUMENTS:

1. E-2782
2. E-2712 sheet 1

SECTION 6

AOP STEP:

6. Perform the following to regain Pressurizer Pressure control:

BASIS:

If Control Channel A PZR pressure is NOT selected, then ALL heaters will be lost on a loss of 2Y2. This step ensures control is selected to operable channel. Proportional heaters on bus 2B6 will be lost due to no power and de-energization of relay 63X/LC210. Backup heaters powered from bus 2B10 will also be lost due to de-energization of relay 63X/LC210.

SOURCE DOCUMENTS:

1. E-2782 sheet 1-3.
2. E-2190
3. E-2191

Loss of 2B61 will require many of the same actions that are required for a loss of 2B6. A repeat of these steps and the basis/source documentation for each of these steps is unnecessary. The information for the duplicated steps is in the 2B6 section of this Tech Guide. The following information will discuss the different actions required for a loss of 2B61 only.

If not already in operation, 2D02 Battery Charger 2D-32A will be placed in service to maintain 2D12 voltage and amperage at their normal levels. Performance of this step negates all actions associated with battery depletion.

A list of Tech Specs and affected components is included in the AOP. Actions required by each Tech Spec are included in order of time requirement and importance.

- TS 3.8.2.3 does not apply if 2D-32A was in service.
- #2 EDG is inoperable due to loss of power to Service Water Outlet Valve (2CV-1504-2).

Loss of power to the Master Recirc (2CV-5628-2) does not affect operability of Red Train HPSI, LPSI and Spray pumps as long as 2CV-5628-2 is open and the respective Mini-Recirc is operable.

Per Licensing, based on the fire in 2B53 on 10/30/06, an intact Steam Generator constitutes isolation for deenergized secondary MOVs, so TS 3.6.3.1 is being complied with for these valves.

Bank:	1905	**Rev:**	0	**Rev Date:**	5/23/2012 9:16:56	**QID #:**	84	**Author:**	Foster
Lic Level:	S	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	Modified NRC bank 1709		
Search	0000322411	**10CFR55:**	41.10 / 43.5 / 45.13	**Safety Function**	7				
System Title:	Loss of Source Range Nuclear Instrumentation	**System Number**	032	**K/A**	2.4.11				
Tier:	1	**Group:**	2	**RO Imp:**	4.0	**SRO Imp:**	4.2	**L. Plan:**	A2LP-RO-FH
OBJ	5								
Description:	Emergency Procedures/Plan - Knowledge of abnormal condition procedures.								

Question:

Consider the following:

- Unit 2 is in mode 6
- Core Reload is in progress
- Refueling Boron concentration is 2825 ppm
- #2 source range neutron flux monitor has failed low

What action(s) is(are) required (if any) due to the above conditions?

A. No action required, T.S. 3.9.2 requirements are satisfied

B. Immediately suspend all operations involving CORE ALTERATIONS

C. Verify Audible count rate on the refueling bridge and continue with fuel movement

D. Restore the source range monitor to OPERABLE status within 1 hour, or suspend CORE ALTERATIONS

Answer:

B. Correct; T.S. 3.9.2 action a. has you immediately suspend all operations involving CORE ALTERATIONS

Notes:

With the Unit in refuel mode of operations the source range instrumentation requirements and actions if a failure were to occur, will be directed from the goveming procedure and T.S. therefore the T.S. will be used to cope with a source range NI failure and actions will be directed accordingly.
A, C, and D are Incorrect based on T.S. 3.9.3 requirements. In Mode 6, a minimum, two source range neutron flux monitors shall be operating, each with continuous visual indication in the control room and one with audible indication in the containment and control room or core onload cannot continue.

References:

T.S 3.9.2, Refueling Operations Instrumentation, and the Basis 3/4.9.2, Rev. 48
A2LP-RO-FH, Rev. 1, Obj. 5, given a set of plant conditions associated with fuel handling, evaluate Technical Specification and Technical Requirement entry conditions and describe any LCO actions that may be required.
A2LP-RO-NI Rev. 11, Obj. 8: Using the Unit 2 Tech Specs explain the Limiting Condition for operations and Surveillance requirements associated with the Excore NI system.

Historical Comments:

Modified NRC bank question 1709, this question has not been previously used.

REFUELING OPERATIONS

INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.9.2 As a minimum, two source range neutron flux monitors shall be operating, each with continuous visual indication in the control room and one with audible indication in the containment and control room.

APPLICABILITY: MODE 6.

ACTION:

a. With one of the above required monitors inoperable, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

b. With both of the above required monitors inoperable, determine the boron concentration of the reactor coolant system at least once per 12 hours.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.2 Each source range neutron flux monitor shall be demonstrated OPERABLE by performance of:

a. A CHANNEL CHECK at least once per 12 hours,

b. A CHANNEL FUNCTIONAL TEST at least once per 7 days, and

c. A CHANNEL FUNCTIONAL TEST within 8 hours prior to the initial start of CORE ALTERATIONS.

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: 1) the reactor will remain subcritical during CORE ALTERATIONS, and 2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the accident analyses.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short-lived fission products. This decay time is consistent with the assumptions used in the accident analyses.

3/4.9.4 CONTAINMENT PENETRATIONS

The requirements on containment penetration closure ensure that a release of radioactive material within containment will be restricted from leakage to the environment. The OPERABILITY and closure restrictions are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE.

Containment penetrations, the personnel airlock doors, and/or the equipment door may be open during movement of irradiated fuel in the containment and during CORE ALTERATIONS provided a minimum of one closure method (manual or automatic valve, blind flange, or equivalent) in each penetration, one door in each airlock, and the equipment door are capable of being closed in the event of a fuel handling accident. This allowance assumes that 23 feet of water is maintained above the fuel seated within the reactor vessel to ensure any offsite dose consequence remains within 10 CFR 50.67 limits in the event of a fuel handling accident. Equivalent isolation methods must be approved and may include use of a material that can provide a temporary atmospheric pressure ventilation barrier. For closure, the equipment door will be held in place by a minimum of four bolts.

QID: 1709 **Rev:** 1 **Rev Date:** 7/17/2009 9: **RO Select:** **SRO Select:** **Points:**

Lic Level: S **Difficulty:** 3 **Taxonomy:** H **Source:** xam Bank 1484 M **Originator:** Coble

10CFR55_41: **10CFR55_43:** **Section:** **Type:**

System Title: Generic **System Number** :NER **K/A:** 2.1.1

RO Tier: 3 **RO Group:** 1 **RO Imp:** 3.8 **SRO Tier:** **SRO Group:** 1 **SRO Imp:** 4.2

Description: Conduct of Operations - Knowledge of conduct of operations requirements.

Question:

Consider the following:

* Unit 2 has tripped from full power
* RCS pressure is 1450 psia and slowly lowering
* All RCPs have been secured due to low subcooling margin
* PZR Level is 22% and slowly lowering
* 'A' SG Main Steam Radiation is in alarm and reads 175 mr/hr
* 'B' SG Main Steam Radiation is in alarm and reads 2500 mr/hr
* Condenser Off-Gas Radiation is alarm

Which of the following would be the correct procedure to diagnose after SPTAs and which of the following RCPs should be started FIRST to mitigate this event and why? (Assume all RCP restart conditions are satisfied)

PARENT

A. EOP 2202.004, Steam Generator Tube Rupture; 2P-32C to ensure thorough mixing of the boron with the RCS during SG draining

B. EOP 2202.004, Steam Generator Tube Rupture; 2P-32B to prevent sending a slug of diluted water through the Reactor core

C. AOP 2203.038, Primary to Secondary Leakage; 2P-32C to prevent sending a slug of diluted water through the Reactor core

D. AOP 2203.038, Primary to Secondary Leakage; 2P-32B to ensure thorough mixing of the boron with the RCS during SG draining

Answer:

B. EOP 2202.004, Steam Generator Tube Rupture; 2P-32B to prevent sending a slug of diluted water through the Reactor core

Notes:

Based on the indication a SGTR has occurred in the 'B' Steam Generator (ruptured SG) and 'A' Steam Generator is considered the intact SG. A RCP in the intact (least affected) loop should be started first and flow should be allowed to stabilize for 5 minutes (Steam Generator "A" loop is RCPs 'A" and 'B'). Following the stabilization period the selected RCP in the ruptured loop should be enabled and started. The 5 minute time delay is necessary to allow for mixing of a possible slug of water with reduced boron concentration from the ruptured SG loop. Distracters A and C are incorrect because 2P-32C is on the ruptured loop. Distracter D is incorrect because the reason is wrong.

References:

EOP 2202.004 SGTR, Rev. 9, Step 13 (Note), Step 45 and Technical Guidance for Step 45
STM 2-03-02 RCPs, Rev. 13 Figure on page 44
Lesson Plan A2LP-RO-ESGTR, Rev. 5, Objective 12: Given a set of plant conditions during a SGTR, determine if a RCP can be restarted.

Historical Comments:

Bank:	1906	**Rev:**	0	**Rev Date:**	4/23/2012 1:34:03	**QID #:**	85	**Author:**	Foster
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	Modified NRC bank 0520		
Search	000036A202	**10CFR55:**	41.7 / 41.10 / 43.7	**Safety Function**	8				
System Title:	Fuel Handling Incidents	**System Number**	036	**K/A**	AA2.02				
Tier:	1	**Group:**	2	**RO Imp:**	3.4	**SRO Imp:**	4.1	**L. Plan:**	A2LP-RO-FH
OBJ	4								

Description: Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: -'Occurrence of a fuel handling incident

Question:

Consider the following:

- Unit 2 is in Mode 6
- Refueling is in progress
- A fuel assembly has been dropped in the Spent Fuel Pool (SFP)
- Bubbles are emerging from the dropped fuel assembly

Which of the following actions should be performed for the given conditions?

A. Perform a local evacuation of the Unit 2 SFP area

B. Commence adding Boric acid to the SFP for Shutdown Margin

C. Refueling SRO Directs immediate recovery of dropped fuel assembly

D. Secure the SFP area ventilation exhaust fans to prevent an offsite release

Answer:

A. Correct, OP-2502.001 Refueling Shuffle section 2.0 (Immediate actions) step 2.4.2 directs performing a localize evacuation (step 2.4.2 Perform a localize evacuation IAW 1903.030)

Notes:

B. Incorrect, not directed by procedure, also SDM is verified shiftily during refueling and the minimum boron concentration for refueling operation is 2500 ppm.
C. Incorrect, refueling SRO will be evacuated and a recovery plan will be developed for fuel assembly recovery.
D. Incorrect, OP-2502.001 section 3.0 (follow-up actions) step 3.4.1 monitor for activity using the SFP area exhaust fan Rad monitor and SPING 7.

References:

OP-2502.001, Refueling Shuffle, Rev. 045, Attachment M, Refueling Accident. [page 77]
A2LP-RO-FH, Rev. 1, Obj. 4, Given a fuel handling evolution, determine the correct response

Historical Comments:

Modified NRC bank question 0520

REFUELING ACCIDENT

1.0 SYMPTOMS/ENTRY CONDITIONS

- Bubbles emerging from a submerged Spent Fuel assembly that was dropped or damaged.
- Visual inspection reveals abnormally bent, twisted, or warped Spent Fuel assembly.
- High or abnormal air activity indications on installed or portable air radiation monitor.
- SRO in charge of fuel handling believes a Spent Fuel assembly has been damaged.

2.0 IMMEDIATE ACTIONS

2.1 Persons discovering emergency condition will notify Control Room by most expedient means available.

* 2.2 IF specified fuel handling termination criteria discussed in IPTE/Pre-Job brief is exceeded,
THEN load should be left and job site exited.

{4.3.2}
2.3 **IF fuel handling in progress,**
AND time/dose permits,
THEN the SRO in charge of fuel handling may evaluate placing the fuel assembly in the safest location available prior to bridge evacuation.

2.4 IF accident has occurred at Spent Fuel Pool,
THEN perform the following:

2.4.1 Announce location and nature of emergency

2.4.2 Perform localized evacuation IAW Plant Evacuation (1903.030).

2.5 IF accident has occurred inside Containment,
THEN perform the following:

2.5.1 Verify CNTMT purge secured IAW Containment Atmosphere Control (2104.033).

2.5.2 Obtain SM concurrence for CNTMT evacuation and closure.

2.5.3 Perform "Containment Closure Checklist", Attachment F of SDC Control (1015.008).

2.5.4 Notify Radiation Protection to evacuate CNTMT of all personnel NOT involved with CNTMT closure.

QID:	0520	Rev:	0	Rev Date:	11/7/2004	RO Select:		SRO Select:		Points:	1.00
Lic Level:	S	Difficulty:	3	Taxonomy:	A	Source:	IH 10994 MOD	Originator:	COBLE		
10CFR55_41:	NA	10CFR55_43:	43.5	Section:	4.2	Type:	GENERIC APE				
System Title:	FUEL HANDLING INCIDENTS	System Number	036	K/A:	AA2.02						
RO Tier:	NA	RO Group:	NA	RO Imp:	NA	SRO Tier:	1	SRO Group:	2	SRO Imp:	4.1

Description: Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: Occurrence of a fuel handling incident.

Question:

The following plant conditions exist.

* Mode 6 with Refueling in progress.
* A NEW fuel assembly is dropped from the spent fuel handling machine and falls to the bottom of the fuel tilt pit between the upender and the tilt pit gate valve.
* NO bubbles are emerging from the dropped fuel assembly.
* The readings on the spent fuel handling area ventilation exhaust (SPING 7) are stable and have not changed in the last hour.
* There has been no change in area radiation in the Spent Fuel Pool

PARENT

Which of the following actions should be performed for the given conditions?

A. Sound the plant evacuation alarm, evacuate the Unit 2 SFP area due to the refueling accident, and suspend all core alterations in containment.

B. Prevent all personnel access to the SFP Area floor on both units to minimize dose from the dropped fuel assembly and evacuate the Auxiliary Building.

C. Secure the SFP area ventilation exhaust fans to prevent a release of airborne activity to the atmosphere and evacuate the SFP 404 elevation on both units.

D. Develop a recovery plan after the fuel handler on the spent fuel handling machine notifies the control room by the most expedient means possible .

Answer:

D. Develop a recovery plan after the fuel handler on the spent fuel handling machine notifies the control room by the most expedient means possible .

Notes:

By the description and symptoms listed in Attachment M Steps 2.0 and 4.0, this incident does not classify as a Refueling Accident since it is not a spent fuel assembly and there are no signs of airborne activity therefore the assembly need to be recovered and inspected before use. Step 4.2.1 of Attachment M is the correct response.

Distracter A is incorrect because this is not a refueling accident.

Distracter B is incorrect because there should be no significant dose from a new fuel assembly.

Distracter C is incorrect because there is no airborne activity in the area and if there were the ventilation fans should be ran to filter this activity.

References:

NOP 2502.001, Refueling Shuffle, Attachment M Section 4, Refueling Accident.
A2LP-RO-FH OBJ. 4, Given a fuel handling evolution or condition, determine the correct response.

Historical Comments:

This question has not been used on any previous NRC exams. BNC 11/10/2004.

Bank:	1907	**Rev:**	1	**Rev Date:**	6/27/2012 11:03:5	**QID #:**	86	**Author:**	Foster		
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	007000A202	**10CFR55:**	41.5 / 43.5	**Safety Function**	5						
System Title:	Pressurizer Relief Tank/Quench Tank System (	**System Number**	007	**K/A**	A2.02						
Tier:	2	**Group:**	1	**RO Imp:**	2.6	**SRO Imp:**	3.2	**L. Plan:**	A2LP-RO-RCS	**OBJ**	29

Description: Ability to (a) predict the impacts of the following malfunctions or operations on the PRTS and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: - Abnormal pressure in the PRT

Question:

Given the following:

- Unit 2 is operating at 100% power
- The ATC reports 2CV-4847-2, RCP Bleedoff to VCT, indicates closed
- WCO reports the Instrument Air line to 2CV-4847-2 has ruptured

Given the above conditions, RCP controlled Bleedoff flow should be directed to the ____________ and, using the ACA, the CRS should direct relieving the tank pressure to the ____________.

A. Quench Tank; Containment sump

B. Reactor Drain Tank; Gas Collection Header

C. Quench Tank; Reactor Drain Tank

D. Reactor Drain Tank; Online Holdup Tank

Answer:

C. Correct, with the normal controlled Bleedoff flowpath isolated (2CV-4847-2 failed closed) controlled Bleedoff flow will directed to the Quench Tank via a relief valve (setpoint 150 psig) as QT level rises so will pressure and ACA 2K10 D-4 [Quench Tank Pressure HI] will come into alarm and direct QT venting to either the Gas Collection Header [section 7.5] or to the Reactor Drain Tank [section 7.6] of OP-2103.007, Quench Tank Reactor Drain Tank Operations NOP.

Notes:

A. Incorrect; there is a flowpath to Containment Sump from the QT via a relief valve and rupture disc and is not directed by the ACA
B. Incorrect; Control Bleedoff Flow is not aligned to the RDT, the RDT could be vented to the GCH
D. Incorrect; Control Bleedoff Flow is not aligned to the RDT, the RDT is normally pumped to a on line holdup tank

References:

OP-2203.012-J 2K10 ACA, Rev. 038, window D-4 (QT Pressure HI) page 41
OP-2103.007, Quench Tank and Reactor Drain Tank Ops, Rev. 021, section 3.0 [page 2] section 6.0 [page 4] section 7.6 [page 9] section 8.1, step 8.1.4 [page 15]
STM 2-04 Chemical and Volume Control System, Rev. 28, simplified drawing [page 63]
A2LP-RO-RCS, Rev. 23, Obj. 29, Given a set of plant conditions and the appropriate reference material, determine what actions should be taken for any alarm associated wit the Reactor Coolant System

Historical Comments:

New Question
Rev. 1: changed wording in stem from will to should

ANNUNCIATOR 2K10

D-4

QUENCH TANK PRESSURE HI

1.0 CAUSES

1.1 Quench tank (2T-42) pressure > 40 psig (2PIS-4694).

2.0 ACTION REQUIRED

NOTE

Pressure Relief Valve (2PSV-4696) relieves pressure to CNTMT sump at 70 psig. Rupture Disc (2PSV-4695) opens at 90 psig.

2.1 Vent Quench tank using 2103.007, Quench Tank and Reactor Drain Tank Ops.

2.2 Verify CNTMT LP N2 valve (2CV-6213-2) closed.

2.3 IF Quench tank pressure > 60 psig,
THEN submit WR to replace rupture disc (ANIN-900724-011).

3.0 TO CLEAR ALARM

3.1 Reduce pressure < 40 psig.

4.0 REFERENCES

4.1 E-2456-3

4.2 ANIN-900724-011

1.0 PURPOSE

To provide instructions for evolutions involving Quench Tank (2T-42), Reactor Drain Tank (2T-68) and associated systems.

2.0 SCOPE

This procedure provides a description and instructions for operation of Reactor Drain Tank (2T-68), Quench Tank (2T-42) and Reactor Drain Tank Pumps (2P-41A and 2P-41B).

3.0 DESCRIPTION

The purpose of the Quench Tank is to collect and condense discharge of Pressurizer Safety valves and to collect Reactor Coolant Pump (RCP) controlled bleed-off if normal bleed-off path fails or isolates. Pressurizer Low Temperature Over Pressure Protection relief valves, Pressurizer Emergency Core Cooling System vents and Pressurizer and Reactor Vessel Head High Point vents discharge to the Quench Tank through the Pressurizer Safety Valves discharge line. Quench Tank is maintained partially filled with water from Reactor Makeup water to allow for discharge of Pressurizer Safety Valves below water level for steam condensing. The Quench Tank drains to the Reactor Drain Tank. A relief valve and rupture diaphragm provide overpressure protection for the Quench Tank.

The Reactor Drain Tank collects water from the following systems and components:

- Quench Tank (2T-42)
- Reactor Coolant System (RCS) Loop drains
- Regenerative Heat Exchanger (2E-23) drain
- Letdown Line drain

- Gasket Leak-off from the Vessel Head and RCPs
- Shutdown Cooling Relief Valves (2PSV-5085 and 2PSV-5087)
- Safety Injection Tank Drains and Drain Header Relief
- Vapor Seal Leakage from the RCPs

The Reactor Drain Tank is a horizontal, cylindrical tank located in the Containment Building and has 1600 gallons capacity. It is designed for 250°F and internal pressure of < 25 psig. The Reactor Drain Tank is pumped to the Boron Management System (BMS) using the Reactor Drain Pumps (2P-41A and 2P-41B). These pumps have sufficient capacity to completely drain the Reactor Coolant System in 8 hours.

5.0 LIMITS AND PRECAUTIONS

5.1 The Quench Tank (2T-42) shall be in operation before RCS heatup and pressurization.

5.2 Quench Tank level (2LIS-4694) shall be maintained above 75% to keep spargers covered except during alternate method cooling evolution.

5.3 If Quench Tank pressure (2PIS-4694) exceeds 60 psig, rupture disc (2PSE-4695) shall be replaced. (ANIN-900724-011)

5.4 Do NOT bump MOVs (2CV-4685, 2CV-4691, and 2CV-4692) more than 6 times in any 30 second period. After 6 bumps allow 2 minutes for motor to cool. This is to prevent tripping MOV thermal overloads.

5.5 The Quench Tank and Reactor Drain Tank should be purged after Pressurizer Bubble formation and RCS venting operations to ensure any oxygen ingress has been eliminated. (CR-ANO-2-2000-0208)

{4.3.2}

5.6 Rx Drain Tank Makeup Water Isol valve (2CV-4693) is normally kept open to prevent Containment Penetration failure due to thermal expansion (GL96-06). If it is necessary, this valve can be closed for a short period of time (< 30 consecutive days). For longer than 30 consecutive days, a Design Engineering Evaluation is required.

5.7 During an outage, aligning RDT or Quench tank for venting while these tanks are pressurized can affect RCS level if the ECCS Vents are open and the Pressurizer Manway or Code Safety is installed. (CR-ANO-2-2006-2329) (CR-ANO-2-2008-0981)

5.8 This procedure has been determined to have a Reactivity Impact. Applicable sections that actually have an impact contain a "Caution" at the beginning of the section as follows:

> R
> A
> P
>
> **CAUTION**
>
> The following section has been determined to have a Reactivity Addition Potential (RAP) and this activity is classified as a Risk Level Rx (where "x" is a level 1, 2, 3 or 4 per COPD-030).

6.0 SETPOINTS

6.1 Quench Tank Relief Valve (2PSV-4696) .... 70 psig

6.2 Quench Tank Rupture Disc (2PSE-4695) .... 90 psig

6.3 Reactor Drain Tank Relief Valve (2PSV-2205) 25 psig

6.4 Reactor Drain Pump Suction Isolations (2CV-2201-2 and 2CV-2202-1) must be open before EITHER Reactor Drain Pump (2P-41A or 2P-41B) will start.

6.5 Reactor Drain Pumps (2P-41A and 2P-41B) automatically stop at 20.8% level in the Reactor Drain Tank (2T-68).

CAUTION

Venting pressurized Quench Tank could pressurize RCS and affect RCS level if ECCS vents open and Pressurizer Manway or Code Safeties installed. Refer to CR-ANO-2-2008-0981.

7.6 Venting Quench Tank to Reactor Drain Tank

7.6.1 Verify system aligned IAW System Alignment Verification section of 1015.001, Conduct of Operations.

* 7.6.2 IF NOT vented to atmosphere, THEN maintain greater than 1 psig nitrogen overpressure in Quench Tank IAW applicable "Adding N2 to Quench Tank" step of this procedure. (CR-ANO-2-2000-0208.

* 7.6.3 Monitor Quench Tank (2T-42) pressure (2PIS-4694/P4694).

7.6.4 Verify RDT vent 2CV-2203 open (2HS-2203) on 2C112.

7.6.5 Throttle open Quench Tank Vent Isol 2CV-4691 (2HS-4691).

7.6.6 WHEN Quench Tank at desired pressure, THEN close Quench Tank Vent Isolation 2CV-4691 (2HS-4691).

7.6.7 Close RDT Vent 2CV-2203 (2HS-2203) on 2C112.

8.0 REACTOR DRAIN TANK OPERATIONS

8.1 Lowering RDT Level - Normal Method

8.1.1 Verify system aligned IAW System Alignment Verification section of 1015.001, Conduct of Operations.

* 8.1.2 IF NOT vented to atmosphere, THEN use applicable "Adding N2 to RDT" step of this procedure to maintain greater than 1 psig nitrogen overpressure in RDT. (CR-ANO-2-2000-0208)

* 8.1.3 Monitor the following:

- Reactor Drain Tank level (2LIS-2200/L2200)
- Reactor Drain Tank pressure (2PIS-2200/P2200)

8.1.4 Verify at least ONE BMS Holdup Tank Inlet valve open:

- 2T-12A Inlet 2CV-2230 (2HS-2230)
- 2T-12B Inlet 2CV-2231 (2HS-2231)
- 2T-12C Inlet 2CV-2232 (2HS-2232)
- 2T-12C Inlet 2CV-2233 (2HS-2233)

8.1.5 Open the following valves:

- RDT Pump Suction 2CV-2201-2 (2HS-2201-2)
- RDT Pump Suction 2CV-2202-1 (2HS-2202-1)

8.1.6 Start ONE or BOTH Reactor Drain Pumps:

- RDT Pump 2P-41A (2HS-2205)
- RDT Pump 2P-41B (2HS-2204)

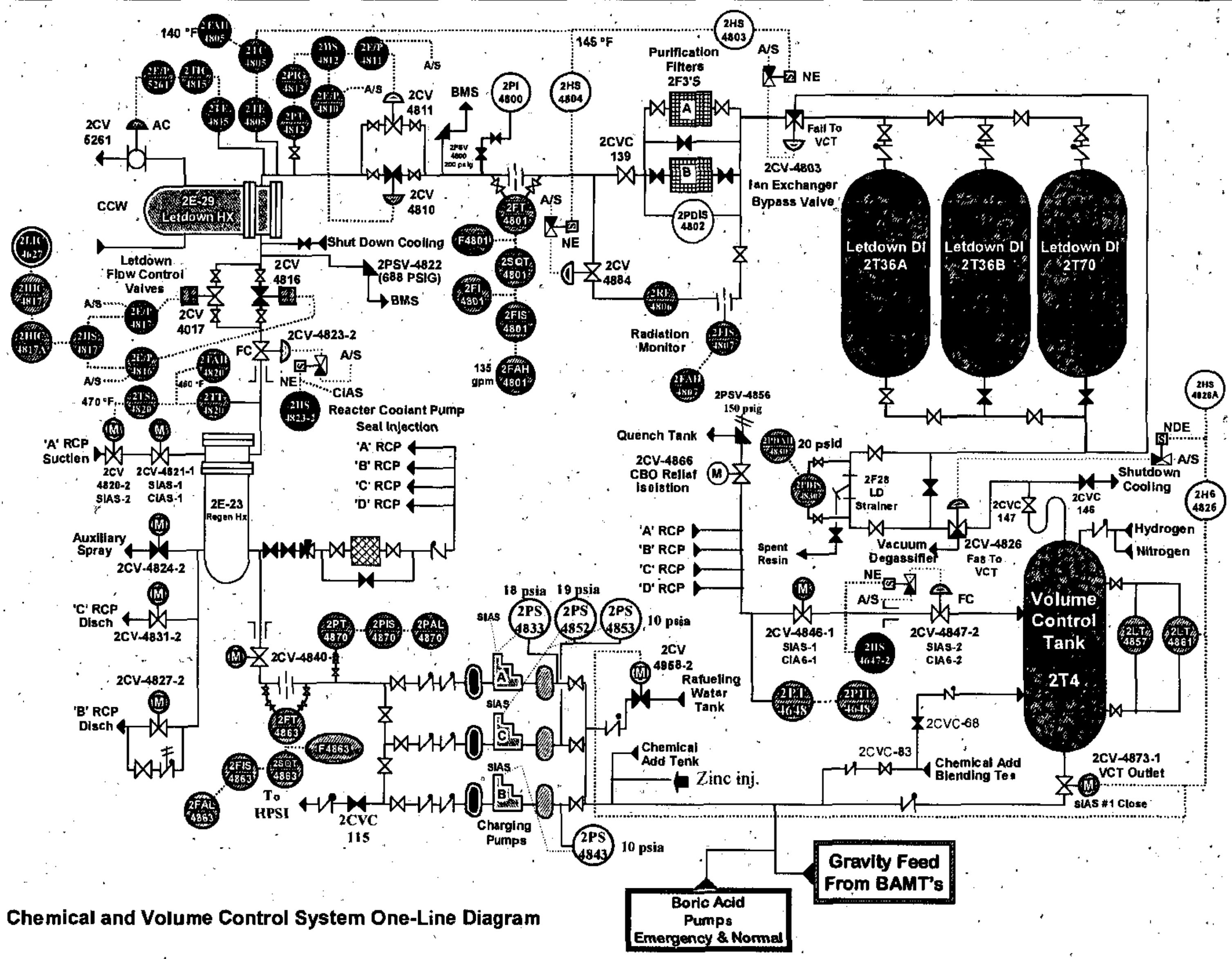
NOTE
Reactor Drain Pumps automatically secure at 20.8% RDT level (2LIS-2200).

8.1.7 WHEN Reactor Drain Tank reaches desired level, THEN stop Reactor Drain Pump(s):

- RDT Pump 2P-41A (2HS-2205)
- RDT Pump 2P-41B (2HS-2204)

8.1.8 Close the following valves:

- RDT Pump Suction 2CV-2201-2 (2HS-2201-2)
- RDT Pump Suction 2CV-2202-1 (2HS-2202-1)



Chemical and Volume Control System One-Line Diagram

REV 0

Data for 2012 NRC RO/SRO Exam

27-Jun-12

Bank: 1907 **Rev:** 0 **Rev Date:** 5/17/2012 11:32:5 **QID #:** 86 **Author:** Foster

Lic Level: S **Difficulty:** 3 **Taxonomy:** H **Source:** NEW

Search 007000A202 **10CFR55:** 41.5 / 43.5 **Safety Function** 5

System Title: Pressurizer Relief Tank/Quench Tank System (**System Number** 007 **K/A** A2.02

Tier: 2 **Group:** 1 **RO Imp:** 2.6 **SRO Imp:** 3.2 **L. Plan:** A2LP-RO-RCS **OBJ** 29

Description: Ability to (a) predict the impacts of the following malfunctions or operations on the PRTS and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: - Abnormal pressure in the PRT

Question:

Given the following:

- Unit 2 is operating at 100% power
- The ATC reports 2CV-4847-2, RCP Bleedoff to VCT, indicates closed
- WCO reports the Instrument Air line to 2CV-4847-2 has ruptured

Given the above conditions, RCP controlled Bleedoff flow will be directed to the ___________ and, using the ACA, the CRS will direct relieving the tank pressure to the _____________.

A. Quench Tank; Containment sump

B. Reactor Drain Tank; Gas Collection Header

C. Quench Tank; Reactor Drain Tank

D. Reactor Drain Tank; Online Holdup Tank

QID use History

	RO	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☐	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

Answer:

C. Correct, with the normal controlled Bleedoff flowpath isolated (2CV-4847-2 failed closed) controlled Bleedoff flow will directed to the Quench Tank via a relief valve (setpoint 150 psig) as QT level rises so will pressure and ACA 2K10 D-4 [Quench Tank Pressure HI] will come into alarm and direct QT venting to either the Gas Collection Header [section 7.5] or to the Reactor Drain Tank [section 7.6] of OP-2103.007, Quench Tank Reactor Drain Tank Operations NOP.

Notes:

A. Incorrect; there is a flowpath to Containment Sump from the QT via a relief valve and rupture disc and is not directed by the ACA
B. Incorrect; Control Bleedoff Flow is not aligned to the RDT, the RDT could be vented to the GCH
D. Incorrect; Control Bleedoff Flow is not aligned to the RDT, the RDT is normally pumped to a on line holdup tank

References:

OP-2203.012-J 2K10 ACA, Rev. 038, window D-4 (QT Pressure HI) page 41
OP-2103.007, Quench Tank and Reactor Drain Tank Ops, Rev. 021, section 3.0 [page 2] section 6.0 [page 4] section 7.6 [page 9] section 8.1, step 8.1.4 [page 15]
STM 2-04 Chemical and Volume Control System, Rev. 28, simplified drawing [page 63]
A2LP-RO-RCS, Rev. 23, Obj. 29, Given a set of plant conditions and the appropriate reference material, determine what actions should be taken for any alarm associated wit the Reactor Coolant System

Historical Comments:

New Question

Bank:	1908	**Rev:**	0	**Rev Date:**	4/20/2012 1:35:28	**QID #:**	87	**Author:**	Foster		
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	0260002212	**10CFR55:**	41.10 / 43.2	**Safety Function**	5						
System Title:	Containment Spray System (CSS)	**System Number**	026	**K/A**	2.2.12						
Tier:	2	**Group:**	1	**RO Imp:**	3.7	**SRO Imp:**	4.1	**L. Plan:**	A2LP-RO-SPRAY	**OBJ**	10
Description:	Equipment Control - Knowledge of surveillance procedures.										

Question:

Consider the following:

- Unit 2 is operating at 100% power
- Quarterly surveillance for the "B" Spray pump is scheduled (Containment Spray procedure OP-2105.005, Supplement 2)

During the performance of the "B" Spray pump quarterly surveillance, the Containment Spray system Tech Spec (3.6.2.1) ______ required to be entered and a flowpath ______ established through the "B" Shutdown Cooling Heat Exchanger (2E-35B).

A. is; is

B. is; is not

C. is not; is

D. is not; is not

Answer:

A. Correct, the Spray pump is INOP during the surveillance and step 2.1 in supplement 2 prompts entry into T.S. 3.6.2.1 (applicable in modes 1, 2, and 3) and flow is aligned through the SDC Hx during the test.

Notes:

B, C, and D are Incorrect, for reasons stated above

References:

STM 2-08, Containment Spray System, rev. 22, simplified drawing on page 40 (flowpath)
OP-2104.005, Containment Spray, rev. 063, Supplement 2 (2P-35B Quarterly Test with SDC Secured) [pages 82, 83, and 84]
A2LP-RO-SPRAY, Rev. 11, Obj. 10, Summarize the operation of the CSS during the following modes of operation to include the flow path as appropriate and the purpose of ant task specific notes and/or cautions: Quarterly Operability Testing

Historical Comments:

New Question

2.0 TEST METHOD

2.1 IF in Mode 1, 2, or 3,
THEN verify entry into Tech Spec 3.6.2.1.

2.2 Verify the following valves open:

- RWT Recirc/Test Line Return Isol (2BS-25)
- RWT Recirc/Test Line Inlet to RWT (2BS-26)
- ESF Mini-Recirc Header Isolation (2CV-5628-2)
- 2P-35B Recirc Iso (2CV-5672-1)
- RWT 2T-3 Outlet (2CV-5631-2)
- 2E-47B SW Inlet (2CV-1448-2)
- SW Header Isol (2CV-1406-2)

2.3 IF 2P-89A is operable,
THEN verify the following alignment for testing RWT Outlet to A ESF Suction Header (2BS-1A):

- 2P-89A Recirc Isol (2CV-5126-1) open
- HPSI 2P-89A Recirc to Suction (2SI-64) open
- HPSI 2P-89A Recirc to Suction (2BS-53) open

2.4 IF 2P-89C aligned to Red Train
AND 2P-89A is removed from service,
THEN verify the following alignment for testing RWT Outlet to A ESF Suction Header (2BS-1A):

- 2P-89C Recirc Isol (2CV-5127-1) open
- HPSI 2P-89C Recirc to Suction (2SI-62) open
- C HPSI Pump Recirc to B Suction (2SI-67) closed
- C HPSI Pump Recirc to A Suction (2SI-66) open
- HPSI 2P-89A Recirc to Suction (2BS-53) open

{4.3.1} 2.5 **Verify 2P-35B Discharge (2BS-4B) operable per IST Program testing requirements by performing the following:**

2.5.1 Unlock AND close 2BS-4B.

2.5.2 Record 2BS-4B position in Section 3.0 of this supplement.

2.5.3 LOCK OPEN 2BS-4B. Performed By: ____________________

2.6 Verify SDC Hx Return (2CV-5093) closed.

2.7 Unlock AND open SDC Hx 2E-35B Outlet X-connect Isol (2SI-5B) a minimum of 30 turns (50% open).

NOTE

An operator shall be designated to shut 2SI-18 as directed by Control Room upon receipt of a CSAS OR SIAS. This maintains CSS Availability. (NEI 99-02, CR-ANO-C-2001-0099) (OE-28755, CR-ANO-2-2009-01817)

2.8 Designate operator to shut 2SI-18 if directed by Control Room.

* 2.9 IF CSAS OR SIAS received,
THEN direct designated operator to shut 2SI-18.

2.10 Open CS/LPSI System Recirc to RWT (2SI-18) at least 3 turns.

2.11 Verify at least two available SDC Hx Room Coolers secured AND in NORMAL AFTER STOP:

- SDC Hx Room cooler (2VUC-1D)
- SDC Hx Room cooler (2VUC-1E)
- SDC Hx Room cooler (2VUC-1F)

NOTE

Motor idle oil level shall be at lower mark (cold) to 1/2 inch above lower mark.

2.12 Check CSS 2P-35B motor sight glass idle oil level at lower mark (cold) to 1/2 inch above lower mark.

2.12.1. IF 2P-35B motor oil level not within prescribed band, THEN initiate the following actions:

- WR/WO to adjust oil level
- Condition Report
- Suspension of surveillance until oil level adjusted to within prescribed band.

2.13 Unisolate CS Pump 2P-35B Suction Pressure gauge (2PI-5687) by opening the following valves:

- CS Pump 2P-35B Suction 2PI-5687 Isol (2BS-5687A)
- CS Pump 2P-35B Suction 2PI-5687 Isol (2BS-5687B)

{4.3.4} **2.14 To test 2BS-1A closure perform the following:**

2.14.1 Verify 2P-60A Suction Isol (2SI-2A) open.

2.14.2 Verify LPSI Pump Suction Pressure Transmitter Isolation valves open:

- LPSI 2P-60A Suction 2PI-5039 (2SI-5039A)
- LPSI 2P-60A Suction 2PT-5039 (2SI-5039)

2.14.3 Verify LPSI Pump Suct/Disch Press (2PI-5039A) on.

2.14.4 Setup computer trends for P5039.

2.14.5 Record 2P-60A Suction Pressure in Section 3.0 of this supplement.

2.15 IF performing non-intrusive full open test of 2BS-1B, THEN notify Component Engineer of pump start.

2.16 Start 2P-35B.

2.17 Unisolate CS Pump 2P-35B Discharge Pressure Gauge (2PI-5688) by opening the following valves:

- CS Pump 2P-35B Disch 2PI-5688 isol/drain (2BS-1029B)
- CS Pump 2P-35B Disch 2PI-5688 isol/drain (2BS-1030B)

2.18 IF less than 200 gpm indicated on 2FIS-5616, THEN throttle open 2SI-18 until greater than 200 gpm is indicated.

2.19 Close 2P-35B Recirc Isol (2CV-5672-1).

2.20 Throttle open 2SI-18 to between 2225 and 2315 gpm AND record flow in Section 3.0 of this supplement.

{4.3.4} 2.21 **For 2BS-1A closure check, record final 2P-60A Suction Pressure in Section 3.0 of this supplement.**

2.22 Verify LPSI Pump Suct/Disch Press (2PI-5039A) off.

2.23 IF available, THEN verify the following Room coolers start (~ 70 sec time delay):

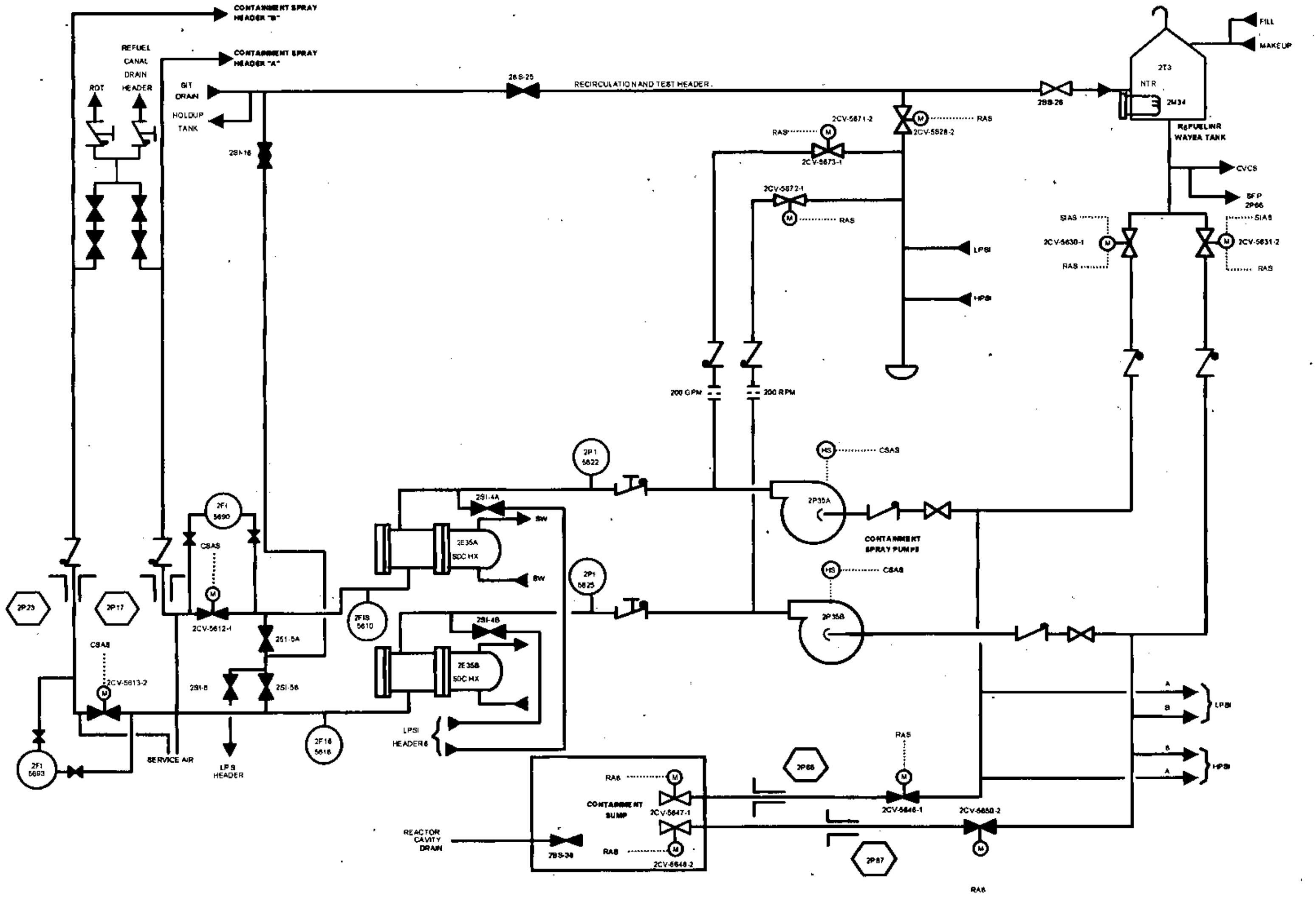
- 2VUC-1D
- 2VUC-1E

2.23.1 IF EITHER 2VUC-1D OR 2VUC-1E NOT available, THEN start 2VUC-1F.

2.24 Inspect Containment Spray System valve packing, flange gaskets, and pump seals in the ESF room for leakage.

- IF pump seal leakage ≥ 17 drops per minute, THEN initiate Condition Report AND WR/WO for repair of mechanical seal.

Figures



SIMPLIFIED DIAGRAM- CONTAINMENT SPRAY SYSTEM

Bank: 1909	**Rev:** 0	**Rev Date:** 5/14/2012 11:58:1		**QID #:** 88		**Author:** Foster			
Lic Level: S	**Difficulty:** 2	**Taxonomy:** H		**Source:** NEW					
Search 0590002130		**10CFR55:** 41.7 / 43.5 / 45.7		**Safety Function** 4					
System Title: Main Feedwater (MFW) System				**System Number** 059		**K/A** 2.1.30			
Tier: 2	**Group:** 1	**RO Imp:** 4.4	**SRO Imp:** 4.0	**L. Plan:** A2LP-RO-MFPTC		**OBJ** 22			
Description: Conduct of Operations - Ability to locate and operate components, including local controls.									

Question:

Consider the following:

- Unit 2 is operating at 60% power
- "A" Main Feed Pump is in operation
- "B" Main Feed Pump is running at idle speed
- Annunciator 2K03 D-8, Turb BRG Temp HI, is in alarm

"A" Main Feed Pump turbine oil temperature __________ be locally controlled at the temperature control valve, and if oil temperature can not be lowered the ACA should direct

__________________________.

A. can; reducing load on "A" MFP

B. can; placing "B" MFP in service

C. can not; reducing load on "A" MFP

D. can not; placing "B" MFP in service

Answer:

A. Correct, the ACA directs taking actions to manually control LO temperatures, first from the control room TIC-5283 (ACA step 2.2.2) and then locally (ACA step 2.2.3) ACA step 2.2.4 direct lowering turbine load (reduce speed)

Notes:

B, C and D are incorrect; The LO temperature can be controlled locally but placing a second MFP in service will only raise LO temperature (raise load on the LO system, not lower it) therefore this would not be a correct action

References:

OP-2203.012-C ACA, Rev. 028, window D-8 step 2.2.2, step 2.2.3, step 2.4 [page 81]
STM 2-19-1, Main Feedwater Pump & Turbine Control System, Rev. 19, section 1.4.4 [page 18]
A2LP-RO-MFPTC, Rev. 4, Obj. 22: using applicable Operating Procedures discuss annunciators associated with the Main Feedwater Pumps

Historical Comments:

New Question

ANNUNCIATOR 2K03

D-8

TURB BRG OIL TEMP HI

1.0 CAUSES

1.1 MFP Turbine (2K-2A) bearing inlet oil temperature > 135°F (2TI-2611A).

1.1.1 Validate alarm using trending capability of PMS/PDS - 2P-1A screen.

2.0 ACTION REQUIRED

2.1 Verify CCW aligned to in service Lube Oil cooler per Component Cooling Water System Operations (2104.028).

2.2 Check MFP LO Temp controller (2TIC-5283) operating properly as follows:

2.2.1 Check MFP A turbine bearing inlet oil temperature < 135°F by EITHER of the following:

- Computer point T0374 (available on PMS 2P-1A screen)
- MFP Bearing/Oil Temperature recorder 2TRS-0325 [(2TE-0374) - #5, 2K-2A LO TO BRG]

2.2.2 <u>IF</u> 2TIC-5283 NOT operating properly, <u>THEN</u> place 2TIC-5283 in manual and control CCW flow as necessary to maintain MFP A turbine bearing inlet oil temperature < 135°F.

2.2.3 <u>IF</u> 2TIC-5283 in manual and will not control temperature, <u>THEN</u> locally control CCW flow as necessary to maintain MFP A turbine bearing inlet oil temperature < 135°F.

2.3 Shift LO coolers as necessary using Main Feedwater Pump and FWCS Operations (2106.007).

2.4 <u>IF</u> bearing oil temperature cannot be lowered, <u>THEN</u> reduce load on MFP 2P-1**A**.

3.0 TO CLEAR ALARM

3.1 Reduce supply oil temperature < 135°F.

4.0 REFERENCES

4.1 E-2453-2

automatic start feature is tested weekly by operation of local push-button switch 2HS-0384. When actuated, this switch opens a solenoid valve that ports oil from between the orifice and the pressure switch back to the reservoir. This causes sensed oil pressure to decrease simulating a loss of oil pressure. Successful completion of the test causes the ELOP to start. The switch can then be released and, if desired, the pump must be manually secured from its hand-switch on 2C02 in the Control Room.

Each Main Feedwater Pump has three pressure control valves that control pressure to the thrust bearing, the turbine journal bearings, and the pump journal bearings. 2PCV-2602A/B controls pressure to the turbine journal bearings, 2PCV-2603A/B controls pressure to the pump journal bearings, and 2PCV-2604A/B controls pressure to the thrust bearing. These pressure control valves are located inside the MFP Lube Oil Reservoir which is a FME Zone 1 area. Upon system startup, these valves are manually adjusted in accordance with the MFWP operating procedure 2106.007 to the desired pressure ranges. All of these pressure control valves are turned clockwise to raise pressure and counterclockwise to lower pressure. Each one has a jam nut that needs to be backed off/loosened by turning counterclockwise prior to making any adjustments and tightened by turning clockwise when adjustments are complete.

1.4.4 MFP Lube Oil Coolers

The Main Feedwater pump Lube Oil Coolers, designated 2E-22A and 2E-22B, are shell and tube type heat exchangers. Lube oil flows on the shell side and Component Cooling Water (CCW) flows through the tubes. Lube oil flow through the coolers is rated at 185 gpm.

During normal operations, only one cooler is in service. The Coolers are selected by positioning of the Cooler Selector valve 2LO-49. 2LO-49 is a plug type transfer valve. It has two handwheels associated with it, one to actually position the plug which selects which cooler is in service and another to lock the plug in position. It should be noted that when the lower handwheel is used to unlock the valve, the plug is actually lifted off of the seat at that time, crossconnecting both coolers. This design contributed to a loss of Main Turbine Lube Oil transient at the Salem plant when operators were trying to stop leakage into the idle cooler that had been drained for maintenance (INPO Event Number 272-990228-1). This valve is located below an access cover on top of the reservoir. It is arranged so that lube oil flow is never shut off during shifting operations.

CCW flow through the coolers is controlled by control valve 2CV-5283. This valve is located on the common cooling water outlet line and controls CCW flow through the coolers. It is positioned by temperature controller 2TIC-5283 located on 2C02, to maintain lube oil temperature at ~120 °F. This controller senses oil temperature downstream of the lube oil filters, 2F-297A and B. Maintaining reservoir oil temperature minimizes the formation of condensation.

Bank:	1910	**Rev:**	0	**Rev Date:**	5/7/2012 2:17:51	**QID #:**	89	**Author:**	Foster		
Lic Level:	S	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	NEW				
Search	063000A202	**10CFR55:**	41.5 / 43.5 / 45.3 / 45.	**Safety Function**	6						
System Title:	D.C. Electrical Distribution System	**System Number**	063	**K/A**	A2.02						
Tier:	2	**Group:**	1	**RO Imp:**	2.3	**SRO Imp:**	3.1	**L. Plan:**	A2LP-RO-ED125	**OBJ**	9

Description: Ability to (a) predict the impacts of the following malfunctions or operations on the D.C. Electrical System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: - Loss of ventilation during battery charging

Question:

Consider the following:

- Unit 2 is operating at 100% power
- Annunciator 2K09 B-5, Battery RM Exhaust Fan 2VEF-49 Air Flow LO is in alarm
- IAO reports a burnt smell from 2VEF-49 supply Breaker 2B64-K4

The CRS should direct ______________________ due to a concern for ________________ caused by the loss of battery room ventilation.

A. establishing alternate room ventilation; low oxygen levels

B. establishing alternate room ventilation; high hydrogen concentrations

C. placing battery charger on equalize charge; low oxygen levels

D. placing battery charger on equalize charge; high hydrogen concentrations

Answer:

B. Correct, there is a caution about the buildup of hydrogen gases from battery charging operations and the ACA does establish alternate ventilation. The ACA does not mention anything about changing the charger status (normal 100% operation has the battery on a float [trickle] charge, placing the battery on an equalize charge would raise the production of hydrogen gases therefore would not be a correct choose].

Notes:

A, B, and D are Incorrect due to reasons stated above

References:

OP-2203.012-I ACA, rev. 031, window B-5 step 2.7 [page 37]
OP-2107.004, DC Electrical System operation, Rev. 032, section 3.0 [page 3] and section 5.2 [page 5]
A2LP-RO-ED125, Rev. 7, Obj. 9: Evaluate a set of plant conditions that is causing an alarm on the 125VDC Distribution System and determine the cause of the alarm and any actions required to be taken

Historical Comments:

New Question

ANNUNCIATOR 2K09

B-5

BATTERY RM EXH FAN 2VEF49 AIR FLOW LO
(Continued)

2.6 IF a LOCA occurs
AND 2D-12 Battery Room Exhaust Fan (2VEF-49) is NOT available,
THEN start the following fans within 15 hours:

- 2D-11 Battery Room Exhaust Fan (2VEF-65)
- 2A4 Switchgear Exhaust Fan (2VEF-56A) using ESF Electrical System Operation (2107.002)

CAUTION

Loss of ventilation could cause Battery Room H_2 concentration to rise.

2.7 IF unable to restore normal ventilation,
THEN perform the following:

- Verify the following fans running:
  - 2D-11 Battery Room Exhaust Fan (2VEF-61)
  - 2D-11 Battery Room Exhaust Fan (2VEF-65)
- Assess operability of Green Train Vital DC electrical equipment using Supplement 7 of 2107.004, DC Electrical System Operations.
- IF 2VEF-49 has NOT been run for > 10 minutes in last 24 hours, THEN establish temporary ventilation until normal ventilation restored.
- Contact Design Engineering for further guidance.

3.0 TO CLEAR ALARM

3.1 Stop 2VEF-49.

3.2 Restore air flow.

3.3 Restore power.

4.0 REFERENCES

4.1 E-2456-2

4.2 E-2355-1

4.3 EC-20198

1.0 PURPOSE

To provide a procedure for operation of the DC electrical systems.

2.0 SCOPE

This procedure includes battery chargers and DC distribution systems. It provides guidance for normal breaker alignment, DC transfer operation and battery charger operation. Checklist forms, which are intended to serve as a pre-heatup electrical distribution lineup, ensure equipment operability and identify and document discrepancies.

3.0 DESCRIPTION

The 125V DC System is an ungrounded electrical system. This design prevents a single ground from rendering equipment inoperable or causing spurious operation of equipment.

Three Battery Banks (2D-11, 2D-12, 2D-13) and their respective chargers supply power to three DC busses (2D01, 2D02, 2D03). Battery banks 2D-11 and 2D-12 are called the "Red" and "Green" ESF batteries respectively, while 2D-13 is designated as the "Black" battery. 2D-11 (2D-31A and 2D-31B) and 2D-12 (2D-32A and 2D-32B) have two full capacity chargers with the "B" Charger capable of being powered from the opposite bus. 2D-13 (2D-33) has one charger.

4.0 REFERENCES

4.1 References Used In Procedure Preparation

- ANO Unit 2 Tech Specs 3.8.2.3 and 3.8.2.4
- Electrical Schematics
- TM P319-0010, Unit Two Battery Chargers and Battery Eliminators
- DCP 89-2030, ANO-2 2D-13 Station Battery Replacement
- CR-2-90-514, Removal of DC Breakers
- DCP-94-2013, Replaced 2SV-0205 with 2CV-0205-2
- CR-1-94-0364, Unavailability of DC lighting in STBY with no AC.
- CR-C-96-0023, Correct aiming points for 2EL-90 and 2EL-96.
- DCP-96-3242-D201, Unit 2 Battery Charger Replacement
- DCP-96-3242-D202, Inverter Replacement
- TM S250.0180
- DCP-96-3543-D201, Backup DC Source for Main Turbine Controls
- CR-ANO-2-1999-0556, Vital DC Bus Auto-Transfer Switch Operations
- LIC-00-006, ANO-2 Cascading Tech Specs - Station Batteries
- CALC-92-E-0072-10, Hydrogen Evolution of Battery 2D-11, 2D-12 and 2D-13
- ER 963486E201 Revision 1 Response: Ventilation Requirements for Operability of Switchgear and DC Equipment.

5.0 LIMITS AND PRECAUTIONS

5.1 WR/WO shall be used for breaker removal and replacement to ensure like for like replacement.

5.2 Battery room ventilation (installed or temporary) should be maintained > 10 minutes per 24 hour period to prevent hydrogen gas buildup and maintain temperature within limits.

5.3 Exhaust fans and room coolers can be required for Tech Spec operability of equipment they support. Supplement 7 and 8 of this procedure provides guidance for determining operability of DC equipment if ventilation equipment becomes inoperable.

5.4 Placing a 12V DC Emergency Light in STANDBY mode when AC power is off renders the emergency light unavailable until AC power is restored. Attachment M of this procedure contains TRM Emergency Lights Power Cross Reference.

5.5 If normal lighting AC power is lost, the 12V DC Emergency Lights should remain in READY mode (energized) to maintain availability.

5.6 Only one battery charger should be in service to a bus. The out of service battery charger should normally be de-energized for HVAC and EDG loading considerations. Two battery chargers may be connected to the same bus during a parallel transfer. (SAR 8.3.2.1.2)

5.7 Transfers of vital DC bus auto-transfer switches should not be performed on-line unless essential to support continued operation.

5.8 Due to seismic concerns, do not exceed the following combination for an operable 2D01 or 2D02 switchgear without Design Engineering approval: (Each bullet item assumes the empty compartment is a missing beaker)

- ONE additional breaker may be removed from any location AND at the same time up to three breakers can be racked out in any location.
- Maximum of three additional breakers may be removed at one time under the following conditions:
  - Only one of the breakers can be from lower half of the cabinet (compartments 13, 14, 23, 24, 33, 34).
  - Three removed breakers cannot be in same row unless they are in the top row (compartments 11, 21, 31).
  - All of the remaining breakers in the cabinet are racked in.

5.9 Opening RED or GREEN Battery disconnect (2D-51 or 2D-52) will render the respective EDG inoperable. Refer to Control Room Emergency Air Conditioning and Ventilation (2104.007) for CREVS and CREACS operability. (CR-ANO-C-2006-1642)

6.0 SETPOINTS

None.

Bank:	1911	**Rev:**	1	**Rev Date:**	6/28/2012 6:40:59	**QID #:**	90	**Author:**	Foster
Lic Level:	S	**Difficulty:**	4	**Taxonomy:**	H	**Source:**	NEW		
Search	0640002406	**10CFR55:**	41.10 / 43.5	**Safety Function**	6				
System Title:	Emergency Diesel Generator (ED/G) System	**System Number**	064	**K/A**	2.4.6				
Tier:	2	**Group:**	1	**RO Imp:**	3.7	**SRO Imp:**	4.7	**L. Plan:**	A2LP-RO-ESPTA
OBJ	11								

Description: Emergency Procedures/Plan - Knowledge of EOP mitigation strategies.

Question:

Consider the following:

- Unit 2 is operating at 100% power
- AACDG is OOS for generator repairs
- A Grid disturbance has occurred de-energizing the 500KV and 161KV lines

Post trip the ATC reports:

- Annunciator 2K08 H-3, 2A3 L.O.Relay Failure, is in alarm
- Annunciator 2K09 A-3, Load Center 2B6 Undervoltage, is in alarm
- #1and #2 EDGs are running with normal voltage and frequency with their output breakers open

During the performance of OP-2202.001, Standard Post Trip Actions (SPTAs) EOP, the #2 EDG should be manually ______________________ and after performing OP-2202.010, Standard Attachments exhibit 8, the ______________________ should be diagnosed.

A. tied to 2A4 vital bus; OP-2202.007, Loss of Offsite Power EOP

B. tied to 2A4 vital bus; OP-2203.013, Natural Circulation Operations AOP

C. secured by placing local handswitch in lockout; OP-2202.009, Functional Recovery EOP

D. secured by placing local handswitch in lockout; OP-2202.008, Station Blackout EOP

Answer:

A. Correct, with a under voltage condition of the green vital safety bus and the status of the #2 EDG given [#2 EDG running with normal voltage and frequency] the student should determine the #2 EDG is available to power the green safety bus and take action during SPTAs [step 4.G contingency column G.1] to tie the #2 EDG to 2A4, therefore, after actions are taken [tying the #2 EDG to its vital safety bus] the Loss of Offsite Power EOP will be diagnosed. If the student does not determine the bus is available, the student should direct actions from SPTAs [step 4, contingency action 4.H] and locally secure the EDG which will place the Unit in a blackout condition.

Notes:

B. Incorrect, with a EDG powering a safety bus the entry conditions for the Station Blackout EOP are not met.

C. and D. are Incorrect, SPTAs will direct locally securing the EDG by placing local handswitch in lockout if the EDG is running without SW. initial the EDG is running W/O SW but this contingency is after evaluating the EDG and placing it in service on the Bus. Station Blackout EOP would not be the EOP entered with a EDG powering 2A4.

References:

OP-2202.001, Standard Post Trip Actions (SPTAs), Rev. 013, step 4.G contingency column G.1) [page 5] (if safety bus de-energized and EDG available then verify EDG supplying bus)
OP-2202.010, Standard Attachments, Rev. 019, Exhibit 8 [page 166] with 1 Safety Bus energize, a LOOP should be diagnosed.
OP-2203.012-H ACA, Rev. 034, window H-3 page 27 (2A3 bus lockout)
OP-2203.012-I ACA, Rev. 031, window A-3 page 22 (2B6 under voltage)
A2LP-RO-ESPTA, Rev. 9, Obj. 11: Describe the major actions taken during the performance of SPTA and the basis for each

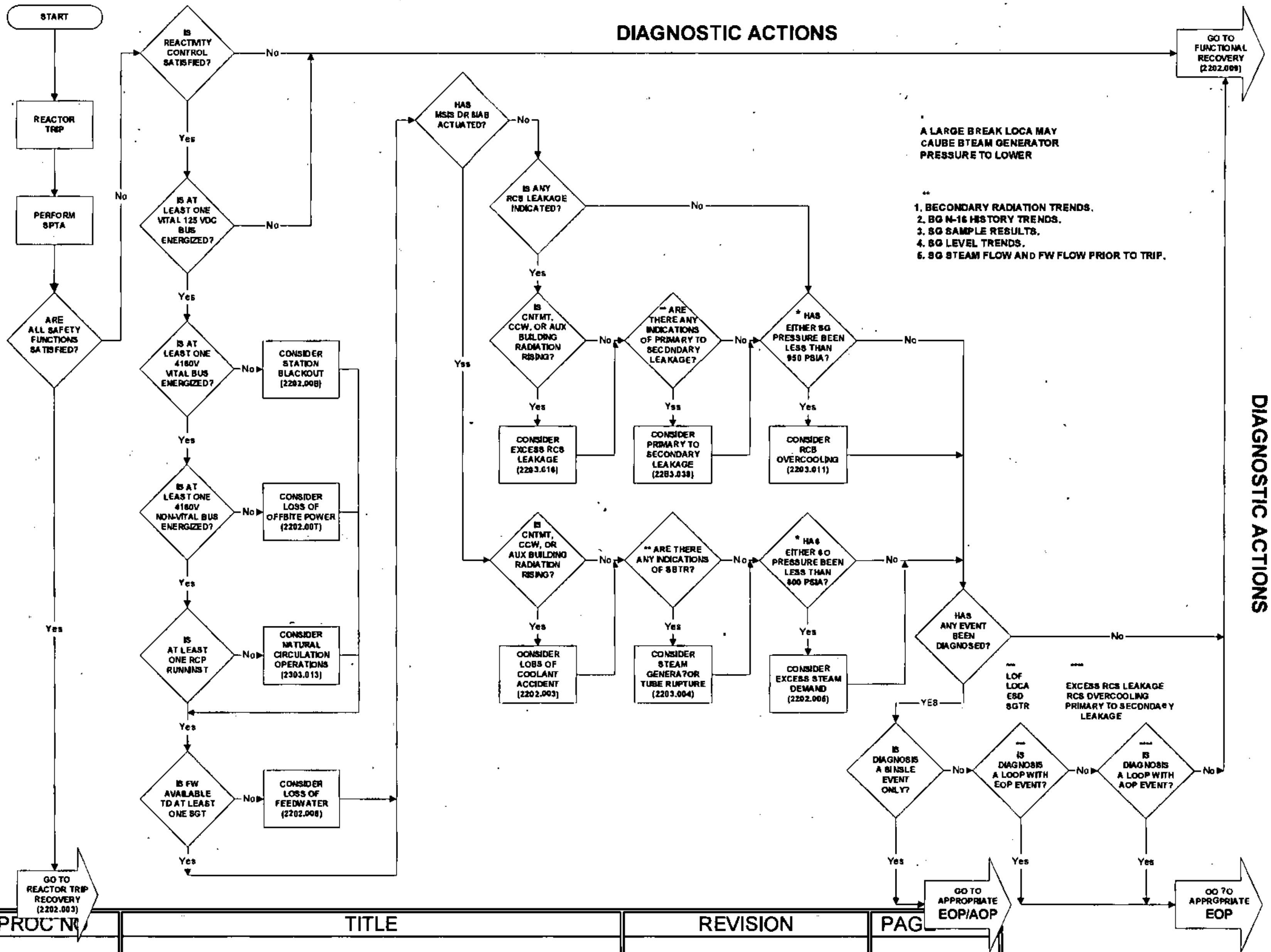
Historical Comments:

New Question
Rev. 1: Change stem to clarify intent of question. Added wording to the answers for the same reason (clarify intent of question). Changed distractors for procedure that could be entered and changed wording from would to should in stem.

INSTRUCTIONS	CONTINGENCY ACTIONS
4 (continued)	
____E. At least ONE 6900v AC bus energized.	
____F. At least ONE 4160v Non-vital AC bus energized.	
____G. BOTH 4160v Vital AC buses energized	G. Perform the following: 1) IF de-energized 4160v Vital AC bus available AND associated EDG available, THEN verify associated EDG supplying bus. 2) IF NEITHER DG available, THEN start AACG AND align to associated 4160v Vital bus using 2104.037, Alternate AC Diesel Generator Operations, Attachment E. ____3) Check at least ONE 4160v and 480v Vital AC bus energized.
H. BOTH DGs secured.	H. IF ANY DG running AND SW NOT aligned, THEN locally stop DG by unlocking and placing "ENGINE CONTROL" handswitch in LOCKOUT: • 2E11 • 2E21
____I. At least ONE 125v Vital DC bus energized: • 2D01 - SPDS point E2D01 • 2D02 - SPDS point E2D02	

EXHIBIT 8

DIAGNOSTIC ACTIONS



ANNUNCIATOR 2K08

H-3

2A3 L.O. RELAY FAILURE

NOTE

- This window has multiple inputs and no reflash capability.
- The 2A3 Bus Lockout relay (186-2A3) is located on the door for 2A-309.

1.0 CAUSES

1.1 Loss of DC control power to the 2A3 Bus Lockout relay (186-2A3)

1.2 Bus 2A3 Lockout relay (186-2A3) tripped

1.3 Loss of DC control power to switchgear (2D23-4)

1.4 Bus 2A3 Lockout (186-2A3) relay coil failure

1.5 2A3 Lockout Failure Sensing relay (27-2A3) coil failure

2.0 ACTION REQUIRED

2.1 Check DC control power breaker (2D23-4) closed.

2.2 Check main DC breaker closed in 2A-309.

2.3 IF main DC breaker in 2A-309 or 2D23-4 tripped,
THEN refer to Tripped Breakers and Thermal Overloads section of Electrical System Operations (2107.001).

3.0 TO CLEAR ALARM

3.1 Restore DC control power.

3.2 Reset 2A3 Lockout relay.

4.0 REFERENCES

4.1 E-2456-1

4.2 E-2099-1

ANNUNCIATOR 2K09

A-3

LOAD CENTER 2B6 UNDERVOLT

1.0 CAUSES

1.1 2A4-2B6 Feeder breaker (2A-401) handswitch in NORMAL AFTER CLOSE with 2A-401 open

1.2 Bus 2B6 undervoltage

2.0 ACTION REQUIRED

2.1 Refer to 2203.045, Loss of 480 Volt Vital Bus.

3.0 TO CLEAR ALARM

3.1 Restore 2B6 bus voltage.

3.2 Close breaker 2A-401.

3.3 Place 2A-401 handswitch in NORMAL AFTER OPEN or PULL TO LOCK.

4.0 REFERENCES

4.1 E-2456-2

Data for 2012 NRC RO/SRO Exam

REV 0 27-Jun-12

Bank:	1911	**Rev:**	0	**Rev Date:**	4/23/2012 4:09:58	**QID #:**	90	**Author:**	Foster
Lic Level:	S	**Difficulty:**	4	**Taxonomy:**	H	**Source:**	NEW		
Search	0640002406	**10CFR55:**	41.10 / 43.5	**Safety Function**	6				
System Title:	Emergency Diesel Generator (ED/G) System	**System Number**	064	**K/A**	2.4.6				
Tier:	2	**Group:**	1	**RO Imp:**	3.7	**SRO Imp:**	4.7	**L. Plan:**	A2LP-RO-ESPTA	**OBJ** 11
Description:	Emergency Procedures/Plan - Knowledge of EOP mitigation strategies.								

Question:

Consider the following:

- Unit 2 is operating at 100% power
- AACDG is OOS for generator repairs
- A Grid disturbance has occurred de-energizing the 500KV and 161KV lines
- Annunciator 2K08 H-3, 2A3 L.O.Bus Lockout, is in alarm
- Annunciator 2K09 A-3, Load Center 2B6 Undervoltage, is in alarm
- The ATC reports #1and #2 EDGs are running with normal voltage and frequency

During SPTAs the #2 EDG would be ______________________ and after performing Exhibit 8, the ________________ would be diagnosed.

A. tied to its safety bus 2A4; Loss of Offsite Power EOP

B. tied to its safety bus 2A4; Station Blackout EOP

C. secured locally by placing local handswitch in lockout; Loss of Offsite Power EOP

D. secured locally by placing local handswitch in lockout; Station Blackout EOP

QID use History

	RD	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☐	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

Answer:

A. Correct, SPTAs step 4.G contingency column G.1will direct tying the EDG to 2A4 (if safety bus de-energized and EDG available then verify EDG supplying bus) and with 1 Safety bus energize then the Loss of Offsite Power EOP will be diagnosed and entered.

Notes:

B. Incorrect, with a EDG powering a safety bus the entry conditions for the Station Blackout EOP are not met.

C. and D. are Incorrect, SPTAs will direct locally securing the EDG by placing local handswitch in lockout if the EDG is running without SW. initial the EDG is running W/O SW but this contingency is after evaluating the EDG and placing it in service on the Bus. Station Blackout EOP would not be the EOP entered with a EDG powering 2A4.

References:

OP-2202.001, Standard Post Trip Actions (SPTAs), Rev. 013, step 4.G contingency column G.1) [page 5] (if safety bus de-energized and EDG available then verify EDG supplying bus)
OP-2202.010, Standard Attachments, Rev. 019, Exhibit 8 [page 166] with 1 Safety Bus energize, a LOOP should be diagnosed.
OP-2203.012-H ACA, Rev. 034, window H-3 page 27 (2A3 bus lockout)
OP-2203.012-I ACA, Rev. 031, window A-3 page 22 (2B6 under voltage)
A2LP-RO-ESPTA, Rev. 9, Obj. 11: Describe the major actions taken during the performance of SPTA and the basis for each

Historical Comments:

New Question

Bank:	1912	**Rev:**	0	**Rev Date:**	4/25/2012 12:04:2	**QID #:**	91	**Author:**	Foster
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	Modified NRC bank 1579		
Search	017000A202	**10CFR55:**	41.5 / 43.5	**Safety Function**	7				
System Title:	In-Core Temperature Monitor (ITM) System	**System Number**	017	**K/A**	A2.02				
Tier:	2	**Group:**	2	**RO Imp:**	3.6	**SRO Imp:**	4.1	**L. Plan:**	ASLP-RO-EPLAN	**OBJ**	7

Description: Ability to (a) predict the impacts of the following malfunctions or operations on the ITM System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: - Core damage

Question:

REFERENCE PROVIDED:

Consider the following:

- Unit 2 is operating at 100% power
- A large break LOCA has occurred
- OP-2202.003, Loss of Coolant Accident EOP, is being implemented

20 minutes into the event the ATC reports:

- RCS pressure 1300 psia and trending down
- RVLMS level 8 and above indicates DRY
- Average CET temperature is 590°F and rising
- Containment pressure is 25 psia and rising
- Standard Attachments exhibit 9, ESFAS actuation, has been completes SAT

The Reactor Core is ____________ and based on this information the CRS should ____________.

A. subcooled; remain in OP-2202.003, Loss of Coolant Accident EOP

B. subcooled; go to OP-2202.009, Functional Recovery procedure

C. superheated; Remain in OP-2202.003, Loss of Coolant Accident EOP

D. superheated; go to OP-2202.009, Functional Recovery procedure

Answer:

D. Correct, based on conditions provided, the Core is in a superheated condition which does not meet the SFSC for Core Heat Removal, a exit condition for LOCA is the SFSCs are not met therefore the CRS will direct entry into the Functional Recovery procedure.

Notes:

A, B, and C are Incorrect due to the statement above.

OP-2202.003, Loss Of Coolant Accident, Rev. 013, Safety Function Status Checks {PROVIDED TO STUDENT}

References:

OP-2202.003, LOCA EOP, Rev. 013, Core Heat Removal Safety Function Status Check [page 59]
OP-1015.021, EOP/AOP Users Guide, Rev. 011, step 5.7.1 [page 20]
ASLP-RO-EPLAN, Rev. 1, Obj. 7: (SE/SRO Only) Using references, discuss the requirements for classifying and upgrading,

downgrading, and terminating an emergency including any time limitations that may apply

Historical Comments:

Modified NRC bank question 1579, used on NRC 2008 SRO test

SAFETY FUNCTION STATUS CHECK

SAFETY FUNCTION	ACCEPTANCE CRITERIA

5. Core Heat Removal

5. A. RCS TH and average CET temperatures less than superheated.

OR

B. 1) RCS TH and average CET temperatures less than 10°F superheat.

2) RVLMS LVL 06 or higher elevation indicates WET.

OR

C. 1) BOTH RVLMS channels inoperable.

2) RCS TH and average CET temperatures less than 10°F superheat.

3) RCS temperatures <u>NOT</u> rising.

4) CET temperatures less than 700°F.

6. RCS Heat Removal

6. A. 1) At least ONE SG level maintained 10% to 90% [20% to 90%] with FW available.

OR

2) SG level being restored by total FW flow greater than 485 gpm.

B. RCS T_C stable or lowering.

5.6.4 One of the first recovery actions will be to assess the safety functions against specific acceptance criteria using the Safety Function Status Check (SFSC). This serves a dual purpose:

A. It is a check to verify that all safety functions are being satisfied.

B. It provides a means of verifying that the initial diagnosis was correct.

5.7 FUNCTIONAL RECOVERY PROCEDURE

5.7.1 The FUNCTIONAL RECOVERY PROCEDURE, 2202.009, is designed to provide guidance for managing any event which results in a reactor trip. The FRP may be entered directly from SPTA via Diagnostic Actions or from an Optimal Recovery Procedure. Entry from an Optimal Recovery Procedure may occur if an ORP has been initially selected by the operator, but is subsequently found to be inadequate. The Safety Function Status Check (SFSC) in each ORP is the primary means used to judge this adequacy. If the Safety Function acceptance criteria are not satisfied at any time, then the operator is directed to evaluate the need to implement FUNCTIONAL RECOVERY PROCEDURE.

5.7.2 FUNCTIONAL RECOVERY PROCEDURE is implemented using the FUNCTIONAL RECOVERY Entry Procedure. The operator reviews the status of all safety functions by checking control board or SPDS indications against acceptance criteria for each safety function. When all Safety Functions have been checked and jeopardized or challenged safety function(s) are identified, the operator will implement a success path based on available equipment and current plant conditions.

5.7.3 FUNCTIONAL RECOVERY is laid out to maintain the Safety Function hierarchy. When there are several Safety Functions in jeopardy, the highest priority Safety Function in the hierarchy shall be pursued first until satisfied. After the Safety Function is satisfied the procedure Reader will proceed to the next jeopardized Safety Function. When all jeopardized safety functions are satisfied, then the reader will pursue the challenged safety functions in order of hierarchy. Any safety function that has been maintained satisfied will be checked by implementing the appropriate success path to ensure any applicable actions are taken after the jeopardized and challenged safety functions are satisfied.

QID: 1579 **Rev:** 0 **Rev Date:** 11/21/2007 **RO Select:** **SRO Select:** **Points:** 1.00

Lic Level: S **Difficulty:** 3 **Taxonomy:** H **Source:** NEW **Originator:** Coble

10CFR55_41: **10CFR55_43:** **Section:** **Type:**

System Title: In-Core Temperature Monitor (ITM) System **System Number** 017 **K/A:** A2.02

RO Tier: 2 **RO Group:** 2 **RO Imp:** 3.6 **SRO Tier:** **SRO Group:** 2 **SRO Imp:** 4.1

Description: Ability to (a) predict the impacts of the following malfunctions or operations on the ITM System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: - Core damage

Question:

Given the following: (Reference Provided)

* The plant has tripped due to a large break LOCA.
* The LOCA Recovery procedure has been implemented.
* RCS pressure is 1250 psia and slowly dropping
* Average CET temperature is 587°F and rising.
* RVLMS level 8 and above indicate DRY.
* RCS Chemistry sample indicates 390 microcuries/gram specific Iodine-131
* Containment pressure is 27 psia and rising.
* No release has been detected outside Containment.
* Hydrogen concentration in Containment is < 1%.
* All safety systems actuated as designed.

Which one of the following would be the correct action to take AND the correct E-plan classification?

A. Remain in the LOCA Recovery procedure; Alert.

B. Remain in the LOCA Recovery procedure; Site Area Emergency

C. Go to the Functional Recovery procedure; Site Area Emergency.

D. Go to the Functional Recovery procedure; Alert.

PARENT

Answer:

C. Go to the Functional Recovery procedure; Site Area Emergency.

Notes:

The conditions do not meet the safety function status check for Core Heat Removal in the LOCA EOP; therefore the SRO should transition to the functional recovery procedure. There is indication of > 1% failed fuel/core damage along with > 10 degrees F superheat so EAL 1.3 or 2.3 apply. There is no indication of a challenged or failed Containment so EAL 1.7 (General Emergency would not apply).

This question will require OP 1903.010 procedure as a reference.

References:

OP 2203.003, LOCA EOP, Core Heat Removal Safety Function Status Check.
OP 1015.021, EOP/AOP Users Guide, Step 5.7.1.
OP 1903.010, EAL Classification, EALs 1.3, 1.7, and 2.3.
OP 1903.010, EAL Classification, definitions, 4.11.1. B, 4.11.3, and 4.12..3

Historical Comments:

Bank:	1913	**Rev:**	1	**Rev Date:**	6/27/2012 11:10:5	**QID #:**	92	**Author:**	Foster		
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW				
Search	0330002242	**10CFR55:**	41.7 / 41.10 / 43.2 / 43	**Safety Function**	8						
System Title:	Spent Fuel Pool Cooling System (SFPCS)	**System Number**	033	**K/A**	2.2.42						
Tier:	2	**Group:**	2	**RO Imp:**	3.9	**SRO Imp:**	4.6	**L. Plan:**	A2LP-RO-FH	**OBJ**	5

Description: Equipment Control - Ability to recognize system parameters that are entry-level conditions for Technical Specifications.

Question:

REFERENCE PROVIDED

Consider the following:

- Unit 2 is in mode 6
- Defueling the Reactor to the Spent Fuel Pool (SFP) is in progress
- Service Water temperature is 82°F
- Service Water flow to the SFP Heat Exchanger is 4800 gpm
- "A" and "B" SFP cooling pumps (2P-40A and B) are in service
- Reactor Engineering reported current heat load in the SFP is 40 MBTU/hr
- WCO reports the "A" SFP cooling pump (2P-40A) has tripped

SFP cooling ______ adequate for the given condition and Fuel movement ______ to continue.

A. is; is allowed

B. is; is not allowed

C. is not; is allowed

D. is not; is not allowed

Answer:

D. Correct, based on the information provided and TRM figure 3.9.3-1, cooling is not adequate and the TRM directs securing fuel movement

Notes:

A, B, and C are Incorrect based on statement above

References:

OP-2203.002, Spent Fuel Pool Emergencies AOP, Rev. 006, step 2.B [page 1 and 3]
TRM 3.9.3 decay time, Rev.49, [PROVICED TO STUDENT]
A2LP-RO-FH, Rev. 1, Obj. 5: Given a set of plant conditions associated wit fuel handling, evaluate Technical Specification and Technical Requirements entry conditions and describe any LCO actions that may be required

Historical Comments:

New Question
Rev. 1: changed wording in answers from can and can not to allowed or not allowed

SPENT FUEL POOL EMERGENCIES

PURPOSE

This procedure provides instructions for a loss of Spent Fuel pool cooling, SFP Heat Exchanger tube leaks, SFP Decay Heat exceeding SFP Decay Heat Removal capacity or loss of inventory.

ENTRY CONDITIONS

ANY of the following conditions exist:

1. "TEMP HI" annunciator (2K11-K5) in alarm.
2. "LEVEL LO" annunciator (2K11-J5) in alarm AND level lowering.
3. SFP Heat Exchanger SW Outlet Radiation monitor (2RITS-1525) in high alarm.
4. Unplanned loss of EITHER Fuel Pool Cooling pump (2P-40A/B).
5. "LEVEL HI" annunciator (2K11-J4) in alarm AND level rising.
6. SFP Area Radiation Monitors (2RITS-8914/2RITS-8915/2RITS-8916) in high alarm.
7. SFP Decay Heat exceeds SFP Decay Heat Removal capacity in accordance with TRM 3.9.3, Decay Time and Spent Fuel Storage, Figure 3.9.3-1.

EXIT CONDITIONS

WHEN ALL appropriate actions have been performed, THEN exit this procedure.

2. IF core offload in progress OR complete, THEN perform the following:

A. IF fuel or control component handling in progress in SFP area, THEN perform the following:

1) Place fuel and control components in a safe position or condition.

2) Suspend fuel and control component handling activities.

B. IF unplanned loss of EITHER Fuel Pool Cooling pump (2P-40A/B) has occurred THEN direct Reactor Engineering to check SFP Decay Heat Load less than SFP Decay Heat Removal Capacity, refer to TRM 3.9.3, Decay Time and Spent Fuel Storage.

C. IF cause of entry will result in rising Spent Fuel Pool temperature, THEN determine predicted time to 200°I using Attachment F, Heatup to 200°F On Loss Of Cooling - Full Core Offloaded (INPO IER 11-2 Rec 3).

D. IF Outage Desk manned, THEN notify Shift Outage Manager.

E. IF TSC manned, THEN report measurements and trends to TSC.

REFUELING OPERATIONS

DECAY TIME AND SPENT FUEL STORAGE

TECHNICAL REQUIREMENT FOR OPERATION

3.9.3 The total heat load in the Spent Fuel Pool (SFP) shall remain within the limits specified in TRM Figure 3.9.3-1 or TRM Figure 3.9.3-2, as appropriate.

APPLICABILITY: During movement of irradiated fuel to the SFP.

ACTION:

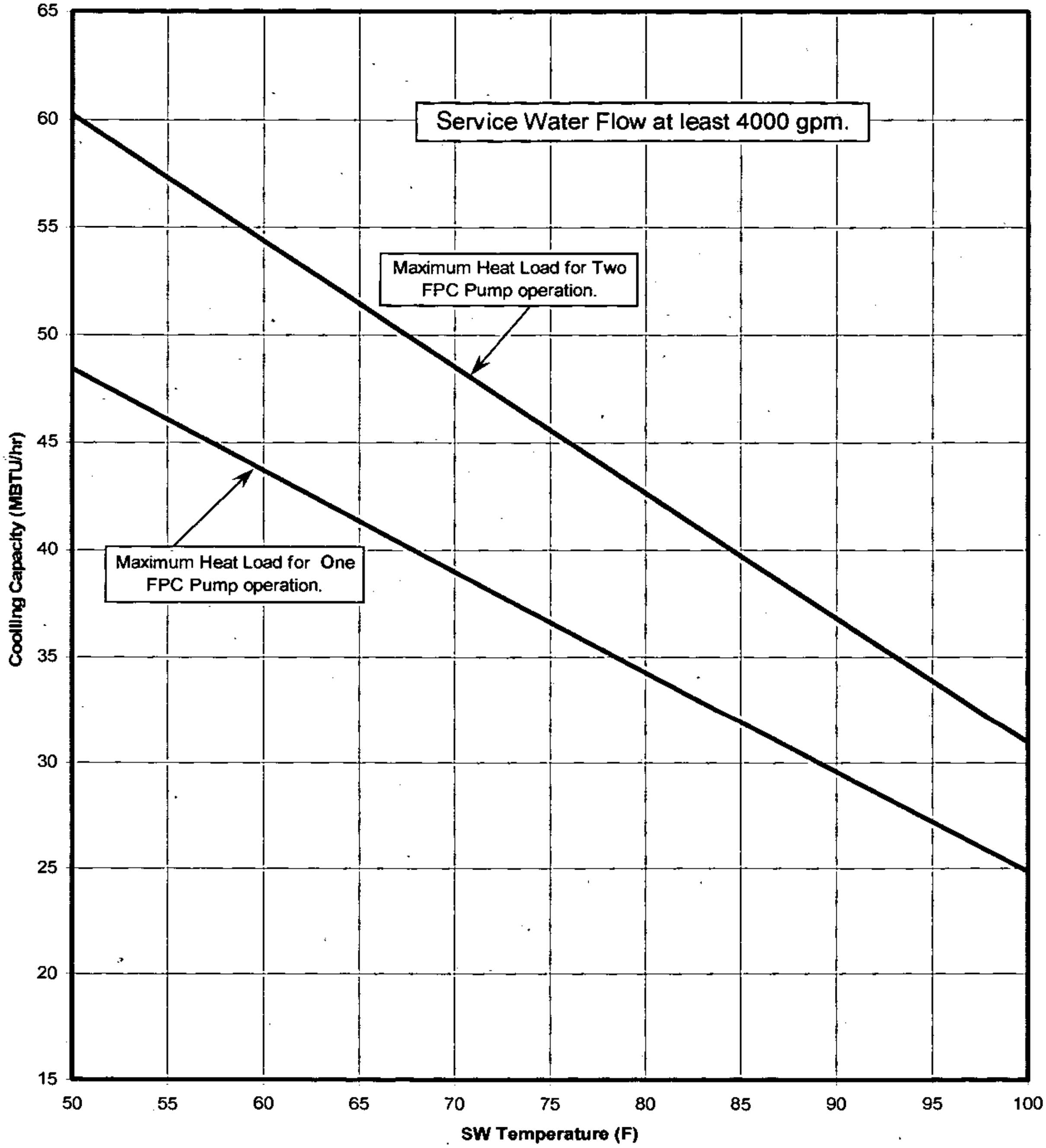
With the total heat load exceeding the requirements in TRM Figure 3.9.3-1 or TRM Figure 3.9.3-2, as appropriate, or with no SFP cooling pump in operation, suspend all transfer of irradiated fuel to the SFP until the limits are restored.

TEST REQUIREMENTS

4.9.3 The total heat load in the pool shall be determined to be less than the limits specified in TRM Figure 3.9.3-1 or TRM Figure 3.9.3-2, as appropriate, when transferring irradiated fuel to the SFP.

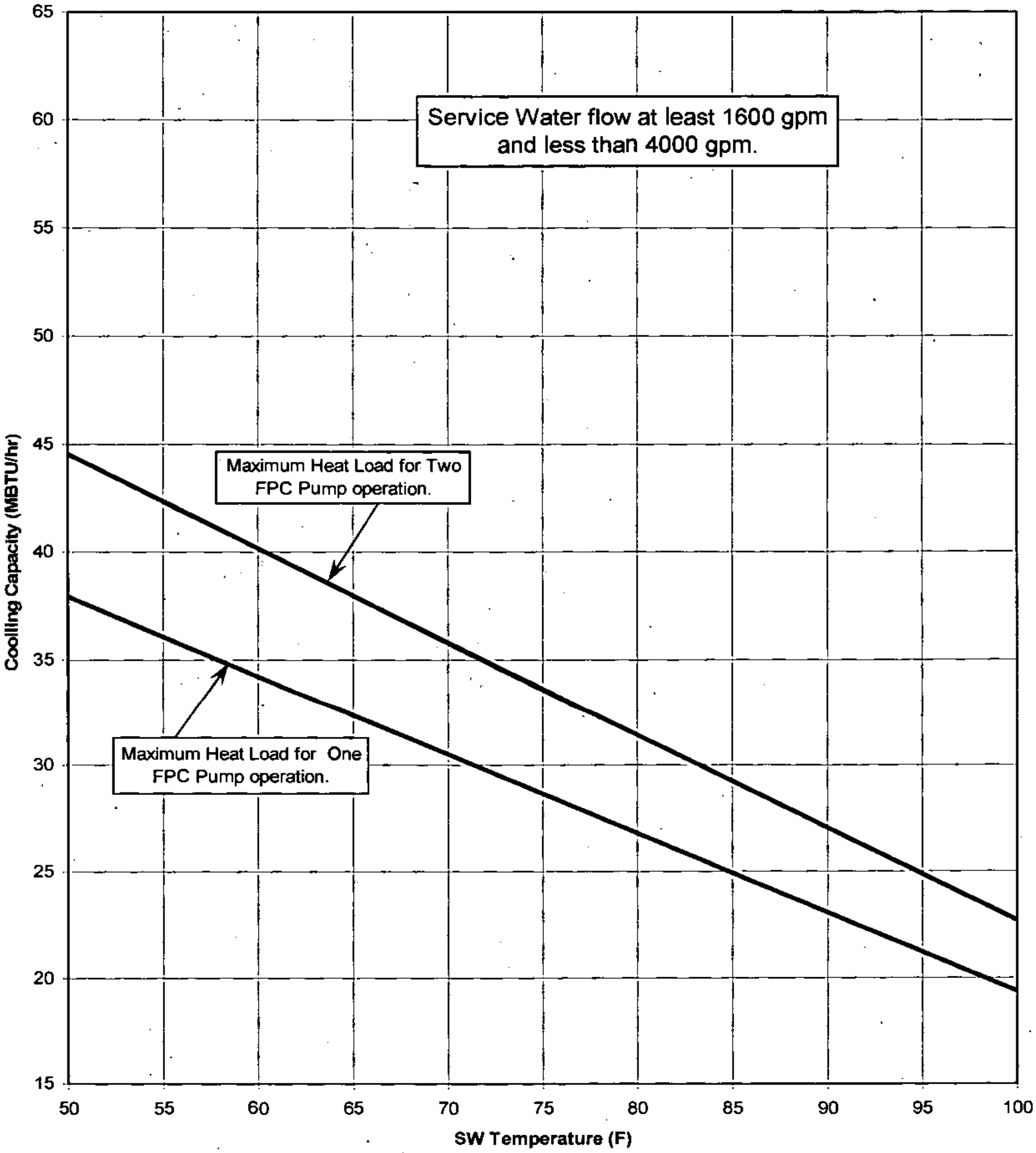
TRM Figure 3.9.3-1

Spent Fuel Pool Cooling Capacity



TRM Figure 3.9.3-2

Spent Fuel Pool Cooling Capacity



REV 0 27-Jun-12

Data for 2012 NRC RO/SRO Exam

Bank: 1913 **Rev:** 0 **Rev Date:** 4/25/2012 1:08:05 **QID #:** 92 **Author:** Foster

Lic Level: S **Difficulty:** 3 **Taxonomy:** H **Source:** NEW

Search 0330002242 **10CFR55:** 41.7 / 41.10 / 43.2 / 43 **Safety Function** 8

System Title: Spent Fuel Pool Cooling System (SFPCS) **System Number** 033 **K/A** 2.2.42

Tier: 2 **Group:** 2 **RO Imp:** 3.9 **SRO Imp:** 4.6 **L. Plan:** A2LP-RO-FH **OBJ** 5

Description: Equipment Control - Ability to recognize system parameters that are entry-level conditions for Technical Specifications.

Question:

REFERENCE PROVIDED

Consider the following:

- Unit 2 is in mode 6
- Defueling the Reactor to the Spent Fuel Pool (SFP) is in progress
- Service Water temperature is 82°F
- Service Water flow to the SFP Heat Exchanger is 4800 gpm
- "A" and "B" SFP cooling pumps (2P-40A and B) are in service
- Reactor Engineering reported current heat load in the SFP is 40 MBTU/hr
- WCO reports the "A" SFP cooling pump (2P-40A) has tripped

SFP cooling ______ adequate for the given condition and Fuel movement _______ continue.

A. is; can

B. is; can not

C. is not; can

D. is not; can not

QID use History

	RO	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☐	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

Answer:

D. Correct, based on the information provided and TRM figure 3.9.3-1, cooling is not adequate and the TRM directs securing fuel movement

Notes:

A, B, and C are Incorrect based on statement above

References:

OP-2203.002, Spent Fuel Pool Emergencies AOP, Rev. 006, step 2.B [page 1 and 3]
TRM 3.9.3 decay time, Rev.49, [PROVICED TO STUDENT]
A2LP-RO-FH, Rev. 1, Obj. 5: Given a set of plant conditions associated wit fuel handling, evaluate Technical Specification and Technical Requirements entry conditions and describe any LCO actions that may be required

Historical Comments:

New Question

Bank: 1914	**Rev:** 0	**Rev Date:** 5/23/2012 1:45:22		**QID #:** 93		**Author:** Foster			
Lic Level: S	**Difficulty:** 3	**Taxonomy:** H		**Source:** NEW					
Search 0860002101		**10CFR55:** 41.10 / 45.13		**Safety Function** 8					
System Title: Fire Protection System (FPS)				**System Number** 086		**K/A** 2.1.1			
Tier: 2	**Group:** 2	**RO Imp:** 3.8	**SRO Imp:** 4.2	**L. Plan:** A2LP-RO-FPROT		**OBJ** 8			
Description: Conduct of Operations - Knowledge of conduct of operations requirements.									

Question:

Consider the following:

- Unit 2 is in mode 4
- Fire panel 2C-343 has been discovered to be deenergized

With Fire panel 2C-343 de-energized, the CRS should enter ______________________, and ______________________________________ is (are) required to be filled out.

A. OP-2203.009, Fire Protection System ACA; multiple fire impairment forms, one for each affected fire zone area,

B. OP-2203.009, Fire Protection System ACA; one fire impairment form, which will cover all the affected fire zone areas,

C. OP-2203.012K, 2K-11 C-9 Fire System Trouble ACA; multiple fire impairment forms, one for each affected fire zone area,

D. OP-2203.012K, 2K-11 C-9 Fire System Trouble ACA; one fire impairment form, which will cover all the affected fire zone areas,

Answer:

B. Correct; after discovery of 2C343 being deenergized, the CRS will enter into OP-2203.009, Fire Protection System ACA and implement requirements of Attachment B

Notes:

A. is Incorrect; this is the right procedure to enter, but step 1.2 relieves the paperwork burden of filling out a OP-1000.120A form for every affected area, states that only 1 form needs to be filled out.

C and D are Incorrect; 2K-11 C-9 Fire System Trouble comes into alarm when the fire panel [2C-343] detects trouble with a detection string. With the fire panel [2C343] deenergized the panel will not come into alarm.

References:

OP-2203.009, Fire Protection System Annunciator Coorective Action, Rev. 023, step 6.4 [page 6] Section 1.0, General Information, step 1.2 [page 11]
A2LP-RO-FPROT, Rev. 15, Obj. 8: Describe the actions taken for a loss of 2C343

Historical Comments:

New Question

6.0 INSTRUCTIONS
{4.3.3}

6.1 **IF Fire Alarm received,**
THEN perform the following:

6.1.1 **Determine which module is in alarm on 2C343-1, 2, or 3.**

6.1.2 **Depress "Alarm Silence" switch on 2C343 to enable reflash capability to Fire Alarm on 2K11.**

6.1.3 **Refer to appropriate page in Attachment A of this procedure for alarming zone.**

6.1.4 **IF firewater flow is necessary**
AND firewater is being used for any reason other than normal on EITHER unit (i.e., temporary cooling, etc.),
THEN isolate firewater to any "other than normal" component.

6.2 IF a fire occurs in any of the following locations,
THEN refer to Alternate Shutdown (2203.014):

- Unit 2 Control Room
- Cable Spreading Room
- Upper South Electrical Penetration Room
- RP Office (CA2)
- Control Room Printer Room
- CPC Room (Old OR New)

6.3 IF Trouble Alarm received,
THEN perform the following:

6.3.1 Silence alarm using Trouble Silence switch on 2C343 Alarm Control Unit.

6.3.2 Refer to Alarm Control Unit (Yellow Master Trouble Light) section of this procedure.

6.4 IF 2C343 fails,
THEN implement Attachment B, Requirements for Loss of 2C343.

NOTE
Physical location of specific detectors can be determined from Fire Prints (FP-2100 series).

6.5 IF specific detector number is required information,
THEN refer to "Open List of Fire Detector ID's" database accessed from Fire Detection Database.

ATTACHMENT B

REQUIREMENTS FOR LOSS OF 2C343

1.0 GENERAL INFORMATION

1.1 A specified zone is one or more locations, which are easily accessible to each other, and can be patrolled within fifteen minutes. Easy access means there are no locked doors, step-off pads, or hazards that would otherwise impede the observation of each location within the specified fire zone at least once every 15 minutes. **A specified zone may consist of more than one FHA fire zone within a single fire area provided easy access can be demonstrated.** Continuous Fire Watches are NOT permitted to rove between fire areas.

1.2 There will be several people stationed in various parts of the plant in the event of a loss of 2C343. To minimize excessive and unnecessary paperwork, only one 1000.120A Form for this occurrence needs to be filled out.

1.3 Personnel stationed at applicable FIU's (or local fire panels) listed below will act as the control room alarm per Fire Protection Engineering. These personnel will have communication with the control room via telephone, Gaitronics, radio, or face-to-face. Personnel monitoring FIU's (or local fire panels) are not required to be fire watch qualified. These personnel are providing a control room alarm function and not fire watch duties. The bases for requiring a Control Room alarm is NFPA 72 which requires that fire protection panels must alarm in a continuously attended location. At ANO, the continuously attended location is normally the Control Room. This attachment allows the use of FIU's to be a continuously attended location for monitoring detection system status. Each of these FIUs are designed to function as a stand alone fire protection panel.

1.4 Attachment D can be used for cross-referencing FIU's to areas monitored for responding to a fire alarm while 2C343 Fire Panel is out of service. Electrical prints E-2581 sheets 1-12 can also be used.

1.5 If a Fire Watch is required to be posted, then these individuals must be qualified Fire Watch, Fire Brigade Member, or Fire Brigade Leader.

Bank:	1915	**Rev:**	0	**Rev Date:**	5/7/2012 1:36:06	**QID #:**	94	**Author:**	Foster
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	F	**Source:**	NEW		
Search	1940012103	**10CFR55:**	41.10 / 43.1	**Safety Function**					
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.1.3				
Tier:	3	**Group:**	1	**RO Imp:**	3.7	**SRO Imp:**	3.9	**L. Plan:**	ASLP-RO-COPD
OBJ	15								

Description: Conduct of Operations - Knowledge of shift or short-term relief turnover practices.

Question:

Consider the following:

- Unit 2 is operating at 100% power
- The on watch ATC operator had to leave due to an Emergency at home

With the watchstander leaving due to an emergency, he/she ______ required to ask permission from the Shift Manager prior to leaving and the Shift Manager has _____ hours to replace the ATC.

A. is; 2

B. is not; 2

C. is; 6

D. is not; 6

Answer:

A. Correct

Notes:

B, C, and D are Incorrect, per EN-OP-115-03, section 5.2[1] states the 2 hour time frame (along with T.S. 6.2.2) section 5.2[2] and 5.2 [3] requires permission [page 6] (as state in [3] Shift Turnover and Relief, personnel who are required as part of shift complement should notify the SM before leaving the site and request permission to leave)

References:

EN-OP-115-03, Shift Turnover and Relief, Rev. 0, section 5.2 [1] and 5.2[2] and5.2[3] (pages 6 and 7)
T.S. 6.2.2.b and c., Unit Staff, amendment 285
ASLPRO-COPD, Rev. 9, Obj. 15: For EN-OP-115, Conduct of Operation and COPD-001, Conduct of Operations: describe the management expectations and responsibilities of Operational Supervisors (SRO)

Historical Comments:

New Question

6.2.2 UNIT STAFF

a. A non-licensed operator shall be on site when fuel is in the reactor and two additional non-licensed operators shall be on site when the reactor is in MODES 1, 2, 3, or 4.

b. The minimum shift crew composition for licensed operators shall meet the minimum staffing requirements of 10 CFR 50.54(m)(2)(i) for one unit, one control room.

c. Shift crew composition may be less than the minimum requirement of 10 CFR 50.54(m)(2)(i) for one unit, one control room, and 6.2.2.a and 6.2.2.f for a period of time not to exceed 2 hours in order to accommodate unexpected absence of on-duty shift crew members provided immediate action is taken to restore the shift crew composition to within the minimum requirements.

d. An individual qualified in radiation protection procedures shall be on site when fuel is in the reactor. The position may be vacant for not more than 2 hours, in order to provide for unexpected absence, provided immediate action is taken to fill the required position.

e. The operations manager or the assistant operations manager shall hold a SRO license.

f. In MODES 1, 2, 3, or 4, an individual shall provide advisory technical support for the operations shift crew in the areas of thermal hydraulics, reactor engineering, and plant analysis with regard to the safe operation of the unit. This individual shall meet the qualifications specified by the Commission Policy Statement on Engineering Expertise on Shift.

5.2 WATCH STATION RELIEF

[1] In the case of illness or unexpected absence, SM should hold a shift member over and arrange for replacement personnel to restore the shift complement within two hours.

[2] In the case where a control room operator needs to be relieved during their shift, the following must be performed:

(a) Permission granted by the SM or CRS as applicable

(b) A verbal turnover conducted to a qualified individual as follows:

(1) If the on-coming operator attended the beginning of shift briefing and turnover then discuss the following:

- Current Plant Status (including any anticipated changes in reactivity status)
- Any significant changes that occurred since the beginning of the shift
- Procedures or evolutions in progress including continuous action steps.
- Parameters being monitored and the frequency of monitoring by the person exiting the Control Room.
- Abnormal system lineups.
- Defeated interlocks.
- Existing or potential plant or equipment problems.

(2) If the on-coming operator did not attend the beginning of shift briefing and turnover, then discuss the following:

- Current Plant Status (including any anticipated changes in reactivity status)
- Any issues or concerns outside of normal conditions such as, but not limited to:
  - Equipment problems the relief operator needs to be aware of

5.2 cont.

- Procedures, tests or evolutions in progress
- Compensatory actions in effect that may need to be performed
- Parameters of special interest being monitored and required frequency
- Equipment out of normal alignment

(c) An update brief performed informing the shift crew of the relief change

[3] In case of an emergency, such as a personal offsite medical emergency, personnel who are required as part of the shift complement should notify the SM before leaving the site and request permission to leave.

[4] During shift turnover briefings, SM should ensure one operator is continuously monitoring Control Room panels, alarms and key parameters to ensure that attentiveness is maintained and avoid huddling of the entire shift crew at a particular panel.

6.0 INTERFACES

None

7.0 RECORDS

Completed turnover documents/checklists are to be handled per site specific requirements.

8.0 SITE SPECIFIC COMMITMENTS

Step	Site	Document	Commitment Number or Reference
5.[1]	GGNS	RG 1.114	C.4.S1 & S2
5.[2]	GGNS	INPO SOER 96-02	All
5.[1], 5.[2]	W3	P-5419	N/A
All	W3	P-15184	N/A

9.0 ATTACHMENTS

None

Bank: 1916	**Rev:** 0	**Rev Date:** 5/23/2012 10:41:4		**QID #:** 95		**Author:** Foster			
Lic Level: S	**Difficulty:** 2	**Taxonomy:** F		**Source:** Modified NRC bank 0539					
Search 1940012113		**10CFR55:** 41.10 / 43.2		**Safety Function**					
System Title: Generic				**System Number** GENERIC		**K/A** 2.1.13			
Tier: 3	**Group:** 1	**RO Imp:** 2.5	**SRO Imp:** 3.2	**L. Plan:** A2LP-RO-TS		**OBJ** 4.b			

Description: Conduct of Operations - Knowledge of facility requirements for controlling vital / controlled access.

Question:

Consider the following:

- Unit 2 has completed a plant shutdown to commence a refueling outage
- Plant cooldown is in progress
- Preparation to commence SDC are in progress
- RCS Pressure is being held steady at 270 psia
- RCS Temperature is 220°F and slowly being lowered
- Preparations to commence Containment Purge are in progress
- An Off Shift RO has ask permission to perform the alarm and interlock function of 2RITS-8233 test for the Containment Purge Isolation valves, one at a time

The Control Room Supervisor [CRS] ____________ allow the Containment Purge Isolation valve testing based on RCS ____________.

A. should; temperature

B. should not; temperature

C. should; pressure

D. should not; pressure

Answer:

B. Correct: the key should not be inserted or the Containment Purge Isolation valves be opened at this RCS temperature [the plant is still Mode 4] . By placing the key into the key switch for the Containment Purge Isolation valves, it will violate Containment Intergrity (required by T.S. 3.6.1.6 to have the keys removed at power) and not be allowed.

Notes:

A is incorrect because the plant is in mode 4 and By placing the key into the key switch for the Containment Purge Isolation valves will violate TS Containment integrity.
C and D are Incorrect because the key should not be issued/inserted into the key switch for the Containment Purge Isolation valves in this mode and Modes are not determined by RCS Pressure.

References:

Technical Specification Definition 1.8 for Containment integrity, Rev. 48
T.S. 3.6.1.1, Containment Integrity for Modes 1-4, Rev. 48
T.S. 3.6.1.6, Containment Purge, Modes 1-4, Rev.48
OP-1015.005, Operations Key Control, Rev. 025, step 6.3.2 [page 6]
OP-2104.033, Containment Atmosphere Control, Rev. 068, Supplement 1, step 4.6 and 4.7 [page 49]
A2LP-RO-TS OBJ. 4.b, From memory, discuss the LCOs and actions statements for all LCOs with action statements less than or equal to one hour.

Historical Comments:

Modified NRC bank question 0539

CONTAINMENT INTEGRITY

1.8 CONTAINMENT INTEGRITY shall exist when:

1.8.1 All penetrations required to be closed during accident conditions are either:

a. Capable of being closed by an OPERABLE containment automatic isolation valve system, or

b. Closed by manual valves, blind flanges, or deactivated automatic valves secured in their closed positions, except for valves that are open under administrative control as permitted by Specification 3.6.3.1.

1.8.2 All equipment hatches are closed and sealed,

1.8.3 Each airlock is OPERABLE pursuant to Specification 3.6.1.3,

1.8.4 The containment leakage rates are within the limits of Specification 3.6.1.2, and

1.8.5 The sealing mechanism associated with each penetration (e.g., welds, bellows or O-rings) is OPERABLE.

CHANNEL CALIBRATION

1.9 A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds with the necessary range and accuracy to known values of the parameter which the channel monitors. The CHANNEL CALIBRATION shall encompass the entire channel including the sensor and alarm and/or trip functions, and shall include the CHANNEL FUNCTIONAL TEST. The CHANNEL CALIBRATION may be performed by any series of sequential, overlapping or total channel steps such that the entire channel is calibrated.

CHANNEL CHECK

1.10 A CHANNEL CHECK shall be the qualitative assessment of channel behavior during operation by observation. This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent instrument channels measuring the same parameter.

3/4.6 CONTAINMENT SYSTEMS

3/4.6.1 PRIMARY CONTAINMENT

CONTAINMENT INTEGRITY

LIMITING CONDITION FOR OPERATION

3.6.1.1 Primary CONTAINMENT INTEGRITY shall be maintained.

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

ACTION:

Without primary CONTAINMENT INTEGRITY, restore CONTAINMENT INTEGRITY within one hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.1.1 Primary CONTAINMENT INTEGRITY shall be demonstrated:

a. At least once per 31 days by verifying that each containment isolation manual valve and blind flange (Note 1) that is located outside containment and not locked, sealed, or otherwise secured and is required to be closed during accident conditions is closed, except for containment isolation valves that are open under administrative control as permitted by Specification 3.6.3.1.

b. By verifying that each containment air lock is OPERABLE per Specification 3.6.1.3.

c. After each closing of the equipment hatch, by leak rate testing the equipment hatch seals in accordance with the Containment Leakage Rate Testing Program.

d. Prior to entering MODE 4 from MODE 5 if not performed within the previous 92 days by verifying each containment isolation manual valve and blind flange (Note 1) that is located inside containment and not locked, sealed, or otherwise secured and required to be closed during accident conditions is closed, except for containment isolation valves that are open under administrative controls as permitted by Specification 3.6.3.1.

Note 1: Valves and blind flanges in high radiation areas may be verified by use of administrative means.

CONTAINMENT VENTILATION SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.1.6 The containment purge supply and exhaust isolation valves shall be closed and handswitch keys removed.

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

ACTION:

With one or more containment purge supply and/or exhaust isolation valves not closed with the handswitch keys removed, place the valve(s) in the closed position with handswitch keys(s) removed within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.1.6 The containment purge supply and exhaust isolation valves shall be determined closed at least once per 31 days.

The interlock mechanism OPERABILITY verification required by SR 4.6.1.3.2 is modified by Note 7, which provides an allowance for not performing the verification unless the air lock is being used for containment access. Because each of the air lock doors meet their respective CONTAINMENT INTEGRITY requirements, the opening of a single door does not result in a breach of containment or challenge the interlock mechanism. In addition, challenges to the interlock mechanism are minimized by strict procedural guidance that prohibits the opening of more than one door in the air lock at a time when CONTAINMENT INTEGRITY is required to be maintained. Therefore, accessing the air lock without intention of ingress or egress through both doors of the air lock does not require performance of SR 4.6.1.3.2.

3/4.6.1.4 INTERNAL PRESSURE AND AIR TEMPERATURE

The limitations on containment internal pressure and average air temperature, assuming a worst case relative humidity value of 0 %, ensure that 1) the containment structure is prevented from exceeding its design negative pressure differential with respect to the outside atmosphere of 5.0 psi, 2) the containment peak pressure does not exceed the design pressure of 59 psig during design basis conditions, 3) the ECCS analysis assumptions are maintained, and 4) the containment cooling fan motor qualifications are maintained.

The limitation on containment average air temperature ensures that the containment liner plate temperature does not exceed the design temperature of 300°F during LOCA conditions. The containment temperature limit is consistent with the accident analyses. Figure 3.6-1 represents analysis limits and does not account for instrument error.

3/4.6.1.5 CONTAINMENT STRUCTURAL INTEGRITY

This limitation ensures that the structural integrity of the containment will be maintained comparable to the original design standards for the life of the facility. Structural integrity is required to ensure that the containment will withstand the maximum design pressure of 59 psig.

For ungrouted, post tensioned tendons, the SR ensures that the structural integrity of the containment will be maintained in accordance with the provisions of the Containment Tendon Surveillance Program. Testing and frequency are consistent with 10 CFR 50.55a(b)(2), and Subsection IWL of the ASME Code.

3/4.6.1.6 CONTAINMENT VENTILATION SYSTEM

The containment purge supply and exhaust isolation valves are required to be closed during plant operation since these valves have not been demonstrated capable of closing during a LOCA. Maintaining these valves closed during plant operations ensures that excessive quantities of radioactive materials will not be released via the containment purge system.

6.1.11 Shift Manager shall determine status of all keys checked out for 12 hours or longer by contacting individual or his/her supervisor.

6.1.12 At end of his/her shift, Shift Manager shall transfer key to cabinet to his/ her relief. Log will be reviewed by oncoming Shift Manager to determine status of keys that have been issued.

6.2 Safety Interlock and Bypass Keys

6.2.1 Keys to safety interlocks and bypasses shall be maintained in Shift Manager's key cabinet and controlled in accordance with provisions of section 6.1 of this procedure.

6.2.2 Operation of safety interlocks and bypasses shall not result in violation of minimum protection channel, safeguards channel, or equipment operability requirements as defined in ANO Technical Specifications.

6.2.3 Safety Systems shall be bypassed or defeated only as allowed by Operations Expectations and Standards (COPD-001) "Manual Control of Automatic Systems" section.

6.3 Key Operated Valve/Damper Handswitches

6.3.1 Keys to key-operated handswitches which do not have direct safety significance, or which are not procedurally withdrawn from switch do not require administrative control under this procedure.

6.3.2 Position of and removal of keys from key-operated handswitches which have direct safety-significance shall be controlled by applicable operating procedures and keys shall be administratively controlled under this procedure.

6.4 Manual Valve Padlock Keys

6.4.1 Manual valves which are padlocked in a specified position fall into two basic categories:

A. Locked manual or deactivated automatic valves which are secured in closed position to ensure containment integrity.

B. Category E and other Administratively controlled valves which are procedurally locked to prevent inadvertent operation. Use of a lock ensures that a deliberate effort is required to reposition valve.

6.4.2 Manual Valve padlocks as described in step 6.4.1 shall be controlled in accordance with Conduct of Operations (1015.001).

4.0 PURGE SYSTEM VERIFICATION (Operations)

4.1 Record Initial CAMS Gaseous reading from Section 2.0:

____

4.2 Record Current 4 hour averaged gaseous count rate on running CAMS:

____

(i.e. PDS 4 Hour History or any averaging method acceptable)

4.3 Calculate allowable count rate Limits as follows:

Initial Gaseous ____________ x 2 = ____________ CPM

4.4 IF Current Gaseous averaged count rate greater than allowable Limits, THEN perform the following:

4.4.1 Notify Chemistry to obtain Containment Air Sample and perform Gross Count.

4.4.2 Compare activity obtained in above step to previous Containment Air Sample.

4.4.3 IF sample results indicate < 10% rise, THEN continue with purge.

4.4.4 IF sample results indicate > 10% rise, THEN resubmit Purge Permit.

4.5 Verify NO OTHER Gaseous Release in progress.

4.6 Verify plant in Mode 5 or 6.

4.7 Verify alarm and interlock functions of 2RITS-8233 by performing the following:

4.7.1 Open CNTMT Purge Supply Isolation 2CV-8283-1 (2HS-8283-1).

4.7.2 Open CNTMT Purge Exhaust Isolation 2CV-8285-1 (2HS-8285-1).

4.7.3 Place 2RITS-8233 to PULSE CAL.

4.7.4 IF 2RITS-8233 setpoint higher than Pulse Cal, THEN release Potentiometer stop AND lower setpoint.

QID: 0539 **Rev:** 0 **Rev Date:** 11/23/2004 **RO Select:** **SRO Select:** **Points:** 1.00

Lic Level: S **Difficulty:** 2 **Taxonomy:** K **Source:** NEW **Originator:** Mayfield

10CFR55_41: 41.10 **10CFR55_43:** 43.5 **Section:** 2 **Type:** GENERIC K&As

System Title: CONDUCT OF OPERATIONS **System Number** 2.1 **K/A:** 2.1.13

RO Tier: NA **RO Group:** NA **RO Imp:** 2.0 **SRO Tier:** 3 **SRO Group:** NA **SRO Imp:** 2.9

Description: Knowledge of facility requirements for controlling vital / controlled access.

Question:

Given the following:

* The plant is performing a cooldown for a refueling outage.
* RCS pressure is 260 psia and steady
* RCS temperature is 240 degrees F and dropping.
* The containment emergency escape hatch is required to be opened to route cables through the hatch in support of Maintenance.
* Security has requested that the Escape Hatch Key be issued.

The Shift Manager _________ issue the Escape Hatch key because ______________________________?

A. should; RCS temperature is low enough

B. should not; RCS temperature is too high

C. should; RCS pressure is low enough

D. should not; RCS pressure is too high

Answer:

B. should not; RCS temperature is too high

Notes:

Distracter A is incorrect because the plant is in mode 4 and the Escape hatch being open would violate TS Containment integrity.
Distracter C is incorrect because the key should not be issued in this mode and Modes are not determined by RCS Pressure.
Distracter D is incorrect because Modes are not determined by RCS Pressure.

References:

Technical Specification Definition 1.8 for Containment integrity.
T.S. 3.6.1.1, Containment Integrity for Modes 1-4.
OP 1015.005, Operations Key Control, Step 6.5.2
A2LP-RO-TS OBJ. 4.b, From memory, discuss the LCOs and actions statements for all LCOs with action statements less than or equal to one hour.

Historical Comments:

PARENT

This question has not been used on any previous NRC exams. BNC 11/17/2004. Replaced Bank QID 532 with this question based on feedback from the NRC. 01/04/2005.

Bank:	1917	**Rev:**	0	**Rev Date:**	4/24/2012 10:11:4	**QID #:**	96	**Author:**	Foster
Lic Level:	S	**Difficulty:**	2	**Taxonomy:**	F	**Source:**	Modified NRC bank 1705		
Search	1940012211	**10CFR55:**	41.10 / 43.3	**Safety Function**					
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.2.11				
Tier:	3	**Group:**	1	**RO Imp:**	2.3	**SRO Imp:**	3.3	**L. Plan:**	ASLP-RO-MNTC
OBJ	25								
Description:	Equipment Control - Knowledge of the process for controlling temporary design changes.								

Question:

Consider the following:

- Unit 2 is operating at 70% power
- A Primary Resin Transfer is in progress from 2T-13 to the Train Bay
- The transfer line has become clogged
- The decision has been made to use Service Air (SA) to clear the clog
- The SA system will be Cross-connected to the resin transfer system with a rubber hose

At a minimum, ____ check valve(s) must be installed in line with the hose and the ________________ is required to approve the installation of this Temporary Modification.

A. 1; Shift Manager

B. 2; Shift Manager

C. 1; Engineering Supervisor

D. 2; Engineering Supervisor

Answer:

B. Correct, 2 check valves are required (section 5.1) and Shift Manager approval is required (section 4.9)

Notes:

A is incorrect because 2 check valves, not 1, are required for mechanical hose jumper installation.
C and D are incorrect because the Engineering Manager cannot authorize Temporary Modification installation- Engineering is responsible to ensure that the Temporary Modification is acceptable for safe plant operation.

References:

Maintenance Procedure EN-DC-136, Rev. 7, section 4.1 page 7 (engineering Supervisor responsibilities), section 4.9 [2] page 8 (Shift Managers responsibilities) and section 5.1 [4] page 10 (requirements for cross connecting a contaminated and non-contaminated system)
ASLP-RO-MNTC, Rev. 8, Obj. 25: Describe the responsibilities of the Operations Supervisors associated with Maintenance Activities

Historical Comments:

Modified NRC bank question 1705, used on NRC 2009 SRO test

4.0 RESPONSIBILITIES

4.1 ENGINEERING SUPERVISOR:

[1] Assigns Qualified Engineering personnel to prepare and review Temporary Modifications.

[2] Designates additional reviews, as required.

[3] Provides engineering approval of Temporary Modifications and Design Considerations. [COM-94-05030]

4.2 INITIATOR:

[1] Determines if the activity qualifies as a Temporary Modification.

[2] Initiates a Temporary Modification by initiating an Engineering Change Request (ECR).

[3] Obtains assistance as necessary from site personnel to ensure the request for the Temporary Modification is clearly understood and the scope is well defined.

4.3 INSTALLER/RESTORER

[1] Installs or restores the Temporary Modification. The installer/restorer is usually an individual in the Maintenance Department.

[2] Ensures that Temporary Modification Tags are installed/removed in accordance with Attachment 9.6.

4.4 OPERATIONS MANAGER:
[COM-92-04392]

[1] Ensures development of new or revision of existing Operations procedures required to reflect the configuration as affected by the Temporary Modification Package.

[2] Ensures that temporary documentation changes and training required to reflect installed Temporary Modification Packages are coordinated with the appropriate organizations.

[3] Ensures that periodic audits of installed Temporary Modification Packages are conducted to verify compliance with tagging and administrative controls.

4.5 ON SITE SAFETY REVIEW COMMITTEE (OSRC)
[NL-83-B61-C02]

[1] Reviews Temporary Modifications and the associated 10CFR50.59 Evaluation when required for Temporary Modifications in accordance with EN-OM-119.

4.6 PLANNING ORGANIZATION:
[NL-96-122-C01] [NL-99-114-C01] [NL-00-068-C02]

[1] Identifies potential Temporary Modifications during the job planning stages

[2] Provides planning support for the Temporary Modification process.

4.7 RESPONSIBLE ENGINEER:

[1] Ensures Temporary Modifications are designed properly.

[2] Ensures Temporary Modifications maintain acceptable plant safety and reliability.

[3] Specifies/ensures proper testing of Temporary Modifications (post-installation & removal).

4.8 TECHNICAL REVIEWER / DESIGN VERIFIER:

[1] Verifies Temporary Modifications have been designed properly.

[2] Verifies Temporary Modifications maintain adequate plant safety and reliability.

[3] Verifies proper specification of Temporary Modification testing requirements (post-installation & removal).

[4] Ensures completeness of the package.

4.9 SHIFT MANAGER:
[FSAR 13.1.2.3.10 Para 3 s1]

[1] Ensures that an Operations Department review is performed of each Temporary Modification package prior to installation.

[2] Authorizes installation and removal of Temporary Modifications.

[3] Maintains the Temporary Modification Log of installed Temporary Modifications.
[ANSI N18.7 5.2.6 s 15]

[4] Verifies that Control Room Drawings are annotated and the Temporary Modification Integrated Drawing List is properly maintained, if used.

[5] Ensures that shift personnel are aware of the installed Temporary Modifications.

[6] Ensures narrative log is updated to track Temporary Modifications installed or removed during their shift.

[7] Maintains overall administrative control of installed Temporary Modifications.

5.0 DETAILS
[P-12058] [P-10490]

5.1 PRECAUTIONS AND LIMITATIONS

[1] It is expected that Temporary Modifications should be short in duration and few in number.

[2] Electrical jumpers used for testing purposes that are removed and installed from the same terminal points during the test are typically equipped with a properly sized switch to provide for positive breaking of the jumper circuit. Electrical jumpers used for testing purposes should be used in conjunction with approved procedures. [ACTS 5245]

[3] Electrical jumpers should be clearly identified (e.g. tagging, contrasting colors, or sufficient length) to be distinguishable from permanent wiring. [A-3771] [A-15360] [P-3768]

[4] Mechanical jumpers should be assessed to avoid the potential for cross-connecting a contaminated system with a non-contaminated system (e.g., hydro lazing or flushing).
IF cross connecting is required,
THEN two check valves in series or a back flow preventer should be installed to prevent the contamination of the clean system (reference 10CFR50 Appendix A GDC 60).

[5] Independence between redundant channels in protective systems should be maintained in accordance with site-specific procedures for cable routing requirements.

[6] Temporary Modifications should be designed and installed considering the design requirements related to redundant channels and should not have the potential to impact redundant channels from a single failure. [LER-99-015-01]

[7] Temporary Modifications, where the installation has been completed, that are left unattended should be tagged using Temporary Modification Tags including those installed by an approved procedure. Temporary Modifications are considered unattended if line of sight is not maintained. [ACTS 1679] [LER-99-015-01]

NOTE

Tagging and logging is not required for implementation of emergency or off-normal/abnormal operating procedures.

[8] The use of alligator or bulldog clips should be limited to circuits that cannot be de-energized at both end points due to an automatic action. Alligator or bulldog clips should not be used in unattended seismic applications. [ACTS 5223]

[9] Temporary Modification Packages which have been installed (or received Operations Department approval) under a previous revision of this procedure, may be installed or remain in place. Temporary Alteration Packages approved prior to the initial effective date of this procedure shall not be left in place after the completion of the following refueling outage. [A-11604]

QID: 1705 **Rev:** 1 **Rev Date:** 7/24/2009 7: **RO Select:** **SRO Select:** **Points:**

Lic Level: S **Difficulty:** 2 **Taxonomy:** F **Source:** New **Originator:** Jim Wright

10CFR55_41: **10CFR55_43:** **Section:** **Type:**

System Title: Generic **System Number** :NER **K/A:** 2.2.11

RO Tier: 3 **RO Group:** 1 **RO Imp:** 2.3 **SRO Tier:** **SRO Group:** 1 **SRO Imp:** 3.3

Description: Equipment Control - Knowledge of the process for controlling temporary design changes.

Question:

Given the following:

* System Engineering has determined that connecting a contaminated and non-contaminated system with a rubber hose would be a Temporary Modification

Before the hose is installed between these two systems, who must authorize installation AND what is the minimum number of check valves that must be installed in series to satisfy procedural requirements?

A. System Engineering Manager; 2 check valves

B. Shift Manager; 3 check valves

C. System Engineering Manager; 3 check valves

D. Shift Manager; 2 check valves

Answer:

D. Shift Manager; 2 check valves

Notes:

A and C are incorrect because the System engineering manager cannot authorize Temporary Modification installation- Engineering is responsible to ensure that the Temporary Modification is acceptable for safe plant operation. B is incorrect because 2 check valves not 3 are required for mechanical hose jumper installation.

References:

Maintenance Procedure EN-DC-136 4.9 [2] REV 3
Maintenance ProcedureEN-DC-136 5.0 [4] REV 3
Lesson Plan ASLP-SRO-MNTC Rev 4 Objective 7: Describe the operations department responsibilities associated with installation and restoration of a temporary modification package.

Historical Comments:

Bank:	1918	**Rev:**	0	**Rev Date:**	4/25/2012 10:55:2	**QID #:**	97	**Author:**	Foster
Lic Level:	S	**Difficulty:**	4	**Taxonomy:**	H	**Source:**	NEW		
Search	1940012218	**10CFR55:**	41.10 / 43.2	**Safety Function**					
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.2.18				
Tier:	3	**Group:**	1	**RO Imp:**	2.6	**SRO Imp:**	3.9	**L. Plan:**	A2LP-RO-SDCC	**OBJ**	5

Description: Equipment Control - Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc.

Question:

Consider the following:

- Unit 2 is in Mode 6
- Core reload is complete
- Refueling canal is Flooded to 401' 6"
- "A" SDC train is in standby
- "B" SDC train is in service
- "B" Service Water pump is OOS
- Draindown to LOWERED INVENTORY is scheduled
- Work Management informs the Control room that "A" Service Water pump is being taken out of service for 24 hours

With the "A" Service Water pump out of service, the "A" SDC train ____________ be considered available and the draindown to LOWERED INVENTORY ________ be performed.

A. should; should

B. should not; should

C. should; should not

D. should not; should not

Answer:

D. Correct, based on OP-1015.048 section 5.1, the SDC loop would not be considered available and T.S. 3.9.8.2 required 2 operable SDC loops with fuel <23 ft above the fuel (Lowered inventory is <105" above the hot leg OP-1015.008 5.9) therefore, the CRS would not allow a reduction in RCS inventory while only 1 SCD loop is available

Notes:

A. Incorrect, The SDC loop is not available (for reasons stated above) and with the requirements for SDC not met, the draindown should not be allowed.
B. Incorrect, the first statement is correct but the second part is not for reasons stated above
C. Incorrect, First half is wrong as explained above

References:

OP-1015.008, Unit 2 SDC Control, Rev. 038,section 5.6 page 10 (decay heat removal systems) section 5.9 page 10 (Lowered Inventory) section 5.10.1 page 11 (operable for SDC loop) and flow chart page 25
OP-1015.048, Shutdown Operations Protection Plan, Rev. 006, section 5.1 page 4 (definition of available)
T.S. 3.9.8.2 SDC requirements with water level <23 ft above irradiated fuel [TS-U2_294-B48]
A2LP-RO-SDCC, Rev. 12, Obj. 5: Discuss reasons for additional procedural requirements while in a lowered/reduced inventory condition and how they relate to our approach to reducing the servity of a loss of shutdown cooling event

Historical Comments:

New Question

5.6 DECAY HEAT REMOVAL SYSTEMS

5.6.1 SDC Loop A consists of:

- LPSI pump A or Containment Spray pump A
- SDC Heat Exchanger A
- Associated Service Water Loop
- Required valve lineup

5.6.2 SDC Loop B consists of:

- LPSI pump B or Containment Spray pump B
- SDC Heat Exchanger B
- Associated Service Water Loop
- Required valve lineup

5.6.3 Reactor Coolant Loop A consists of:

- An operable RCP (2P-32A or 2P-32B)
- Required support systems for RCP
- S/G A level ≥ 23% narrow range
- S/G A makeup and heat removal capability

5.6.4 Reactor Coolant Loop B consists of:

- An operable RCP (2P-32C or 2P-32D)
- Required support systems for RCP
- S/G B level ≥ 23% narrow range
- S/G B makeup and heat removal capability

5.7 INVENTORY CONTROL

Measures established to ensure that irradiated fuel assemblies remain adequately covered to maintain heat transfer and shielding requirements.

5.8 KEY SAFETY FUNCTION

- Decay Heat Removal Capability (includes SFP Cooling)
- Inventory Control
- Electrical Power Availability (includes both on-site and off-site)
- Reactivity Control
- Containment Closure

5.9 LOWERED INVENTORY

The condition of the Reactor Coolant System when fuel is in the reactor vessel and the water level is at or below the reactor vessel flange. At ANO2, this level is ≤ 105 inches above the bottom of the hot leg (≤ 377′ 10.5″). (SOER 09-01 Rec. 5)

5.10 OPERABLE

5.10.1 For SDC Loops

Operable means the SDC loop is capable of performing its intended function (e.g., pump motor has electrical power and all support systems available) and can be placed in service within time for core outlet temperature to reach 10°F below saturation temperature for the current RCS pressure or within one hour, whichever is shorter.

The following formula can be used to determine time for core outlet temperature to reach 10°F below saturation temperature for the current RCS pressure:

[(Tsat - 10 - Ti) ÷ (x)] or at 14.7 psia [(202-Ti) ÷ (x)] Tsat is present RCS pressure, Tsat-10 is final temperature, Ti is initial temperature, x is heatup rate in °F/min.

Example: LPSI train A is taken OOS and it is estimated it can be returned to service in 10 minutes, if needed.

RCS temperature = 140°F
RCS pressure = 270 psia (Tsat = 407.80°F)
RCS level = 41% PZR level
TTB = 1 hour 50 minutes 22 seconds
Heatup Rate = 2.86°F/min
Days Since shutdown = 6
[(407.80 - 10 - 140) ÷ (2.86)] = 90.14 minutes

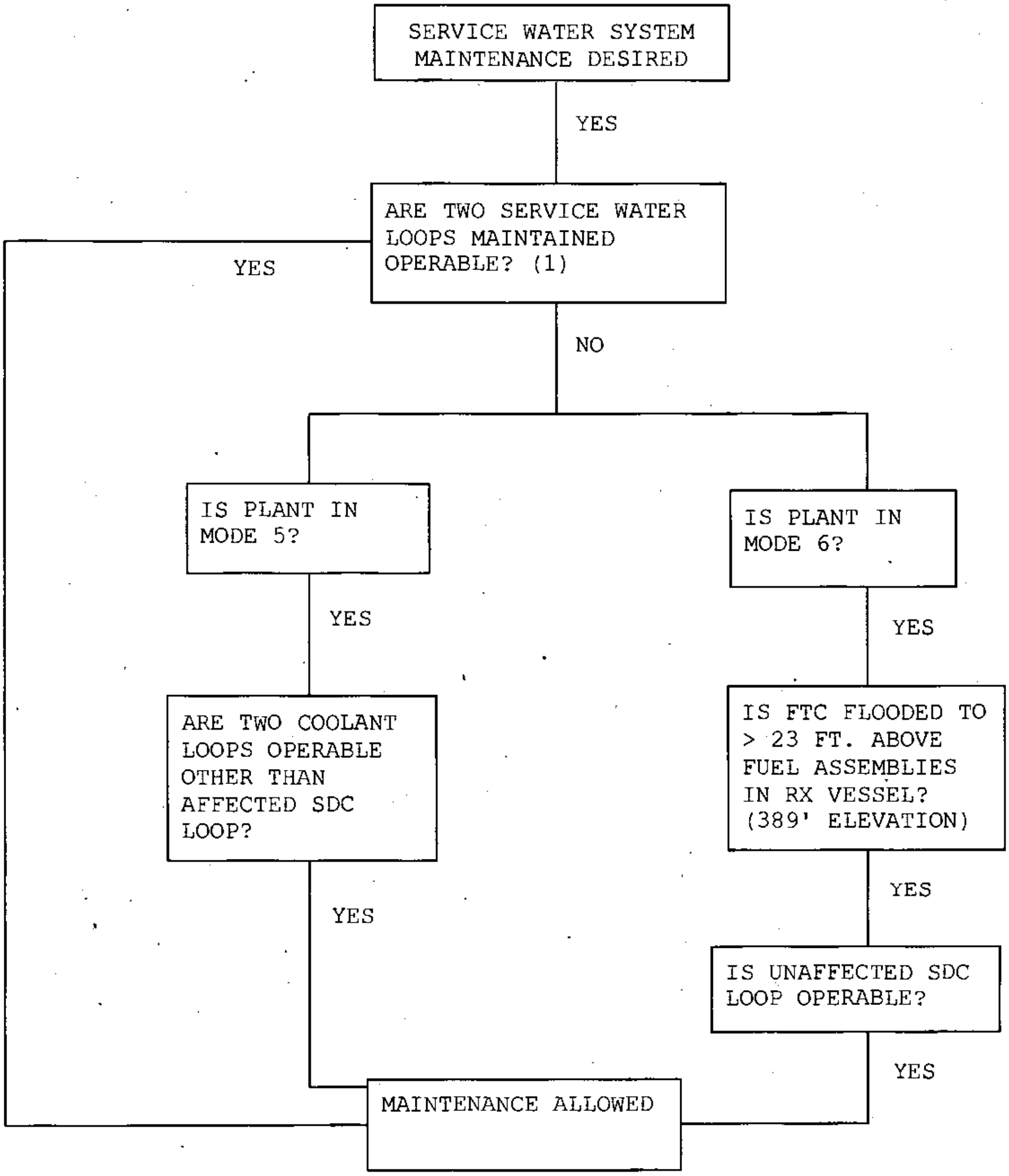
Since it was estimated the SDC loop could be returned to service in 10 minutes and the time for core outlet temperature to reach 10°F below saturation temperature is 81.84 minutes, the SDC loop is operable. (Note: One hour is more restrictive in this example.)

5.10.2 For Systems Other Than SDC Loops

For systems other than SDC loops when used in this procedure the term operable means the system or component is capable of performing its intended function (e.g., pump motor has electrical power and all support systems available) and can be placed in service within time to core boiling or within one hour, whichever is shorter.

5.11 PROTECTED EQUIPMENT/TRAIN

Key plant equipment or systems whose failure would substantially increase the risk of core damage or containment failure if it were to become unavailable while redundant or related equipment is out of service.



NOTE 1: If maintenance affects individual components that are used for SDC, then check other maintenance flow diagrams.

5.0 DEFINITIONS

5.1 AVAILABLE - For purposes of risk determination, "A system, structure, or component along with its necessary auxiliary systems, controls, instrumentation, and power supplies is capable of performing its intended function and can be placed in service by immediate manual or automatic means." [SOER 09-01 Rec 4]

- A system does not need to be operable as defined in the Technical Specifications and other License Basis Documents to be considered available.
- Credit may be taken for reasonable actions both in the Control Room and in-plant. A reasonable action would include an operator closing a breaker outside of the control room. Actions with implementing times approaching the time to boil are not reasonable.
- Credit may also be taken for temporary modifications (e.g., power supplies), contingency plans, and line-ups, provided site approved guidance is available.
- Credited temporary power or temporary backup equipment will be installed and tested versus only staged to consider a component available.
- Systems drained and/or out of service for maintenance are not credited as being available.
- Systems and components required to be available for shutdown safety shall not be isolated under a clearance, partially disassembled for maintenance, or otherwise unable to perform their intended function (i.e. power available, system filled and vented, support systems, available, etc.).

5.2 CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

5.3 CONTAINMENT CLOSURE CONTROLS - Controls established by applicable site procedures to track any impaired containment penetration so that at least one barrier to the release of radioactive material can be quickly achieved in the event of a loss of Decay Heat Removal or a fuel handling accident.

REFUELING OPERATIONS

SHUTDOWN COOLING – TWO LOOPS

LIMITING CONDITION FOR OPERATION

3.9.8.2 Two independent shutdown cooling loops shall be OPERABLE.*

APPLICABILITY: MODE 6 when the water level above the top of the irradiated fuel assemblies seated within the reactor pressure vessel is less than 23 feet.

ACTION:

a. With less than the required shutdown cooling loops OPERABLE, immediately initiate corrective action to return the loops to OPERABLE status as soon as possible.

b. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.8.2 The required shutdown cooling loops shall be determined OPERABLE per the Inservice Testing Program.

* The normal or emergency power source may be inoperable for each shutdown cooling loop.

Bank:	1919	**Rev:**	0	**Rev Date:**	4/24/2012,9:20:27	**QID #:**	98	**Author:**	Foster				
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	H	**Source:**	NEW						
Search	1940012306	**10CFR55:**	41.13 / 43.4	**Safety Function**									
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.3.6								
Tier:	3	**Group:**	1	**RO Imp:**	2.0	**SRO Imp:**	3.8	**L. Plan:**	A2LP-RO-RWST	**OBJ**	6.b.3		
Description:	Radiological Controls - Ability to approve release permits.												

Question:

Consider the following:

- Unit 2 is operating at 100% power
- Unit 1 is operating at 40% power with 3 Circ Water pumps running
- 2T-69A, Boric Acid Condensate Tank, is on recirc and is ready for release
- BMS Liquid Discharge Radiation Monitor, 2RITS-2330, is Out of Service
- OP-2104.014, LRW and BMS Operations supplement 3, is in progress

To perform the release of 2T-69A:

A. Have Unit 1 start ONE Circ Water pump

B. Have Unit 1 secure ONE Circ Water pump

C. 2 independent discharge valve lineup are required to be performed

D. Return 2RITS-2330, BMS Liquid Discharge Radiation Monitor, to service

Answer:

C. Correct, OP-2104.007 supplement 3 section 1.0 step 1.3 requires 2 independent discharge valve lineup to be performed when dumping a tank with an non functional rad monitor.

Notes:

A, and B are Incorrect, OP-2104.007 supplement 3 section 2.0 performs a status of Unit 1 Circ Water system but does not direct the number of pumps required to perform a release. If flow is changed from when the permit was submitted or during the release it directs either resubmitting release permit (supplement 1) or terminating the release (supplement 3)
D. Incorrect, supplement 1 and 3 both allows a tank release with a non functional rad monitor

References:

OP-2104.014, LRW and BMS Operations, Rev. 052, Supplement 1 section 3.0 page 123 (Unit 1 circ water alignment) and section 7.0 step 7.7 [page 127] for non functional Rad Monitor and Supplement 3, 2T-69A tank release (sections 1.0 and 2.0) page 135
A2LP-RO-RWST, Rev. 6, Obj. 6: Describe the following tasks associated with the radioactive waste operating procedures: b.3. Perform a BACT 2T-69A/B Release

Historical Comments:

New Question

3.0 UNIT 1 RELEASE DATA:

3.1 IF Unit 1 Circ water flow has been adjusted since initiation of this release permit,
THEN do NOT perform this release.

* 3.2 IF Unit 1 Circ water flow adjusted during performance of this release permit,
THEN discontinue release permit.

3.3 IF less than two Unit 1 Circ pumps running,
THEN verify Pre-release Report reflects reduced dilution flow.

3.4 Verify Unit 1 water box inlet valves aligned per Circulating Water and Water Box Vacuum System Operation (1104.008) and Chemistry.

4.0 UNIT 2 SHIFT MANAGER RELEASE APPROVAL:

- Verify all name and signature blanks on Pre-release Report have been completed.

Unit 2 SM ____

5.0 IF BMS Liquid Discharge Radiation Monitor (2RITS-2330) functional,
THEN record current background reading. ______________cpm

NOTE

The cause for the difference in the 2RITS-2330 readings will need to be determined prior to submitting a new Liquid Radwaste Release Permit.

6.0 IF BMS Liquid Discharge Radiation Monitor (2RITS-2330) functional
AND current reading and initial reading (1.0 REQUEST) differ by > 25%,
THEN do NOT perform this release (CR-ANO-2-2003-0753).

6.1 Return unused release paperwork to Chemistry.

7.0 IF BMS Liquid Discharge Radiation Monitor (2RITS-2330) functional
AND BMS Liquid Discharge Radiation Monitor (2RITS-2330) initial reading and current reading differ by < 25%,
THEN continue with release by verifying proper operation of 2RITS-2330 interlock as follows:

7.1 Verify the following valves closed:

- 2P-53A/B Discharge to Circ Water Flume (2LRW-13)
- 2P-47A/B Discharge to Circ Water Flume (2BM-35)
- 2F-11/11A Disch to CW Flume (2LRW-24)

7.5 Reset 2RITS-2330:

- Verify valves tested have re-opened.
- Check all associated alarms clear.

7.6 Place 2RITS-2330 in OPERATE.

7.7 IF 2RITS-2330 determined to be non-functional, THEN return this Release Permit to Chemistry for independent sampling and analysis per ODCM App. 2, L2.1.1.

7.8 Perform Independent Verification of the following:

- Pre-Release Report set point copied correctly to this supplement.
- 2RITS-2330 dial set point correct per Radiation Monitor Alarm Set point Table 1 OR Figure 1.
- 2RITS-2330 set at correct dial set point{4.3.1}
- (4.3.1) **2RITS-2330 in OPERATE.**

Independent Verification by ______________________

8.0 Commence release using applicable supplement:

- Supplement 2 - Waste Condensate Tank (2T-21A/B) Release.
- Supplement 3 - Boric Acid Condensate Tank (2T-69A/B) Release.

Performed By ______________________ Date: __________

______________________ Date: __________

______________________ Date: __________

SUPPLEMENT 3

BORIC ACID CONDENSATE TANK (2T-69A/B) RELEASE

1.0 IF BMS Liquid Discharge Radiation Monitor (2RITS-2330) non-functional, THEN perform the following to implement ODCM L2.1.1 action 1:

1.1 Verify at least two independent samples of tank to be released have been analyzed.

1.2 Verify release rate computer input data independently verified by at least two technically qualified members of Facility Staff.

1.3 Verify discharge valve lineup independently verified by at least two technically qualified members of Facility Staff.

* 2.0 IF Unit 1 Circ water flow adjusted during this release, THEN terminate release.

3.0 IF any magnetic tag NOT on hand switch, THEN do NOT perform this release and submit new release permit (Supplement 1).

4.0 IF releasing Boric Acid Condensate tank (2T-69A), THEN perform the following:

4.1 Check the following valves closed AND magnetic tag on hand switch:

	Valve Closed	Tag on HS
• 2T-69A Inlet 2CV-2312 (2HS-2312)	______	______
• 2P-47A Discharge 2CV-2318 (2HS-2318)	______	______

4.2 IF using 2P-47B to pump 2T-69A, THEN check the following:

- 2P-47B Discharge (2CV-2326) closed.
- Magnetic tag on hand switch 2HS-2326.

5.0 IF releasing Boric Acid Condensate tank (2T-69B), THEN perform the following:

5.1 Check the following valves closed AND magnetic tag on hand switch:

	Valve Closed	Tag on HS
• 2T-69B Inlet 2CV-2320 (2HS-2320)	______	______
• 2P-47B Discharge 2CV-2326 (2HS-2326)	______	______

5.2 IF using 2P-47A to pump 2T-69B, THEN check the following:

- 2P-47A Discharge (2CV-2318) closed.
- Magnetic tag on hand switch 2HS-2318.

6.0 Verify selected Boric Acid Condensate pump running:

- 2P-47A (2HS-2316)
- 2P-47B (2HS-2324)

Bank: 1920	**Rev:** 0	**Rev Date:** 5/8/2012 7:50:20	**QID #:** 99	**Author:** Foster			
Lic Level: S	**Difficulty:** 2	**Taxonomy:** F	**Source:** NEW				
Search 1940012414	**10CFR55:** 41.10 / 43.5	**Safety Function**					
System Title: Generic	**System Number** GENERIC	**K/A** 2.4.14					
Tier: 3	**Group:** 1	**RO Imp:** 3.8	**SRO Imp:** 4.5	**L. Plan:** A2LP-RO-ESPTA	**OBJ** 3		
Description: Emergency Procedures/Plan - Knowledge of general guidelines for EOP usage.							

Question:

Considering the general guidelines for the Functional Recovery EOP:

The actions which the CRS should implement after all success paths for a safety function have been attempted and all safety function acceptance criteria are NOT met (Safety Function NOT Satisfied) are ____________________, and the actions which are implemented once all safety function acceptance criteria have been met (Safety Function IS Satisfied) are ____________________.

A. Continuing Actions; Long Term Actions

B. Long Term Actions; Continuous Actions;

C. Long Term Actions; Contingency Actions

D. Contingency Actions; Prudent Actions

Answer:

A. Correct, the CRS during performance of the Functional Recovery EOP will have to recognize conditions and implement actions, either Long term or continuing, based on safety functions.

Notes:

B, C, and D are Incorrect. OP-1015.021 definition section (4.0) state the definitions for Continuing Actions [4.10] Continuous Actions [4.9], Long Term Actions [4.25], and Prudent Actions [4.31]

References:

OP-1015.021, EOP/AOP Users Guide, Rev. 011, section 4.0, 4.10, Continuing Action [page 3], 4.9 Continuous Actions [page 3.] 4.25 Long Term Actions [page 5] and 4.31 Prudent Actions [page 7]
A2LP-RO-ESPTA, Rev. 9, Obj. 3: Describe the content of OP-1015.021, the ANO-2 EOP/AOP Users Guide, to include Definitions of Terms, Post Trip Emergency Operations and Usage Philosophies

Historical Comments:

New Question

4.4 BRANCHING

Directs the user to exit the current procedure or step and enter another procedure or step. The words "GO TO" and "RETURN TO" are used to indicate a branch (See Defined EOP/AOP Words, Section 4.34).

4.5 CAUTION

Calls attention to a condition that could result in damage to equipment, personnel hazard, or otherwise adversely affect plant operations.

4.6 COMMUNICATIONS STRATEGIES

Discussions, Transient Briefs and Update Announcements are communications tools employed during implementation of EOPs/AOPs. Definitions and implementation strategy for these tools are found in Operations Expectations and Standards, COPD-001.

4.7 CONDITIONAL STATEMENTS AND LOGIC SEQUENCES

Used in EOPs/AOPs to describe a set of conditions or express complex combinations of conditions. Logic terms include <u>IF</u>, <u>WHEN</u>, <u>THEN</u>, <u>AND</u>, <u>OR</u> and <u>NOT</u>.

4.8 CONTINGENCY ACTION STEPS

Action steps performed if the instruction or expected response is not achieved.

4.9 CONTINUOUS ACTION STEPS

Procedure steps performed on a continuing basis AFTER they are presented. Actions are taken by the operator when needed. Continuous action steps are prefaced by an asterisk (*) in front of the step number.

4.10 CONTINUING ACTIONS

Actions which are implemented after all success paths for a safety function have been attempted and all safety function acceptance criteria are NOT met for a particular safety function (safety function is NOT satisfied). The operator is required to continue to work on this safety function and to peruse other jeopardized or challenged safety functions simultaneously.

4.11 DECISION TREES

Flowcharts which provide the operator with a quick method to determine the appropriate success path to use in the functional recovery procedures.

4.20 FLOATING STEPS

Procedure steps that allow performance of that step at any time the specified conditions exist once the operator has entered that procedure. FLOATING STEPS are prefaced by a solid rectangle (■) in front of the step number.

4.21 FLOWCHARTS

A printed format in which procedures or processes are depicted in graphic form emphasizing decision points and links between decision points.

4.22 FUNCTIONAL RECOVERY PROCEDURE (FRP) and LOWER MODE FUNCTIONAL RECOVERY PROCEDURE (LMFRP)

The ANO-2 plant specific FUNCTIONAL RECOVERY procedures are used by the operator to verify the satisfactory control or restoration of all safety functions, and to provide actions to restore and maintain those safety functions when degraded. 2202.009, FUNCTIONAL RECOVERY PROCEDURE or 2202.011, LOWER MODE FUNCTIONAL RECOVERY PROCEDURE is written such that the user need not diagnose an event in order to establish and maintain the plant in a safe, stable condition.

4.23 IMMEDIATE ACTION STEPS

Steps taken without delay when there are indications of an emergency. These actions are to stop further degradation of existing conditions, to mitigate the consequences and to allow the operators to assess the situation. These actions may be performed simultaneously by different operators and are not sequence dependent unless specifically stated. All IMMEDIATE ACTION STEPS are completed even if a previously listed IMMEDIATE ACTION STEP results in a branching instruction.

IMMEDIATE ACTION STEPS are designated by a circle around the step designator. All sub-steps under the circled step are also IMMEDIATE ACTION STEPS.

4.24 INSTRUCTION STEPS

Action statements describing either the action to be performed or an expected plant response.

4.25 LONG-TERM ACTIONS

Actions which are implemented once all safety function acceptance criteria have been met <u>for a particular safety function (safety function is satisfied)</u>. These long term actions shall help ensure that the operator continues to periodically verify adequate maintenance of safety functions, assess the status of the plant, implement the appropriate Optimal Recovery Procedure or ORP if conditions warrant, and determine whether it is possible to cooldown to shutdown cooling conditions.

4.31 PRUDENT ACTION (a.k.a. manual action/anticipatory action/action to mitigate the consequences of an accident/skill of the craft)

Operators may take manual control of a component when that component is deviating from its design function state or has the potential to deviate from its design function state. However operators should use judgment when deciding to take manual control of components. The task must be a simple action that usually involves the alignment of a single component such as a valve controller. A more complex task, such as starting a pump that requires proper alignment of valves to prevent equipment damage, would NOT be considered a prudent action. This is not a procedure deviation. This can be justified as per ANS 3.2 1976 step 5.2.2(3).

Prudent (manual)action is permitted when

- A system component is deviating from its design function state or has the potential to deviate from its design function state.

- The task is simple and is considered a routine activity based on operational experience or training.

- The task will not interfere with the intent or strategy of procedure in effect.

- The operator obtains concurrence from CRS/SM prior to performing the task.

Bank:	1921	**Rev:**	1	**Rev Date:**	6/28/2012 6:40:36	**QID #:**	100	**Author:**	Foster
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	F	**Source:**	NEW		
Search	1940012408	**10CFR55:**	41.10 / 43.5	**Safety Function**					
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.4.8				
Tier:	3	**Group:**	1	**RO Imp:**	3.8	**SRO Imp:**	4.5	**L. Plan:**	A2LP-RO-ESPTA **OBJ** 3

Description: Emergency Procedures/Plan - Knowledge of how abnormal operating procedures are used in conjunction with EOPs.

Question:

Consider the following:

- A 15 gpm Steam Generator Tube leak has been confirmed in "A" SG
- OP-2203.038,Primary to Secondary Leakage AOP, is in use
- A plant shutdown has been commenced
- Annunciator 2K12 A-8, INSTR AIR PRESS HI/LO, is in alarm
- OP-2203.021, Loss of Instrument Air AOP, is being implemented
- Instrument Air header pressure is 34 psig and trending down
- CRS directs the ATC to trip the Reactor
- OP-2202.001, Standard Post Trip Actions (SPTAs), has been entered

OP-2203.021, Loss of Instrument Air AOP, should be performed ________________ SPTAs and OP-2203.038, Primary to Secondary Leakage AOP, should be performed ________________ SPTAs.

A. after completion of; in conjunction with

B. after completion of; after completion of

C. in conjunction with; after completion of

D. in conjunction with; in conjunction with

Answer:

C. Correct, the IA procedure directs the use of this AOP in conjunction with SPTAs (step 6.B.) the Primary to Secondary AOP (step 22 directs a reactor trip from 20% power, perform SPTAs, then return to this procedure and continue) the student should know that not all AOPs are used with EOPs. If and AOP is being implemented and EOP entry conditions are met, then the EOP should be entered. The AOPs that are to be performed in conjunction with EOPs will state so in the AOP.

Notes:

A. Incorrect, Loss of IA AOP directs AOP performance during SPTAs (step 6.B.) Primary to Secondary leakage AOP directs performing SPTAs before continuing with the AOP
B. Incorrect, due to reason as stated above
D. Incorrect, due to reason as stated above

References:

OP-2203.012-L ACA, Rev. 040, 2K12 window A-8 instrument air pressure HI/LO (page 82)
OP-2203.021, Loss of Instrument Air AOP, Rev. 015, step 6 contingency column 6.A. (manually trip the reactor) and 6.B. (perform SPTAs in conjunction with this procedure) page 3
OP-2203.038, Primary to Secondary Leakage AOP, Rev. 013, step 22 [page 9]
A2LP-RO-ESPTA, Rev.9, Obj. 3: Describe the content of OP-1015.021, the ANO-2 EOP/AOP Users Guide, to include

Definitions of Terms, Post Trip Emergency Operations and Usage Philosophies

Historical Comments:

New Question
Rev. 1: added procedure numbers to the stem and changed wording from would to should.

ANNUNCIATOR 2K12

A-8

INSTR AIR PRESS HI/LO

1.0 CAUSES

1.1 HIGH - Instrument Air Filter outlet pressure ≥ 110 psig (2PIS-3013)

1.2 LOW - Instrument Air Filter outlet pressure ≤ 80 psig (2PIS-3013)

2.0 ACTION REQUIRED

NOTE
High header pressure is indicative of unloader failure.

2.1 Check pressure on 2PIS-3013.

2.2 IF HIGH pressure,
THEN shift IA Compressors using Instrument Air System (2104.024).

2.3 IF LOW Pressure,
THEN GO TO Loss of Instrument Air (2203.021).

3.0 TO CLEAR ALARM

3.1 Restore header pressure to between 80 and 110 psig.

4.0 REFERENCES

4.1 E-2457-4

INSTRUCTIONS	CONTINGENCY ACTIONS
*5. **IF event on Unit 2,** **AND Unit 1 IA header pressure drops below 60 psig,** **THEN secure cross-connect with Unit 1 as follows:** A. Close IA Cross-connect valves: • 2CV-3004 • 2CV-3015 B. Locally verify the following valves closed: • MANUAL X-CONNECT TO UNIT 1 (2IA-47) • MANUAL X-CONNECT TO UNIT 1 (2IA-48) • 2F-37 INLET FROM DRY HDR (2IA-192)	
■ 6. **Check IA header pressure greater than 35 psig.**	■ 6. **IF Plant in Mode 1** **THEN perform the following:** A. Manually trip Reactor. B. Perform 2202.001, Standard Post Trip Actions, in conjunction with this procedure.

INSTRUCTIONS | **CONTINGENCY ACTIONS**

22. IF required by Attachment A, THEN commence power reduction using 2102.004, Power Operations as follows:

    A. Refer to applicable reactivity plan.

    B. IF leakage less than 10 gpm, THEN perform EITHER of the following using 2102.004, Power Operations:

    - RCS boration using 2104.003, Chemical Addition, Attachment R, RCS Boration from the RWT or BAMT.
    - RCS boration using 2104.003, Chemical Addition, Exhibit 3, Normal RCS Boration at Power.

    C. IF leakage greater than or equal to 10 gpm, THEN perform RCS boration using 2104.003, Chemical Addition, Attachment R, RCS Boration from the RWT or BAMT using 2102.004, Power Operations:

    D. WHEN Reactor power ~ 20%, THEN trip the Reactor.

    E. Perform 2202.001, Standard Post Trip Actions.

    F. WHEN Standard Post Trip Actions completed, THEN **GO TO** Step 23.

Bank:	1921	**Rev:**	0	**Rev Date:**	4/25/2012 8:17:05	**QID #:**	100	**Author:**	Foster
Lic Level:	S	**Difficulty:**	3	**Taxonomy:**	F	**Source:**	NEW		
Search	1940012408	**10CFR55:**	41.10 / 43.5	**Safety Function**					
System Title:	Generic	**System Number**	GENERIC	**K/A**	2.4.8				
Tier:	3	**Group:**	1	**RO Imp:**	3.8	**SRO Imp:**	4.5	**L. Plan:**	A2LP-RO-ESPTA
OBJ	3								

Description: Emergency Procedures/Plan - Knowledge of how abnormal operating procedures are used in conjunction with EOPs.

Question:

Consider the following:

- A 15 gpm Steam Generator Tube leak has been confirmed in "A" SG
- Primary to Secondary Leakage AOP, OP-2203.038 is in use
- A plant shutdown has been commenced
- Annunciator 2K12 A-8, INSTR AIR PRESS HI/LO, is in alarm
- Loss of Instrument Air AOP, OP-2203.021, is being implemented
- IA header pressure is 34 psig and trending down
- CRS directs the ATC to trip the Reactor
- Standard Post Trip Actions (SPTAs) AOP has been entered

The Instrument Air AOP will be performed ________________ SPTAs and the Primary to Secondary AOP would be performed ________________ SPTAs.

A. after completion of; in conjunction with

B. after completion of; after completion of

C. in conjunction with; after completion of

D. in conjunction with; in conjunction with

QID use History

	RO	SRO
2005	☐	☐
2006	☐	☐
2008	☐	☐
2009	☐	☐
2011	☐	☐
2012	☐	☑

Audit Exam History

2006	☐
2009	☐
2011	☐

Answer:

C. Correct, the IA procedure directs the use of this AOP in conjunction with SPTAs (step 6.B.) the Primary to Secondary AOP (step 22 directs a reactor trip from 20% power, perform SPTAs, then return to this procedure and continue) the student should know that not all AOPs are used with EOPs. If and AOP is being implemented and EOP entry conditions are met, then the EOP should be entered. The AOPs that are to be performed in conjunction with EOPs will state so in the AOP.

Notes:

A. Incorrect, Loss of IA AOP directs AOP performance during SPTAs (step 6.B.) Primary to Secondary leakage AOP directs performing SPTAs before continuing with the AOP
B. Incorrect, due to reason as stated above
D. Incorrect, due to reason as stated above

References:

OP-2203.012-L ACA, Rev. 040, 2K12 window A-8 instrument air pressure HI/LO (page 82)
OP-2203.021, Loss of Instrument Air AOP, Rev. 015, step 6 contingency column 6.A. (manually trip the reactor) and 6.B. (perform SPTAs in conjunction with this procedure) page 3
OP-2203.038, Primary to Secondary Leakage AOP, Rev. 013, step 22 [page 9]
A2LP-RO-ESPTA, Rev.9, Obj. 3: Describe the content of OP-1015.021, the ANO-2 EOP/AOP Users Guide, to include Definitions of Terms, Post Trip Emergency Operations and Usage Philosophies

Historical Comments:

New Question