Beaver Valley Unit 2

Post Exam Comments, Resolution and Technical References

Attachment A

Facility Comments for Written Exam Questions

Question 12

Recommendation: The facility recommends deleting question #12 from the RO portion of the exam.

Reason: The question is on the RO exam but is at the SRO level of required knowledge as determined by ES-401 Figure 2.

Question:

12. The plant has been operating at 100% power with all systems in NSA for the past 100 days.

- An inadvertent reactor trip occurs coincident with a loss of offsite power
- All systems function as designed
- The crew is implementing the actions of ES-0.2, "Natural Circulation Cooldown"
- RCS temperature is 400°F lowering at 20°F/hr
- RCS Subcooling is 165°F
- RCS Pressure 1200 psig and stable

Alarm A11-5G, CRDM Shroud Fan Auto-Start/Auto-Stop is received. ALL CRDM shroud fans have tripped and cannot be restarted.

What ramifications will the loss of these CRDM Shroud Fans have on the continued performance of ES-0.2, "Natural Circulation Cooldown"?

A. Further RCS cooldown (below 350°F) cannot continue UNTIL a suitable RX vessel head soak has been performed.

B. Further RCS depressurization (below 1200 psig) cannot continue UNTIL a suitable RX vessel head soak has been performed.

C. Immediately INCREASE RCS pressure 100 psig to RAISE RCS subcooling.

D. Immediately DECREASE RCS pressure 100 psig to LOWER RCS subcooling.

Question 12 appeared in the RO section of the written exam. ES-401 PREPARING INITIAL SITE-SPECIFIC WRITTEN EXAMINATIONS, Figure 2 indicates that the knowledge needed to answer the question is at the SRO Only level. ES-401 Figure 2 requires ROs to know the purpose, overall sequence of events and overall mitigative strategy of procedures. Per the EOP background documents, the high level actions or overall mitigative strategy of ES-0.2 are:

1) Try to Start a RCP
2) Cool Down and Depressurize RCS with no Upper head Void Growth
3) Lock Out the SI System
4) Place RHS in Service
5) Cooldown to Mode 5

The final decision block in ES-401 Figure 2 asks the following question:

Does the question require one or more of the following?
• Assessing plant conditions (normal, abnormal, or emergency) and then selecting a procedure or section of a procedure to mitigate, recover, or with which to proceed?

While the stem of Question 12 asks what the ramifications of a certain condition will be, it is really asking what the procedural requirements are for an existing condition. Additionally, it requires the candidate to assess plant conditions in order to select a section of a procedure with which to proceed. This assessment includes the following:

- Note: The ES-0.3 Natural Circulation Cooldown With Steam Void in Vessel (With RVLIS) and ES-0.4 Natural Circulation Cooldown With Voids (Without RVLIS) procedures are sub-procedures of the natural circulation group of EOPs. The candidates had to determine if the 20F per hour cooldown rate was within the limits of ES-0.2 or if a transition to ES-0.3 or ES-0.4 was required. Step 13 of ES-0.2 has a transition to ES-0.3 or ES-0.4 based on the ability to control cooldown rates. Distractor "D" references an action performed in ES-0.4. This distractor requires a detailed understanding of procedure content to determine if the action is correct.

- The impact of losing all CRDM fans on the proper flow path to take through the EOP. Step 15 of ES-0.2 requires the crew to assess the status of CRDM cooling fans and select the proper section of the EOP to perform based on that assessment. The direction needed to arrive at the correct answer for this question is contained in the "Response Not Obtained" section of the procedure.

- Sufficient Subcooling for current plant conditions – Step 16 of ES-0.2 checks for sufficient sub-cooling. If insufficient subcooling exists the crew is directed to stop the depressurization and re-establish subcooling. Distractor "C" references this action.

Conclusion: To answer question 12 correctly requires the candidate to know the detailed actions of the Response Not Obtained section of step 15 of ES-0.2 which requires three actions, maintain RCS Pressure at 1200 psig with acceptable subcooling, cool down to less than 350F and wait for the 9 hour soak, then cool down and depressurize the plant. The knowledge required to answer the question is beyond the required RO level outlined in ES-401 Figure 2.

Based on the above information the facility believes that the question cannot be answered *solely* by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure, and therefore should be classified as an SRO only question and as such be removed from the RO portion of the exam.

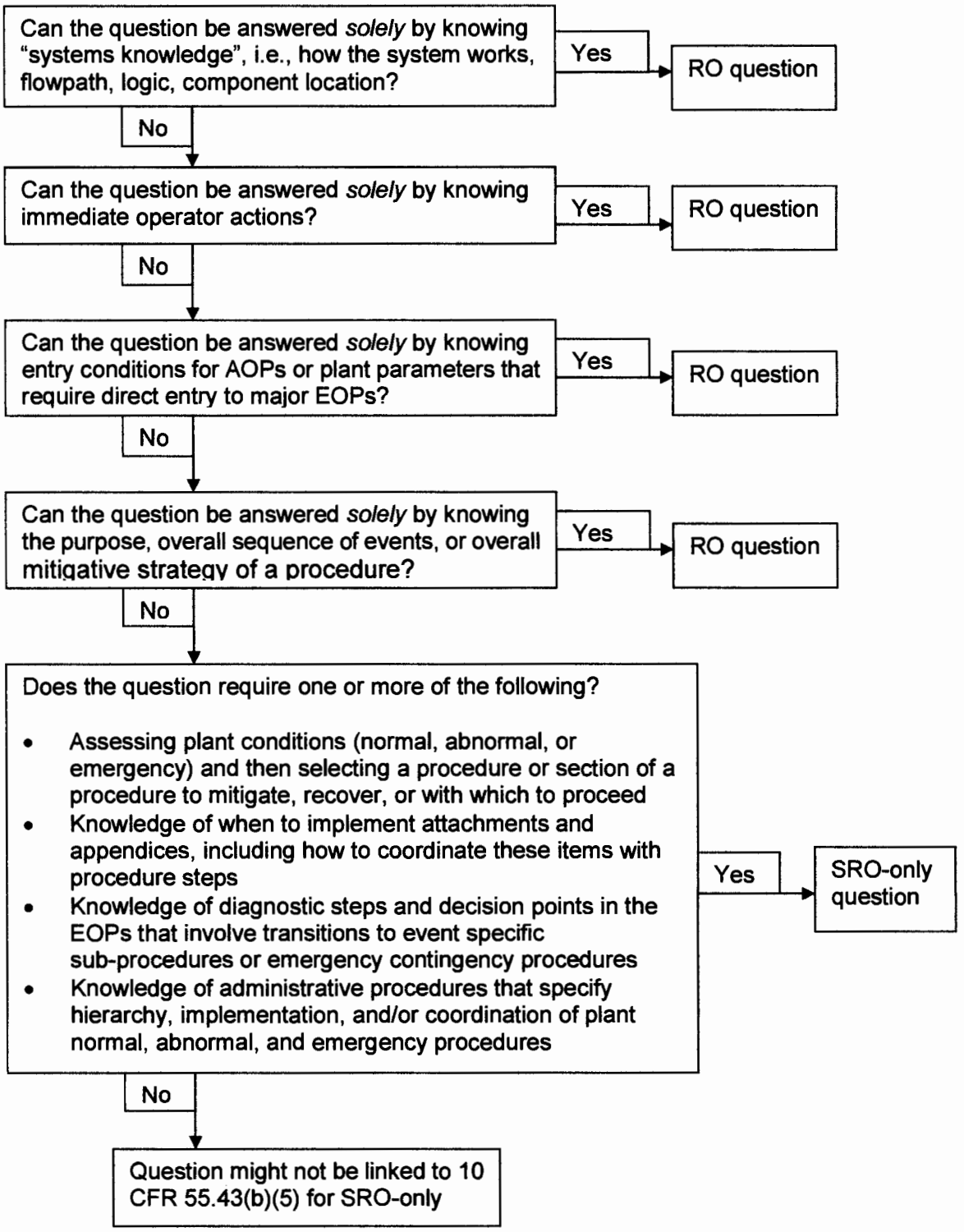
Number ES-0.2	Title Natural Circulation Cooldown	Issue 2 Revision 1

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
13	Check Cooldown Rate In RCS Cold Legs • All RCS loops active - LESS THAN 25F/HR -OR- • One or two RCS loops inactive - LESS THAN MAXIMUM ALLOWABLE LIMIT OF ATTACHMENT A-4.10	Reduce RCS cooldown rate to less than allowable limit. IF cooldown rate can NOT be reduced to less than 25F/HR, THEN Go to: • ES-0.3, "Natural Circulation Cooldown With Steam Void In Vessel (With RVLIS)", Step 1. -OR- • ES-0.4, "Natural Circulation Cooldown With Steam Void In Vessel (Without RVLIS)", Step 1.

Number	Title	
ES-0.2	**Natural Circulation Cooldown**	**Issue 2 Revision 1**

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
15	Verify Vessel Head Soak Not Required	
	a. CRDM fans - AT LEAST TWO RUNNING (ONE FAN PER UNIT)	a. Perform the following: 1) Maintain RCS pressure at 1200 PSIG and RCS subcooling within acceptable range on Attachment A-4.2. 2) Cooldown the RCS to less than 350F. 3) Wait for 9 HOURS, THEN Go to Step 16.

Figure 2: Screening for SRO-only linked to 10 CFR 55.43(b)(5) (Assessment and selection of procedures)



Question 29

Recommendation: The facility recommends accepting two answers for this question.

Reason: The stem of the question contains some unclear and confusing information that led to different assumptions by the candidates.

29. The plant is shutting down for a refueling outage in accordance with 2OM-52.4.R.1.F, "Station Shutdown From 100% Power To Mode 5".
Plant is at 30% power
All systems in normal alignment for this power level

Chemistry has requested a purge of the VCT to remove non-condensable gases.

In accordance with 2OM-7.4.F, "Degassing the Reactor Coolant System From The Volume Control Tank", which of the following completes the statements below?

At this power level, _____(1)_____ gas is used for purging the RCS of non-condensable gasses.

The non-condensable gasses from the VCT will be purged to the _____(2)_____.

A. 1) Hydrogen
2) Primary Plant Sample System

B. 1) Hydrogen
2) Boron Recovery System

C. 1) Nitrogen
2) Primary Plant Sample System

D. 1) Nitrogen
2) Boron Recovery System

Some statements in the stem of question 29 are unclear or conflicting. These conflicts caused confusion with the candidates as to the intent of the VCT purge referenced in the question stem. These items are listed below:

- The referenced procedure 2OM-52.4.R.1.F "Station Shutdown from 100% to Mode 5" does not reference the use of 2OM-7.4.F "Degassing the RCS from the VCT" until the RCS is being cooled down from 500F to 350F. The stem of the question states that the plant is at 30% power, at which time RCS temperature is ~ 556F. This led to confusion as to why the degas operation was being performed.
- The direction to use the procedure listed in the question stem - 2OM-7.4.F "Degassing the RCS from the VCT" while the unit is at 30% power is directed from a different procedure than was listed in the stem of the question. Specifically, procedure 2OM-52.4.R.1.A "STATION SHUTDOWN MODE 1 TO MODE 6 ADMINISTRATIVE AND LOCAL ACTIONS " page 23 step 71, directs the use of 2OM-7.4.F, not 2OM-52.4.R.1.F "Station Shutdown from 100% to Mode 5" as was stated in the stem of the question.
- 2OM-52.4.R.1.A "STATION SHUTDOWN MODE 1 TO MODE 6 ADMINISTRATIVE AND LOCAL ACTIONS " page 23 step 71 directs the operator to "Place N2 cover gas on VCT and Commence

purges as directed by chemistry in accordance with 2OM-7.4.F, "Degassing the Reactor Coolant System From The VCT". While this procedure step does specify adding Nitrogen to the VCT it does not state why Nitrogen is added to the VCT but does state to do this as directed by chemistry. The primary chemistry requirements/direction at this point of a planned shutdown are to reduce RCS Hydrogen concentration, not to remove non-condensable gases, as was listed in the stem of the question. This led to confusion when answering the question because typical at power operations require non-condensable gases to be removed by adding Hydrogen to the VCT while the intentional reduction of Hydrogen concentration of the RCS requires the addition of Nitrogen to the VCT.

- The stem of the question stated that the intent of the VCT purge was to remove Non-condensable gasses from the VCT. When at power this evolution is typically accomplished by the use of 2OM-7.4.E "Hydrogen Concentration Control of the Reactor Coolant System" and Hydrogen is used to perform the purge. 2OM-7.4.F "Degassing the RCS from the VCT" is typically used when removing hydrogen (Degassing) the VCT. The use of both concepts in the question caused confusion as to the intent of the evolution being described.
- The candidates understood the operation of the system as evidenced by all selecting the proper flow path, however the confusion in the intent of the evolution caused the majority of the candidates to select Hydrogen as the purging medium.

Based on the above information the facility is requesting that two answers (B and D) be accepted as correct answers.

T- 24 HOURS

68. Begin monitoring **Attachment 2**, Continuous Actions.

Initial

69. Verify that the controlled copies of the following procedures are available to the Control Room:

    - 2OM-52.4.R.1.F "Station Shutdown From 100% to MODE 5"
    - 2OM-52.4.R.1.S "Secondary Plant Shutdown"
    - 2OM-52.4.R.2.F "Station Shutdown - MODE 5 Activities"

Initial

70. Verify that the binders for the individual Operators have controlled copies of the applicable parts of this procedure (Continuous Actions, Expected Alarms, Attachments, etc.)

Initial

71. Place N2 cover gas on VCT and Commence purges as directed by chemistry in accordance with 2OM-7.4.F, "Degassing the Reactor Coolant System From The VCT".

Initial

72. Notify Effluent Control that steam will be released during the shutdown from the Steam Generator Atmospheric's, [2SVS-PCV101A, B, C].

Initial

    a. Initiate the performance of 2OM-10.4.A, "RHR System Startup", to check for RHR System voids, to sample both trains of RHR and to maximize CCP flow. Additional SWS flow required should be directed to the EOF.

Initial

73. Stage communications equipment for the Turbine Overspeed test attachment of 2OM-52.4.R.1.F "Station Shutdown From 100% to MODE 5".

Initial

I. **RCS Cooldown to 350F**

1. ♦ Perform the applicable part of 2OST-49.2A "Shutdown Margin Calculation For Cooldown To 350F, to verify boron requirement for cooling down to 350F is met.

Initial

2. Continue the RCS cooldown and depressurization to 350F at desired rate ≤ 100F (90F Target) IN ANY ONE HOUR **AND** on the target line of **Figure 1**, "RCS Press / Temp Limits Cooldown Curve", in accordance with **Attachment 5**, Continuous Action Step I **(PERFORMING RCS COOLDOWN)**

Initial

3. Begin raising pressurizer level to the target of "90% actual pressurizer level" as follows:

   a. Adjust net charging flow as desired by performing the applicable steps of **Attachment 22**, "Letdown Orifice Manipulations".

   b. Throttle charging flow < 150 gpm to maintain pressurizer level on target **AND** Net Charging Flow less than maximum.

   c. Refer to **Figure 2**, **Figure 3, and Table 2** for target and maximum values.

   d. Trend [2RCS*TI450] Surge Line Temperature.

Initial

4. When desired by Station Chemistry during plant cooldown, purge the VCT of non-condensable gasses in accordance with either of the following: (N/A the option **NOT** used)

   a. If charging pump suction is aligned to the RWST, **THEN** Initiate **Attachment 25**, "Purging the VCT." (otherwise N/A)

Initial

   b. If charging pump suction is aligned to the VCT, **THEN** Initiate 2OM-7.4.F, "Degassing the Reactor Coolant System From The Volume Control Tank." (otherwise N/A)

Initial

MANPOWER TASKS TIME TABLE

	RO	BOP	Level Oper	RHR Oper	PAB Oper	Turb Oper	Out side	STA	Extra RO #1	Extra NO #1	Extra NO #2
1. Reduce Load		■									
2. Stop Feedpump						■					
3. Stroke Bypass Vls						■					
4. Pedestal Checks 48%						■			■		
5. Isolate MSRs						■					
6. Bypass Feed in Ser. 30%			■								
7. Raise SG level to 50-60%			■								
8. Isol Blowdown						■					
9. Align Boration					■						
10. Manual Rods 15%	■										
11. Steam Press Mode		■									
12. T/S Survl Trends								■			
13. Open MOBs		■									
14. Stop Main Trf Cooling							■				
15. Trip Reactor 10- 15%	■										
16. Feedwater Isl Att		■									
17. Borate RCS Att				■							
18. Isl P/G WT					■						
19. Cooldown – 500F		■									
20. Source Range Att									■		
21. 2OST-49.2A								■			
22. 541F Intlk P12		■									
23. Post SM Clr, RODs				■							
24. Stop RCP B&A	■										
25. SDM <500F								■			
26. <500F Sample RHR											
27. Block Safety Inj	■	■			■						
28. Begin Raising PRZR Level	■										
29. Align Demins											
30. Cooldown to 350F		■									
31. VCT Burp 500-350F									■		
32. Stop MFD Pump	■					■					
33. Adjust Seal Inj					■					■	
34. ISL SI Accums 1K				■					■		
35. PORV Vent	■										
36. PRT Press Control				■							
37. Gland Stm Transfer						■					
38. OPPS in Service	■										
39. Enter MODE 4	■										
40. Heatup RHR				■							
41. Pull Stm Dump Fuses											
42. Enter MODE 5	■										

Beaver Valley Power Station

Unit 2

2OM-7.4.E

Hydrogen Concentration Control Of The Reactor Coolant System

STEP-BY-STEP

Revision 6

Prepared by	Date	Pages Issued	Effective Date
J. P. Keegan	**09/10/08**	**1 through 9**	**09/18/08**
Reviewed by	Date	Validated by	Date
C. Eberle	**09/16/08**	**N/A**	
PORC Meeting No.	Date		
PORC Not Required		**PAF-08-01991**	

I. PURPOSE

This procedure describes the steps necessary to purge the VCT with hydrogen and place a hydrogen cover pressure on the VCT.

This procedure describes the steps necessary to purge the VCT with hydrogen to maintain proper hydrogen concentration in the RCS

II. PRECAUTIONS & LIMITATIONS

A. Explosive mixtures of oxygen and hydrogen in the Volume Control Tank (VCT) must be avoided at all times. The oxygen content in the tanks must not exceed 2% by volume whenever a hydrogen blanket is present. Nitrogen gas may be used for purging.

III. INITIAL CONDITIONS

A. For Part A, A nitrogen blanket is being maintained on the VCT.

B. For Part B, hydrogen has been established on the VCT.

C. Hydrogen is available to [2CHS*65], H2 Inlet Isolation to [2CHS-PCV118].

D. The boron recovery system is aligned to receive and process letdown from the CHS System.

E. The reactor plant vents and drains system is lined up to receive and process the VCT vents.

F. Charging and letdown flow has been established.

G. The oxygen concentration of the RCS is less than 0.10 ppm.

H. At least one (1) of the following loops are in operation maintaining 3000 gpm flow through the core:

1. Reactor coolant loop A **OR** B **OR** C and its associated steam generator and RCP.

2. Residual heat removal pump A **OR** B and a heat exchanger.

I. The oxygen concentration of the PRT is less than 2%.

J. The oxygen concentration in [2GWS-TK21], Gaseous Waste Surge Tank, is less than 2%.

K. The oxygen concentration in [2GWS-TK25A, B, C, D, E, F, G], Gaseous Storage Tanks, is less than 2%.

L. The oxygen concentration in [2DGS-TK21, 22], Primary Drains Transfer Tanks, is less than 2%.

M. [2CHS*PCV117], VCT Vent Back Pressure Regulator, is set at 20 psig.

N. [2CHS*AOV102], Volume Control Tank Recycled Hydrogen Inlet is closed.

IV. INSTRUCTIONS

A. Establishing Hydrogen Concentration Control of RCS

1. Notify NDE to perform an UT inspection on piping segments with high voiding potential or known voids prior to hydrogen addition.

2. Sample the VCT gaseous space and verify oxygen content is less than 2% by volume.

3. Remove the nitrogen supply from the VCT as follows: (Aux Bldg, El 755)

   a. Close [2CHS*67], N2 Inlet Isol to [2CHS-PCV119].

   b. Close [2CHS*68], N2 to VCT Isol.

   c. Close [2GNS-94], Nitrogen Supply Isolation to VCT.

4. Establish automatic supply of hydrogen gas to the VCT as follows:

   a. Verify [2CHS*PCV116B], Volume Cont Tank Press Control Vlv, is set at 16 psig. (BB-A)

   b. Open [2CHS*65], H2 Inlet Isolation to [2CHS-PCV118]. (Aux Bldg, El 755)

   c. Verify [2CHS*PCV118], Hydrogen Supply Pressure Regulator, is set at 50 psig. (Aux Bldg, El 755)

   d. Open [2CHS*66], H2 Outlet Isol for [2CHS*PCV118]. (Aux Bldg, El 755)

Note:	[2CHS*AOV8101] may need to be intermittently closed to maintain VCT pressure ~20 psig during VCT fill.

5. Open [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers, to establish VCT vent. (VB-A)

6. Place [2CHS*LCV115A] Mode Selector Switch to the VC Tank position. (BB-A)

7. Raise the VCT level to 95% as indicated at [2CHS-LI115] while purging with hydrogen as follows: (VB-A)

   a. Raise the pressure setting for [2CHS*PCV116B], Volume Cont Tank Press Control Vlv, to 25 psig. (BB-A)

   b. If necessary to raise the VCT level, makeup to the VCT in accordance with 2OM-7.4.N, "Blender Manual Makeup Operation".

c. When 95% VCT level is reached as indicated on [2CHS-LI115], complete the following: (VB-A)

1) If manual makeup was started then secure manual makeup in accordance with 2OM-7.4.N, "Blender Manual Makeup Operation".

2) Ensure VCT pressure being maintained ~ 20 psig.

3) Verify open [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers.

4) Maintain this condition for 10 min.

8. Secure the hydrogen purge after 10 minutes as follows:

a. Reduce the pressure setting for [2CHS*PCV116B], Volume Cont Tank Press Control, to 16 psig. (BB-A)

b. Close [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers. (VB-A)

c. Lower VCT level by placing [2CHS*LCV115A], Mode Selector Switch to AUTO position. (BB-A)

9. When VCT Level returns to 20-65%, Purge the VCT with hydrogen one additional time prior to initial sampling by repeating steps IV.A.5 through IV.A.8.c. (N/A if already performed).

10. When the VCT level returns to the normal operating range of 20-65%, sample the VCT gaseous space and verify nitrogen concentration is less than 3% by volume and oxygen concentration less than 4% by volume, if not repeat Step IV.A.5 through IV.A.10.

11. Independently Verify [2CHS*LCV115A] Mode Selector Switch to AUTO position and document in the Narrative Log.

12. Establish hydrogen supply to the inline sparger as follows:

a. Close [2CHS*PCV116B], Volume Cont Tank Press Control Vlv. (BB-A)

b. Verify [2CHS*PCV116A], Volume Cont Tank Press Control Vlv, is set at 18 psig. (BB-A)

c. Place [2CHS*PCV116A], Volume Cont Tank Press Control Vlv, in Auto. (BB-A)

d. Sample gaseous waste system to verify N2 concentration is less than 0.2% by volume in accordance with BVPS-2 Chemistry Manual.

e. If desired **AND** Chemistry concurs, Open [2CHS*AOV102], Volume Control Tank Recycled Hydrogen Inlet. (BB-A)

f. When makeup from the GW surge tank is no longer required, Close [2CHS*AOV102], Volume Control Tank Recycled Hydrogen Inlet.

13. If the oxygen content in the VCT approaches 5 percent, purge the gas space as follows:

    a. Open [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers. (VB-A)

    b. Raise the pressure setting for [2CHS*PCV116A], Volume Cont Tank Press Control Vlv, to 25 psig. (BB-A)

    c. When oxygen concentration is reduced to desired level complete the following:

        1) Reduce the pressure setting for [2CHS*PCV116A], Volume Cont Tank Press Control Vlv, to 18 psig. (BB-A)

        2) Close [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers. (VB-A)

14. Independently Verify Closed [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers and document in the Narrative Log.

15. Notify NDE to perform an UT inspection on piping segments inspected in Step IV.A.1 **AND** to compare void volumes.

B. **Maintaining Hydrogen Concentration Control of RCS**

1. Notify NDE to perform an UT inspection on piping segments with high voiding potential or known voids prior to hydrogen addition.

Note:	[2CHS*AOV8101] may need to be intermittently closed to maintain VCT pressure ~20 psig during VCT fill.

2. Open [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers, to establish VCT vent. (VB-A)

3. Place [2CHS*LCV115A] Mode Selector Switch to the VC Tank position. (BB-A)

4. Raise the VCT level up to 95% as indicated at [2CHS-LI115] while purging with hydrogen as follows: (VB-A)

   a. If necessary to raise the VCT level, makeup to the VCT in accordance with 2OM-7.4.N, "Blender Manual Makeup Operation".

   b. When ≤ 95% VCT level is reached as indicated on [2CHS-LI115], complete the following: (VB-A)

      1) If manual makeup was started, then secure manual makeup in accordance with 2OM-7.4.N, "Blender Manual Makeup Operation".

      2) Ensure VCT pressure being maintained ~ 20 psig.

      3) Raise the pressure setting for [2CHS*PCV116B], Volume Cont Tank Press Control Vlv, to 25 psig. (BB-A)

      4) Verify open [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers.

      5) Maintain this condition for 10 min.

5. Secure the hydrogen purge after 10 minutes as follows:

   a. Reduce the pressure setting for [2CHS*PCV116B], Volume Cont Tank Press Control, to ~16 psig. (BB-A)

   b. Close [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers. (VB-A)

   c. Lower VCT level by placing [2CHS*LCV115A], Mode Selector Switch to AUTO position. (BB-A)

6. If directed by Chemistry, Purge the VCT with hydrogen one additional time, prior to sampling by repeating Steps IV.B.2 through IV.B.5.c.

7. When the VCT level returns to the normal operating range of 20-65%, Request Chemistry to sample the RCS.

8. If required, Purge the VCT with hydrogen by repeating Steps IV.B.2 through IV.B.7.

9. Independently Verify [2CHS*LCV115A] in Auto position and document in the Narrative Log.

10. Independently Verify Closed [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers and document in the Narrative Log.

11. Notify NDE to perform an UT inspection on piping segments inspected in Step IV.B.1 **AND** to compare void volumes.

V. REFERENCES

A. TECHNICAL SPECIFICATIONS

NONE

B. UPDATED FINAL SAFETY ANALYSIS REPORT

NONE

C. COMMITMENTS

NONE

D. ADMINISTRATIVE

NONE

E. VENDOR INFORMATION

NONE

F. DRAWINGS

1. 10080-RM-407-2, VOND Charging Sys VCT And Make-Up

G. OPERATING MANUAL

1. 2OM-7.1, Chemical And Volume Control System, Description
2. 2OM-7.2 Precautions, Limitations and Setpoints
3. 2OM-7.3 2CHS Valve List
4. 2OM-7.4.N, Blender Manual Makeup Operation

H. PLANT MODIFICATION

NONE

I. OTHER

1. OMDR 2-91-0176 (Rev. 0)
2. OMDR 2-93-0511 (Rev. 1)
3. Incorporated: OMDR 2-93-1056 which deleted P&L step concerning reduction of H_2 concentration. OMCR 2-96-1256 changed setpoint for [2CHS-PCV118] to 50 psig per MWR 049809. (Rev. 2)

4. DRR-02-01294, Add Chemistry concurrence for use of [2CHS*AOV102], Volume Control Tank Recycled Hydrogen Inlet and add step to close [2CHS*AOV102] following makeup from GW surge Tank, change Precaution and Limitation A to state the oxygen content in the tanks must not exceed 2% instead of 5%. (Rev. 3)

5. PAF-02-03557, 02-03340RAD, Add to purpose that this procedure describes the steps necessary to purge the VCT with hydrogen to maintain proper hydrogen concentration in the RCS; add initial condition For Part B, hydrogen has been established on the VCT; add steps to Independently Verify Closed [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers and document in the Daily Journal; Add part B, Maintaining Hydrogen Concentration Control of RCS, Independently Verify control switch for [2CHS*LCV115A], VCT Level Cont in the Auto position and document in the Daily Journal. (Rev. 4)

6. CR 02-06831, PAF-02-03577, Added instruction to perform UT inspections to monitor any gas void formations. (Rev. 5)

7. PAF 08-01991 (Revision 6)

   a. CR 08-45417, Order 200335871, Remove steps to adjust the potentiometer for [2CHS*LCV115A] to maintain $\leq$ 95% level in VCT and to place the Control switch for [2CHS*LCV115A], VCT Level Cont to the Auto position.

   b. CA 08-38179-01, PCR 4064, Add a step to close [2GNS-94], Nitrogen Supply Isolation to VCT.

   c. Change Daily Journal to Narrative Log, correct increase and decrease verbs, and change check to verify.

Beaver Valley Power Station

Unit 2

2OM-7.4.F

DEGASSING THE REACTOR COOLANT SYSTEM FROM THE VOLUME CONTROL TANK

STEP-BY-STEP

Revision 20

Prepared by	Date	Pages Issued	Effective Date
J. P. Keegan	**12/03/15**	**1 through 18**	**12/08/15**
Reviewed by	Date	Validated by	Date
C. Eberle	**12/04/15**	**N/A**	
PORC Meeting No.	Date	**PAF-15-02230**	
PORC Not Required			

This Working Copy has been verified current using the designated electronic version or has been compared to a controlled copy of the Operating Manual and SHALL be re-verified current once every 72 Hours.

EMP. NO.	INIT.	DATE	TIME

I. PURPOSE

This procedure provides the steps necessary to reduce the concentration of hydrogen and other dissolved gasses from the reactor coolant system for refueling or maintenance.

This procedure also provides instructions to purge the pressurizer vapor space of non-condensable gasses during power operation to assist in re-establishing the pressurizer PORVs loop seal.

II. PRECAUTIONS & LIMITATIONS

A. Explosive mixture of oxygen and hydrogen in the Volume Control Tank (VCT) must be avoided at all times. The oxygen content in the tanks must not exceed 2% by volume whenever a hydrogen blanket is present. Nitrogen gas may be used for purging. (2OM-7.2)

B. RCS H2 Conc is not to be reduced below 15 cc/kg with Rx critical (2OM-51.2).

III. INITIAL CONDITIONS

A. Charging and letdown flow has been established.

B. The reactor plant vents and drains system is lined up to receive and process the VCT vents.

C. The boron recovery system is aligned to receive and process letdown from the CHS System.

D. Nitrogen is available to [2CHS-67], N2 Inlet Isol to [2CHS-PCV119].

E. The primary plant component and neutron tank cooling water system is supplying cooling water to [2SSR-E22], PZR Vapor Space Sample Cooler.

F. The reactor plant sample system is available to transfer condensable gasses from the pressurizer to a suitable collection point.

G. [2CHS-PCV117], VCT Vent Back Pressure Regulator, is initially set at 20 psig.

IV. INSTRUCTIONS

A. Preparation For Degassing The RCS From The VCT

1. Open [2GNS-94], Nitrogen Supply Isolation to VCT, (Aux. Bldg, EL. 755, 758)
2. Verify Closed [2CHS*AOV102], Volume control Tank Recycled Hydrogen Inlet. (BB-A)
3. Remove hydrogen from the VCT as follows: (Aux. Bldg, EL. 755 VCT Cub South Wall/759)
   a. Close [2CHS-65], (RM) H2 Inlet Isolation to [2CHS-PCV118] AND Caution Tag.
   b. Close [2CHS-66], (RM) H2 Outlet Isol for [2CHS-PCV118] AND Caution Tag.
   c. Verify Closed [2CHS*67] (RM) N2 Inlet Isol to [2CHS*PCV119].
   d. Verify Open [2CHS*68] N2 to VCT Isol.
   e. Relieve any trapped pressure to the VCT as follows:
      1) Open [2CHS*AOV203] VCT Nitrogen Blanket Hdr Isol Vlv. (BB-A)
      2) Open [2CHS*PCV116B] Volume Cont Tank Press Control Vlv. (BB-A)
   f. Fail open [2CHS*PCV119], Nitrogen Supply Pressure Regulator, (Aux Bldg. 759' VCT Cubicle) by lowering VCT pressure **AND** then closing [2CHS-570]. Diaphragm Pressure Root for [2CHS*PCV119] **OR** manually open using the manual override mechanism.
   g. Reclose [2CHS*PCV116B], Volume Cont Tank Press Control Vlv.
   h. Open [2CHS*67] (RM) N2 Inlet Isol to [2CHS*PCV119].
   i. Update the Control Room VOND.
4. Maintain the letdown flow rate as high as permissible for the existing plant conditions.
   a. Keep at least [2RCS*P21A] **or** [2RCS*P21C], Reactor Coolant Pumps, in operation to provide for continuous pressurizer spray flow.
   b. Energize additional pressurized heaters to maximize spray flow.
5. Verify [2CHS*PCV116A], Volume Cont Tank Press Control Vlv is set at 18 psig. (BB-A)

B. **Purging The VCT During RCS Degasification**

CAUTION:	VCT MINIMUM PRESSURE IS 15 PSIG. THIS WILL PROVIDE THE REQUIRED BACK PRESSURE ON THE RCP SEALS.

1. If necessary to enable reducing VCT pressure in the following steps, then fail open [2CHS-PCV117], VCT Vent Back Press Reg, by Performing the following: (Aux. Bldg 755' VCT Cub E. Wall 757')

   a. Open [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers (VB-A).

   b. Adjust [2CHS-PCV116B], Volume Cont Tank Press Control Vlv, raising VCT pressure above 20 psig to open [2CHS-PCV117].

   c. With VCT pressure above 20 psig, Close [2CHS-564], Root Isol for [2CHS-PCV117] (Aux Bldg 755' VCT Cub E Wall), to trap pressure in the positioner for [2CHS-PCV117].

   d. Close [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers (VB-A).

Note:	Step IV.B.2 through Step IV.B.5 may be performed as necessary during the VCT purge.

2. If required, reduce VCT gas space pressure on [2CHS-PI117], so that additional non-condensable gasses escape from coolant in VCT, by performing any of the following:

   a. Open [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers (VB-A).

CAUTION:	VCT MINIMUM PRESSURE IS 15 PSIG. THIS WILL PROVIDE THE REQUIRED BACK PRESSURE ON THE RCP SEALS.

   b. Adjust [2CHS-PCV116B] to Reduce VCT pressure to between 15 and 20 psig.

   c. When VCT pressure is between 15 and 20 psig, Close [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers.

3. If required, raise VCT level in preparation for VCT purging of non-condensable gasses as follows:

   a. Place [2CHS*LCV115], VCT Level Cont selector switch to VCT position.

   b. If desired to fill the VCT from the PRZR, then increase letdown flow or reduce charging flow. (preferred) (Otherwise step is N/A)

c. If desired to fill the VCT from a Boric Acid Tank, Perform EITHER 2OM-7.4.N, "Blender Manual Makeup Operation", OR the following IF boric acid makeup is desired: (Otherwise step is N/A)

1) Verify open [2CHS*FCV113A], Boric Acid To Boric Acid Blender (BB-A).

2) Verify closed [2CHS*MOV350], Emergency Boration Isol Vlv (BB-A).

3) Check running OR Start [2CHS*P22A (22B)], Boric Acid Transfer Pump.

CAUTION:	USING THE RWST DURING MODES 1-4 WILL CAUSE ENTRY INTO T.S. 3.5.4, IF LEVEL REDUCES TO LESS THAN 716 INCHES.

d. If desired to fill the VCT using makeup from the RWST, Perform the following: (Otherwise step is N/A)

1) Open [2CHS*LCV115B or 115D], Charging Pumps Suct From RWST, to provide makeup flow to pressurizer and VCT.

2) Close [2CHS*LCV115C or 115E], Charging Pumps Suct From Volume Control Tank, to divert all return flow from degasifiers to the VCT.

e. Allow VCT level to rise to a maximum of 90% - 95%.

1) As [2CHS-LI115], Volume Control Tank Level, **AND** [2CHS-PI117] Volume Control Tank Pressure, indicators rise, Cycle [2CHS*AOV8101], control switch between OPEN and CLOSE positions, to maintain VCT pressure between 15 and 20 psig.

4. When VCT level reaches the desired level, discontinue VCT fill **AND** Stabilize VCT level as follows:

CAUTION:	SUBSTEPS IV.B.4.a AND IV.B.4.b MUST BE PERFORMED FIRST TO ENSURE SUCTION FLOW TO CHARGING PUMPS.

a. Verify Open [2CHS*LCV115C], Charging Pumps Suct From Volume Control Tank.

b. Verify Open [2CHS*LCV115E], Charging Pumps Suct From Volume Control Tank.

c. If the RWST was used as makeup to the CHS, Close [2CHS*LCV115B and 115D], Charging Pumps Suct From RWST. (Otherwise step is N/A)

d. If desired to isolate makeup flow from the Boric Acid Tank, perform the following: (Otherwise step is N/A)

1) Verify control switch to AUTO for [2CHS*P22A (22B)], Boric Acid Transfer Pump.

2) Close [2CHS*FCV113A], Boric Acid To Boric Acid Blender.

e. Balance charging and letdown flows to stabilize VCT level.

5. When desired, Reduce level in VCT to a minimum of 20% as follows:

a. Close [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers (VB-A).

b. Place [2CHS-PCV116B], Volume Cont Tank Press Control Vlv, controller in AUTO **OR** manually adjust [2CHS-PCV116B] to control VCT pressure.

CAUTION:	[2CHS*RV209], LTDN DEMIN RELIEF VLV, CAN LIFT IF LETDOWN FLOW IS GREATER THAN 75 GPM, [2CHS*LCV115A] IS IN THE FULL DIVERT TO THE DEGASIFIER POSITION, AND ONE DEGASIFIER IS ALIGNED TO RECEIVE LETDOWN.

c. If flow will be diverted to the degasifier in the next step **AND** letdown flow is greater than 75 gpm, perform either of the following: (Otherwise N/A)

1) Reduce letdown flow by removing one 60 gpm or 45 gpm orifice from service according to 2OM-7.4.AN, "Placing or Removing a Letdown Orifice From Service".

OR

2) Align degasifiers to receive maximum letdown by Opening [2BRS-MOV100B], Degasifier Rcvy Exch 24B1 & 24B2 Inlet Valve.

d. Perform either of the following to reduce VCT level:

1) If the plant is in MODE 4 or 5 with an RCP running and a pressurizer steam bubble, Perform Attachment A, otherwise Adjust charging and letdown flows to transfer coolant from VCT to the pressurizer. (Preferred)

OR

2) Operate [2CHS*LCV115A] Mode Selector switch from VCT to AUTO to VCT position, as necessary to direct [2CHS*LCV112] flow to the coolant recovery tanks **AND** to maintain VCT pressure > 15 psig.

e. When VCT level reaches the desired level > 20%, Perform the following

1) Verify **OR** Place [2CHS*LCV115A] Mode Selector switch to AUTO position.

2) Place controller in AUTO for [2CHS-LCV112], VCT Level Cont Divert to Clnt Rcvy.)

3) Return pressurizer level to program **AND** Return charging flow control to automatic.

4) Verify [2CHS-PCV116B], Volume Cont Tank Press Control Vlv, controller in AUTO.

f. If desired to align makeup flow from the Boric Acid Transfer Pump to continue emergency boration, Perform the following: (Otherwise N/A)

1) Open [2CHS*MOV350], Emergency Boration Isol Vlv.

2) Close [2CHS*FCV113A], Boric Acid To Boric Acid Blender.

3) Place control switch to AUTO for [2CHS*P22A (22B)], Boric Acid Transfer Pump.

4) When emergency boration is no longer required, Close [2CHS*MOV350] Emergency Boration Isol. Vlv.

g. If valve is failed open, return [2CHS-PCV117], VCT Vent Back Press Reg, to the 20 psig setting by Opening [2CHS-564], Root Isol for [2CHS-PCV117] (aux Bldg 755' VCT Cub E Wall). (Otherwise step is N/A)

6. If flow to the degasifier(s) was reduced **OR** a second degasifier was placed into service, perform either of the following, as applicable: (Otherwise N/A)

a. Raise letdown flow by placing one 60 gpm or 45 gpm orifice in service according to 2OM-7.4.AN, "Placing or Removing a Letdown Orifice From Service".

OR

b. Align degasifiers by Closing [2BRS-MOV100B], Degasifier Rcvy Exch 24B1 & 24B2 Inlet Valve.

7. Notify Chemistry that VCT has been purged **AND** to sample VCT for hydrogen.

8. Go to Step IV.C.

C. **Continue To Degasify The RCS**

CAUTION: CONTINUOUS PURGE OF THE PRESSURIZER VAPOR SPACE TO THE VCT CAN RESULT IN A DILUTION OF THE RCS AND A RISE IN BORON CONCENTRATION IN THE PRESSURIZER. THE PRESSURIZER BACKUP HEATER(S) ARE PLACED ON AND THE PRESSURIZER SPRAY VALVES CHECKED IN AUTO TO MAINTAIN THE PRESSURIZER EQUALIZED WITH THE RCS.

CONTINUOUS PURGE OF THE PRESSURIZER VAPOR SPACE TO [2DGS-TK21] OR THE SAMPLE SINK MAY RESULT IN A RISE IN BORON CONCENTRATION IN THE RCS AND THE PRESSURIZER WHEN THE PRESSURIZER BACKUP HEATER(S) ARE ON AND THE PRESSURIZER SPRAY VALVES ARE IN AUTO. WITH AN INITIAL HIGH RCS BORON CONCENTRATION, A DILUTION OF 15 GALLONS EVERY HOUR MAY BE REQUIRED TO OFFSET THE BORATION EFFECT.

BASED ON THE INITIAL AMOUNT OF NON-CONDENSABLE GASES IN THE PRESSURIZER, A VCT LEVEL TRANSIENT CAN BE EXPECTED DUE TO A PRESSURIZER INSURGE.

1. Place at least one 2RCP*H2A(B)(D)(E) PRZR Heaters Backup Group (A)(B)(D)(E) to ON.

2. Verify [2RCS*PCV455A, 455B], PRZR Spray Valve Control in AUTO.

3. Request Chemistry to establish a continuous purge of the pressurizer vapor space in accordance with approved Chemistry procedures.

4. If performing a continuous purge of the pressurizer vapor space to [2DGS-TK21] or the sample sink, perform RCS dilutions to maintain Tavg on program, as necessary.

CAUTION: DO NOT REDUCE RCS HYDROGEN CONCENTRATION BELOW 15CC/KG WITH REACTOR CRITICAL.

5. At 3 hour intervals or as directed by Chemistry Section, purge the VCT gas space by performing Step IV.B.

   a. After each purge have chemistry sample Reactor Coolant System.

   b. Verify hydrogen concentration is reduced to less than 5cc/kg and the Xenon 133 gaseous activity to less than 0.5 microcuries/cc. **IF** not continue to purge at regular intervals.

6. To stop the purge of the PZR, Request Chemistry to stop the continuous purge of the pressurizer vapor space in accordance with approved Chemistry procedures.

7. Return [2RCS*PCV455A and 455B], PRZR Spray Valve Control to AUTO.

8. Independently verify [2RCS*PCV455A and 455B], PRZR Spray Valve Control in AUTO and Record the verification in the Narrative Log.

9. Return the 2RCP*H2A,B,C,D and E, PRZR Heaters Group A,B,C,D and E to AUTO.

10. Independently verify the 2RCP*H2A,B,C,D and E, PRZR Heaters Group A,B,C,D and E in AUTO and Record the verification in the Narrative Log.

11. Restore [2CHS-PCV119], Nitrogen Supply Pressure Regulator by Opening [2CHS-570], Diaphragm Pressure Root for [2CHS-PCV119] OR by operating the manual override mechanism, as applicable.

Note:	The following steps provide instructions to purge non-condensable gasses from the pressurizer, which is blocking the formation of the loop seal for the pressurizer PORV.

D. **Purge the Pressurizer of Non-condensable Gasses:**

CAUTION:	CONTINUOUS PURGE OF THE PRESSURIZER VAPOR SPACE TO THE VCT CAN RESULT IN A DILUTION OF THE RCS AND A RISE IN BORON CONCENTRATION IN THE PRESSURIZER. THE PRESSURIZER BACKUP HEATER(S) ARE PLACED ON AND THE PRESSURIZER SPRAY VALVES CHECKED IN AUTO TO MAINTAIN THE PRESSURIZER EQUALIZED WITH THE RCS. CONTINUOUS PURGE OF THE PRESSURIZER VAPOR SPACE TO [2DGS-TK21] OR THE SAMPLE SINK MAY RESULT IN A RISE IN BORON CONCENTRATION IN THE RCS AND THE PRESSURIZER WHEN THE PRESSURIZER BACKUP HEATER(S) ARE ON AND THE PRESSURIZER SPRAY VALVES ARE IN AUTO. WITH AN INITIAL HIGH RCS BORON CONCENTRATION, A DILUTION OF 15 GALLONS EVERY HOUR MAY BE REQUIRED TO OFFSET THE BORATION EFFECT. BASED ON THE INITIAL AMOUNT OF NON-CONDENSABLE GASES IN THE PRESSURIZER, A VCT LEVEL TRANSIENT CAN BE EXPECTED DUE TO A PRESSURIZER INSURGE.

1. Evaluate requesting an RWDA-G as a precaution for purging the pressurizer to the sample panel.
2. Verify at least one 2RCP*H2A(B)(D)(E) PRZR Heaters Backup Group (A)(B)(D)(E) to ON.
3. Verify [2RCS*PCV455A, 455B], PRZR Spray Valve Control in AUTO.
4. Request Chemistry to establish a continuous purge of the pressurizer vapor space in accordance with approved Chemistry procedures.
5. If performing a continuous purge of the pressurizer vapor space to [2DGS-TK21] or the sample sink, perform RCS dilutions to maintain Tavg on program, as necessary.
6. After 24 hrs **OR** a time determined by Chemistry, Request Chemistry to stop the continuous purge of the pressurizer vapor space in accordance with approved Chemistry procedures.
7. Return the 2RCP*H2A(B)(D)(E) PRZR Heaters Backup Group (A)(B)(D)(E) to AUTO.
8. Independently verify the 2RCP*H2A(B)(D)(E) PRZR Heaters Backup Group (A)(B)(D)(E) in AUTO and Record the verification in the Narrative Log.

9. Assess the effectiveness of the purge on the formation of the loop seal by verifying [2RCS-TI463], PORV Temp has dropped or returned to the temperature prior to the PORV leaking.

10. If [2RCS-TI463], PORV Temp has dropped but not fully returned to the temperature prior to the PORV leaking, repeat the above steps to purge the pressurizer vapor space, if desired.

ATTACHMENT A

Note:
- In MODE 4 or 5 with a pressurizer steam bubble in the pressurizer and normal spray in service, **NET** charging flow for this procedure is charging + seal injection - letdown - seal leak-off. 45 kW of PRZR heaters are required for each gpm of **NET** charging flow. (ERFCS point [U1007])
- If all pressurizer heaters are not available, **NET** charging flow must be proportionally lower to prevent an insurge. For example with PRZR Htr H2A Backup Heater (215 Kw) OFF, **NET** charging flow should be reduced to < 25 gpm.
- Expected PRZR level rate of rise should be ≤ 1/3% per minute with all heaters energized.

1. In MODE 4 or 5 with an RCP running and a pressurizer steam bubble, a pressurizer level rise of > 5% shall be performed in accordance with the following steps:

   a. Place all available [2RCP*H2A, H2B, H2C, H2D, H2E] Pressurizer Heaters in service.

   b. Adjust [2RCS*PCV455A(B)] PRZR Spray Valve as necessary to control pressurizer pressure and temperature.

   c. Verify Open [2CHS*LCV460A and 460B], Regenerative Heat Exch Letdown Inlet Vlv.

   d. Verify Open [2CHS*AOV200A, B and C], Letdown Orifice 21, 23, 22 Isol 45, 60, 60 gpm.

   e. Maintain [2CHS*FI150], Non-Regen Hx Outlet Flow stable while performing the following steps.

   f. Slowly raise pressurizer level by raising charging flow to obtain a **NET** Charging Flow of < 30 gpm by Throttling [2CHS*FCV122], Charging Pumps Disch Control in Manual control.

Note: The following step is a continuous action step.

   g. If PRZR surge line in-flow develops ([2RCS*TI450] PRZR Surge Line Temp drops below [2RCS-TI453], PRZR Liquid Temp by > 25F), Reduce charging/seal inj flow or Raise letdown flow to make **NET** charging flow less than PRZR spray flow.

CAUTION:	IF A MAJOR PRESSURIZER INSURGE OCCURS, THE PRESSURIZER LIQUID TEMPERATURE MUST BE ALLOWED TO STABILIZE BEFORE AN OUTSURGE IS RE-ESTABLISHED. THIS WILL PREVENT A SECOND TRANSIENT ON THE PRESSURIZER WHICH IS AS SEVERE AS THE FIRST.

h. If a drop in [2RCS-TI453], PRZR Liquid Temp (T0480A) of > 25 F occurs due to an insurge, Perform the following:

1) Determine **NET** Charging Flow.

2) Stop the pressurizer insurge by Slowly throttling [2CHS*FCV122] and/or [2CHS*PCV145] to obtain a **NET** Charging Flow that corresponds to current heater output (i.e. 30 gpm for all heaters energized).

3) Refer to LR 3.4.3.

4) Monitor [2RCS-TI453], PRZR Liquid Temp.

5) When [2RCS-TI453], PRZR Liquid Temp stabilizes, Re-establish a pressurizer outsurge by reducing charging flow to obtain a **NET** Charging Flow of < 30 gpm by throttling [2CHS*FCV122], Charging Pumps Disch Control.

i. When PRZR level is at the desired level, stabilize pressurizer level by throttling [2CHS*FCV122], Charging Pumps Disch Control **AND** Return to AUTO.

V. REFERENCES

A. TECHNICAL SPECIFICATIONS

1. T.S. 3.4.16
2. T.S. 3.5.4

B. UPDATED FINAL SAFETY ANALYSIS REPORT

NONE

C. COMMITMENTS

NONE

D. ADMINISTRATIVE

1. LR 3.4.3

E. VENDOR INFORMATION

NONE

F. DRAWINGS

1. 10080-RM-407-2, VOND Charging Sys VCT And Make-Up
2. 10080-RM-414A-1, VOND Rx Plant Sample-Hood 1
3. 10080-RM-414A-2, VOND Rx Plant Sample-Hood 2

G. OPERATING MANUAL

1. 2OM-7.1, Chemical And Volume Control System, Description
2. 2OM-7.2 Precautions, Limitations, And Setpoints
3. 2OM-7.3 2CHS Valve List
4. 2OM-7.4.N, Blender Manual Makeup Operations
5. 2OM-14A.3 2SSR Valve List

H. PLANT MODIFICATION

NONE

I. OTHER

1. OMDR 2-91-0177 (Rev. 0)

2. OMDR 2-92-0363 (Rev. 1)

3. OMDR 2-94-0688 (Rev. 2)

4. OMCN 2-96-409 (Rev. 3)

5. OMCR 2-97-0515, Add steps to purge non-condensable gasses from the pressurizer, which is blocking the formation of the loop seal for the pressurizer, Revise Part C to use CM 2-3.35 Part F, "Pressurizer Vapor Purge to the VCT" instead of providing the steps, OE 8037, "Boron Dilution During Pressurizer Steam Space Purge", Revise step A.3 high level action step to address the following substeps, Remove steps that checked open 2CHS-67,68, Add step to close 2CHS-MOV350 when the emergency boration is no longer needed. Add steps to return the pressurizer spray valves, the pressurizer heaters, and 2CHS-PCV119 to NSA, Reword Step to go to 2OM-7.4.T if the VCT sparger is bypassed (Rev. 4)

6. OMCR 2-97-533, Revised step to return PRZR level to program and restore charging flow control to automatic (CR 971142) (Rev. 5).

7. OMCR 1-98-0437, CR 981088, 980357, WCAP 13588 "Operational Strategies for Mitigating Pressurizer Insurge and Outsurge Transients". Notes and steps were added to inform the operator of pressurizer insurges and to properly control charging, letdown to prevent an insurge during pressurizer fill; CR 981459, BCO 2-98-004 (Original issue) - The Chemical and Volume Control System will be operated with a letdown flow rate of greater than 66 gpm and less than or equal to 120 gpm only on a temporary basis to address a transient condition and only when the RCS specific activity is verified to be less than or equal to 0.5 µCi/gram dose equivalent I-131. A Caution was added to inform the user of this limitation. (Rev. 6)

8. OMCN 2-98-334 incorporated Revision 1 to BCO 2-98-004 which changed the letdown flow limit to 75 gpm. (Rev. 7)

9. BCO 2-98-004 (Rev. 2) changed the maximum permissible RCS specific activity to 0.35 µCi/gram dose equivalent I-131 in the Caution containing letdown flow and RCS specific activity limits. (Issue 4/Rev. 8)

10. Removed Caution containing letdown flow and RCS specific activity limits from the step directing the maximizing of letdown flow (Step A.4), and removed the associated reference to BCO 2-98-004, to support implementation of TS Amendment 101. (Issue 4/Rev. 9)

11. CATS E990338B, OMCR 2-99-443, OE 8037 and OE 9822; added to Section "C" a Caution about purging pressurizer vapor space causing a RCS dilution, added steps to Section "C" to energize one set of backup heaters and verify pressurizer spray valve control in AUTO. This is the same Caution and steps that are already in Section "D". Revised step to clarify "check" and "verify" wording. (Revision 10)

12. CR 991449-12, Correct reference number for Chemistry procedure C.M. 2-3.35, Part E.4 (Revision 11).

13. DRR-02-00560: For LAR 2A-159, changed the T.S. 3.1.2.8.b reference to T.S. 3.1.2.8, reflecting a numbering change resulting from the relocation of portions of T.S. 3.1.2.8 to the Licensing Requirements Manual. (Revision 12)

14. DRR-02-01756: For TS Amendment 124, reference to TS 3.4.9.2 was modified to refer to LR 8.4, to reflect relocation of that requirement to the Licensing Requirements Manual. (Revision 13).

15. PAF-02-03743, modified instructions in Part C and Part D to remove a specific reference to "CM 2-3.35 Part E.4, Pressurizer Vapor Purge to the VCT" and replace with "approved Chemistry procedures". This will facilitate performing continuous degasification to the Primary Drains Tank using previously approved Chemistry procedures. (Revision 14)

16. PAF 03-00261, CA 02-06831-54, Deleted old step IV.A.1 for venting the charging pumps. Venting for this condition was determined unnecessary since gas production problem was corrected with installation of multi-staged orifices on the mini-flow lines via DCP 2304. Deleted instruction related to VCT being bypassed i.e. [2CHS-17] closed as management has determined this could adversely effect control of CVCS. CA 03-07909-02, Added "OR BORATION" to caution in section for purging the pressurizer. Corrected NSS to SM to reflect current station title. (Revision 15)

17. PAF 06-00015, Marked current Technical Specifications/License Requirements as [CTS] and added Improved Technical Specifications/License Requirements as [ITS]. Added level of use. (Revision 16)

18. PAF 08-01991, (Revision 17)

    a. CA 08-038197-01, add a step to open [2GNS-94], Nitrogen Supply Isolation to VCT, correct the use of check and verify verbs and change Daily Journal To Narrative Log.

    b. Order 200327672:

        1) Add caution: With an initial high RCS boron concentration, a dilution of 15 gallons every hour can be expected.

        2) Add caution: based on the initial amount of non-condensable gases in the pressurizer, a VCT level transient can be expected due to a pressurizer insurge.

        3) Add step: Evaluate requesting an RWDA-G as a precaution for purging the pressurizer to the sample panel.

    c. Remove reference to current Technical Specifications and update references.

19. PAF-11-00151, CA 10-81062-02, Added a step to provide an option to reduce letdown flow by removing one 60 gpm or 45 gpm orifice from service according to 2OM-7.4.AN, "Placing or Removing a Letdown Orifice From Service" or to align degasifiers to receive maximum letdown by Opening [2BRS-MOV100B], Degasifier Rcvy Exch 24B1 & 24B2 Inlet Valve, if letdown flow to a degasifier will exceed 75 gpm. Added Caution that [2CHS*RV209] may lift if letdown flow is greater than 75 gpm. Added steps to return letdown flow and degasifier alignment to normal arrangement. (Revision 18)

20. PAF 12-02281, LUC PAF 11-00526 (Revision 19)

    a. Delete Step A.8; Open [2CHS*AOV8101], Volume Control Tank Vent To Degasifiers, to establish VCT vent. This step is redundant to the following instructions.

    b. Revise the steps that raise and lower VCT level and pressure by preceding the step with the contingency; if required. Revise the instructions that raise and lower VCT level and pressure by adding; to the desired values, and maintain the parameters within the established limits. The changes provide flexibility to address limiting plant conditions for inventory control and the down stream vent flowpath.

    c. Delete Step B.5; Purge the VCT of non-condensable gasses as follows:

        1) Manually Open [2CHS-PCV116B], Volume Cont Tank Press Control Vlv, to sweep nitrogen across VCT while venting the VCT to degasifiers.

        2) For several minutes, Cycle Open [2CHS*AOV8101], to purge gasses from VCT gas space **AND** Maintain VCT gas pressure on [2CHS-PI117] between 15-20 psig. Experience has shown that sweeping the VCT gas space with nitrogen is not effective at degassing the RCS and causes excessive nitrogen use.

    d. Add the option to manually adjust [2CHS-PCV116B] to control VCT pressure and to select VCT to AUTO to VCT position, as necessary to direct [2CHS*LCV112] flow to the coolant recovery tanks **AND** to maintain VCT pressure > 15 psig. The manual control will allow better control of VCT level and pressure. The rate of nitrogen addition to the VCT is limited.

21. PAF-15-02230, notification 601011600, CR 2015-15730, (Revision 20)

    a. For the Caution before step C.1 and D.1: CONTINUOUS PURGE OF THE PRESSURIZER VAPOR SPACE TO THE VCT MAY RESULT IN AN INADVERTENT DILUTION OF THE RCS. THE PRESSURIZER BACKUP HEATER(S) ARE PLACED ON AND THE PRESSURIZER SPRAY CHECKED IN AUTO TO MAINTAIN THE PRESSURIZER EQUALIZED WITH THE RCS DURING THE PURGE TO PREVENT A DILUTION, remove INADVERTENT and add AND A RISE IN BORON CONCENTRATION IN THE PRESSURIZER.

    b. Add the following caution before step C.1: BASED ON THE INITIAL AMOUNT OF NON-CONDENSABLE GASES IN THE PRESSURIZER, A VCT LEVEL TRANSIENT CAN BE EXPECTED DUE TO A PRESSURIZER INSURGE.

    c. Add caution before step C.1 and D.1: CONTINUOUS PURGE OF THE PRESSURIZER VAPOR SPACE TO [2DGS-TK21] OR THE SAMPLE SINK MAY RESULT IN A RISE IN BORON CONCENTRATION IN THE RCS AND THE PRESSURIZER WHEN THE PRESSURIZER BACKUP HEATER(S) ARE ON AND THE PRESSURIZER SPRAY VALVES ARE IN AUTO. WITH AN INITIAL HIGH RCS BORON CONCENTRATION, A DILUTION OF 15 GALLONS EVERY HOUR MAY BE REQUIRED TO OFFSET THE BORATION EFFECT.

    d. Add steps C.4 and D.5: If performing a continuous purge of the pressurizer vapor space to [2DGS-TK21] or the sample sink, perform RCS dilutions to maintain Tavg on program, as necessary.

    e. For step D.6, After 24 hrs of purging, Request Chemistry to stop the continuous purge of the pressurizer vapor space in accordance with approved Chemistry procedures, add **OR** a time determined by Chemistry.

Question 33

Recommendation: The facility recommends accepting two correct answers for question #33.

Reason: Technical information available that supports an additional answer and simulator response.

33. Annunciator A4-3H, Pressurizer Relief Tank (PRT) Trouble has alarmed.
    - The operator reports it is due to HIGH PRT temperature
    - Level and pressure are within the normal range
    - PRZR Safety valves and PORVs are closed

    In accordance with 2OM-6.4.AAY, PRT Trouble ARP, which of the following choices identifies ALL of the valves listed below that would be opened to reduce PRT temperature?

    1. PRT Pri Grade M/U Wtr valves [2RCS-MOV516 and 2RCS-AOV519]
    2. PRT Vent Vlv [2RCS-MOV549]
    3. PRT Drain Vlv [2RCS-MOV523]

A. 1 only

B. 1 and 2 only

C. 1 and 3 only

D. 1 and 2 and 3

Question 33 tested knowledge of the system flow path necessary to lower temperature in the PRT. Based on system design only two valves (2RCS-MOV-516 and 2RCS-AOV 519) are required to allow flow to the Pressurizer Relief Tank spray nozzles and lower PRT temperature. This information supports the original correct answer "A".

This question also stated that this evolution was to be performed in accordance with 2OM-6.4.AAY, Pressurizer Relief Tank Trouble. This procedure contains multiple sections that addresses the maintenance of multiple PRT parameters. Specifically, PRT Temperature, Pressure and Level. When reducing PRT temperature, it is common in the plant and simulator to have to drain the PRT due to a resultant high PRT pressure and/or a high PRT level during the cooling operation of flowing water into the PRT via the PRT spray header. Raising PRT level to 90.5% also closes Primary Grade Make up Water Supply Valve 2RCS-MOV516 on interlock which would terminate the cooling water flow and require PRT level to be reduced to continue cooling operations. When performing the PRT cooling portion of 2OM-6.4.AAY, plant and simulator response both show that PRT pressure will be the first PRT parameter to rise outside of it's required band/actuate the high pressure alarm at 13 psig. 2OM-6.4.AAY would then be required to be referenced for high PRT pressure. The high pressure response section of the annunciator response procedure has a subsection that addresses the PRT make up supply valve (2RCS-MOV516) being open and requires the supply valve to be closed and the drain valve (2RCS-MOV523) be opened. Furthermore the high level response section of the annunciator response procedure has a subsection that addresses the PRT make up supply valve (2RCS-MOV516) being open and requires the supply valve to be closed and the drain valve (2RCS-MOV523) be opened.

The opening of the PRT vent valve is not a plausible answer for this question because for this evolution, with the known starting point of level and pressure in the desired band, there is the appropriate volume of gas. Upon completion of this evolution, level and pressure will be returned to the original starting point and thus require the same volume of gas. Venting the PRT will unnecessarily change the desired volume of gas in the PRT. Additionally, opening of the PRT vent valve is not procedurally directed until PRT pressure rises to 67 psig and only if draining is not effective in reducing pressure. Therefore for the given parameters and procedural direction, the PRT vent valve will not be operated for this evolution.

Refer to attached simulator print out of applicable plant parameters and the explanation below.

The Stem of the Question says pressure and temperatures are in their normal ranges;

- Normal PRT pressure should be kept below the alarm setpoint of 13 psig.
- Normal PRT level is maintained between High and Low level alarms per Precaution and Limitation 76 of 2OM-6.2.A which is 66% and 78% (See attached set point document 2OM-6.2.B). Standard simulator Initial Condition Sets have PRT level at 76%.
- Normal PRT temperature should be kept at or below 120F per Precaution and Limitation 76 of 2OM-6.2.A.
- PRT High Temperature Alarm actuates at 125F (See attached set point document 2OM-6.2.B).
- Per simulator trends (See Attached) PRT level rises approximately 14% to reduce PRT temperature by 2F.

If the candidate assumes that level is in the normal operating range as seen in the simulator of approximately 76% and Temperature is to be taken back into the normal range of 120F that equates to approximately a 35% rise in PRT level and takes level above the 90.5% closure set point for 2RCS-MOV516.

Therefore to complete the evolution and return temperature to the normal range PRT drain valve 2RCS-MOV523 must be opened.

A recent training evolution performed in the simulator had candidates drain the PRT during a cool down evolution. It is typical that level rises prior to temperature being reduced to its normal band.

The facility is asking for 2 answers (A and/or C) to be accepted based on the assumption the candidate made when answering the question.

If candidates answered the basic question "What does it take to reduce PRT Temperature" then answer "A" is correct as only 2RCS-MOV-516 and 2RCS-AOV519 are needed to reduce temperature.

If however the candidates took a more integrated approach to the evolution as demonstrated in a recent training session and performed it "In Accordance With" the plant procedure stated in the stem, then PRT drain valve 2RCS-MOV523 must be opened to return PRT temperature to the normal range of 120F. Then answer "C" is correct.

A. PRZR RLF TK TEMP HIGH

SETPOINTS:	125°F
:CT SWITCH:	Bay 10
ING DEVICE:	2 -TY/471, 2RCS-TSH471

PROBABLE CAUSE NO. 1

Power Operated Relief or Pressurizer Safety Valve leakage.

CORRECTIVE ACTIONS

1. Check PRZR Relief Tank Temperature, ([2RCS-TI471], VB-B).
2. If PRZR Relief Tank Temp is > 125°F, check the PORV and Safety Valve tailpipe temperatures for indication of leaking valve, ([2RCS-TI463, 465, 467, 469], VB-B).

Note: A leaking PORV may possibly be identified by observing an excessively high heat trace temperature on circuit [2HTS-JB3-134, 135 or 136] at [2HTSPNLN4AB] C-4, C-5, C-6 (PAB, Elev 755)

3. If PORV leakage is determined to be unacceptable by the SM, Isolate the PORV in accordance with 2OM-6.4.Q, "Isolation of A Power Operated Relief Valve".

   a. Refer to T.S. 3.4.11, for additional requirements with PORV inoperable.

Note: [2RCS-MOV516], PRZR Relief Tank Spray Vlv will not open if PRT leve ≥ 90.5% or PRT pressure is ≥ 67 psig

4. Reduce PRZR Relief Tank Temperature < 125F as follows:

   a. Open [2RCS-MOV516], PRZR Relief Tank Spray Vlv.

   b. Open [2RCS-AOV519], PRZR Relief Tank Pri Grade M/U Wtr Inlet.

   c. When the desired PRT temperature is achieved, Close [2RCS-AOV519], PRZR Relief Tank Pri Grade M/U Wtr Inlet.

   120F per 2OM-6.2A P&L 76

   d. Close [2RCS-MOV516], PRZR Relief Tank Spray Vlv.

   e. Independently verify [2RCS-AOV519] closed and log in the Narrative Log.

5. If a Pressurizer Safety Valve is determined to be leaking, go to 2OM-53C.4.2.6.7, "Excessive Primary Plant Leakage".

C. PRZR RLF TK PRESS RCS-PT472 HIGH

SETPOINTS: 13 psig

DISCONNECT SWITCH: S383, Bay 10

INITIATING DEVICE: 2RCS-PY/472A, 2RCS-PSH472

PROBABLE CAUSE NO. 4

[2RCS-MOV516], PRZR Relief Tank Spray Vlv open.

CORRECTIVE ACTIONS

1. Ensure [2RCS-MOV516], PRZR Relief Tank Spray Vlv is closed, (BB-A).

Note: [2RCS-MOV523], PRZR Relief Tank Drain Vlv will not open if [2DGS-TK21] level ≥ 38" or pressure is ≥ 7.6 psig.

The drain rate of the PRT may exceed the discharge rate of the Primary Drains Transfer Pumps, overfill [2DGS-TK21], Primary Drains Tank 21 and cause water intrusion into the nitrogen supply line to [2DGS-TK21], Primary Drains Tank 21.

2. If PRZR Relief Tank level is > 72%, drain the PRZR Relief Tank to 67% by opening [2RCS-MOV523], PRZR Relief Tank Drain Vlv, (BB-A).

   a. Monitor the level in [2DGS-TK21], Primary Drains Tank 21 while draining the PRT. If A2-5A Primary Drains Transfer Tank/Pump Trouble actuates, refer to the respective ARP.

   b. Close [2RCS-MOV523], PRZR Relief Tank Drain Vlv.

PROBABLE CAUSE NO. 5

Pressurizer PORV or Safety Valve leakage.

CORRECTIVE ACTIONS

1. Check PRZR Relief Tank Pressure ([2RCS-PI472], VB-B).

2. Check the PORV and Safety Valve tailpipe temperatures for indication of leaking valve, ([2RCS-TI463, 465, 467, 469], VB-B).

74. The gases in the pressurizer relief tank must be sampled routinely. The oxygen concentration must be maintained less than 2 percent by volume and the hydrogen concentration less than 4 percent. (Section 5 - Table of References #1)

75. The PRT must **NOT** be vented to the waste disposal system vent header if the pressure exceeds 60 psig. (Section 5 - Table of References #1)

76. The relief tank water temperature should be maintained at or below 120°F **AND** the water level should be maintained in the normal operating range between the high and low alarm set points during normal operation. (Section 5 - Table of Reference #1)

77. Prior to each plant startup, following a refueling, verify that the pressurizer relief tank rupture discs are in place. (Section 5 - Table of Reference #204)

Loop Stop Valves

78. Reactor coolant system loop stop valves may **NOT** be closed in more than one loop unless the reactor coolant system is connected to the residual heat removal system. (Section 5 - Table of References #204)

79. The plant must be at zero load with the shutdown rods fully withdrawn prior to opening either stop valve in an isolated loop **AND** throughout the timing interval required prior to opening the cold leg stop valve. (Section 5 - Table of References #204)

80. The boron concentration in an isolated loop must be maintained at a value greater than or equal to the boron concentration in the active loops. (Section 5 - Table of References #204)

81. **[CTS]** Tech. Spec. 3.4.1.5 "Isolated Loop Startup".

    [ITS] RCS ISOLATED LOOP STARTUP (Refer to T.S. 3.4.18)

82. The neutron count rate must be logged every five minutes during the timing interval required prior to opening the cold leg stop valve. Should the count rate increase by more than a factor of two over the initial count rate, the hot leg stop valve should be re-closed **AND** no attempt made to open the loop stop valves until the reason for the count rate increase has been determined. (Section 5 - Table of References #204)

83. The motor starters for the loop stop valves must be administratively de-energized (circuit breakers opened **AND** padlocked) at all times except when authorized for opening or closing a valve. The motor starters may be energized (circuit breakers unlocked) for only one loop at a time. (Section 5 - Table of References #204)

84. Kerotest valves are 1 1/2 turns full stroke. Attempting to turn the valve in either direction more than 1 1/2 turns may result in damage to the brass plug.

85. Do **NOT** use mechanical leverage on Kerotest valves. If difficulty is encountered, consult maintenance. Note the valve I.D. number to aid maintenance in determining the valve type and permissible torque to apply.

D. PRZR RLF TK LVL RCS-LT470 HIGH

SETPOINTS: 78%

DISCONNECT SWITCH: S382, Bay 10

INITIATING DEVICE: 2RCS-LY/470A, 2RCS-LSH470A

PROBABLE CAUSE NO. 1

[2RCS-MOV516], PRZR Relief Tank Spray Vlv open.

CORRECTIVE ACTIONS

1. Check PRZR Relief Tank level, ([2RCS-LI470], VB-B).
2. If PRZR Relief Tank level is > 78%, ensure [2RCS-MOV516], PRZR Relief Tank Spray Vlv is closed, (BB-A).

Note: [2RCS-MOV523], PRZR Relief Tank Drain Vlv will not open if [2DGS-TK21] level ≥ 38" or pressure is ≥ 7.6 psig.

The drain rate of the PRT may exceed the discharge rate of the Primary Drains Transfer Pumps, overfill [2DGS-TK21], Primary Drains Tank 21 and cause water intrusion into the nitrogen supply line to [2DGS-TK21], Primary Drains Tank 21.

3. Lower PRZR Relief Tank level to < 72%, ([2RCS-LI470], VB-B):
   a. Monitor the level in [2DGS-TK21], Primary Drains Tank 21 while draining the PRT. If A2-5A Primary Drains Transfer Tank/Pump Trouble actuates, refer to the respective ARP.
   b. Open [2RCS-MOV523], PRZR Relief Tank Drain Vlv, (BB-A)
   c. Start [2DGS-P21A(B)], Primary Drains Tfr Pump.
   d. When PRZR Relief Tank level to < 72%, Stop [2DGS-P21A(B)], Primary Drains Tfr Pump **AND** Return control switch to AUTO.
   e. Close [2RCS-MOV523], PRZR Relief Tank Drain Vlv.

PROBABLE CAUSE NO. 2

Primary System Relief valve lifted.

CORRECTIVE ACTIONS

1. Check [2CHS*RV203], Letdown Relief for evidence of lifting:
   a. Check Letdown Relief Line temperature, ([2CHS-TI141], VB-A).

LOOP 1 TAVG RCS-S-TS412E HIGH, F	577.5
LOOP 2 TAVG RCS-S-TS422E HIGH, F	577.5
LOOP 3 TAVG RCS-S-TS432E HIGH, F	577.5
RCL A BYPASS FLW LOW, GPM	180
RCL B BYPASS FLW LOW, GPM	180
RCL C BYPASS FLW LOW, GPM	180
PRZR PORV DISCH TEMP RCS-TS463 HIGH, F	210F
PRZR RLF VLV 1 DISCH TEMP TS469 HIGH, F	210F
PRZR RLF VLV 2 DISCH TEMP TS467 HIGH, F	210F
PRZR RLF VLV 3 DISCH TEMP TS465 HIGH, F	210F
PRZR CONT HTR TRBL	NA
PRZR CONT HTR BKR TRIP	NA
PRZR HTR BACKUP GROUP RCP*H2B/E TRBL	NA
PRZR HTR CONT GROUP RCP*H2C TRBL	NA
PRZR HTR BACKUP GROUP RCP*H2A/D TRBL	NA
LOOP STOP VLV PROT TRN A K117 TEST	NA
LOOP STOP VLV PROT TRN B K117 TEST	NA
PRZR HTR GROUP A AUTO, PSIG	2,210
PRZR HTR GROUP B AUTO, PSIG	2,210
PRZR HTR GROUP D AUTO, PSIG	2,210
PRZR HTR GROUP E AUTO, PSIG	2,210
RCP21A BUS UV PART RX K0401 TRIP, %	75% of rated voltage
RCP21B BUS UV PART RX K0402 TRIP, %	75% of rated voltage
RCP21C BUS UV PART RX K0403 TRIP, %	75% of rated voltage
RCP21A BUS UF K0405 TRIP, Hz	57.5
RCP21B BUS UF K0406 TRIP, Hz	57.5
RCP21C BUS UF K0407 TRIP, Hz	57.5
LOOP A ISOL AND BYP VLV K112 OPEN	NA
LOOP B ISOL AND BYP VLV K212 OPEN	NA
LOOP C ISOL AND BYP VLV K312 OPEN	NA
PRZR VAPOR SPACE TEMP RCS-TS454 HIGH, F	665
PRZR LIQ SPACE TEMP RCS-TS453 HIGH, F	665
PRZR RLF TK LVL RCS-LT470A HIGH %	78
PRZR RLF TK LVL RCS-LT470B LOW, %	66
PRZR RLF TK PRESS RCS-PT472 HIGH, PSIG	13
PRZR RLF TK TEMP HIGH, F	125
PRZR RLF TK LVL LY/470X HIGH, %	90.5
PRT HI HI PRESS/PRT SPRAY ISOLATION, PT472, PSIG	67
RCL OT D/T RX K0101 TRIP	Computer Generated
RCL OP D/T RX K0102 TRIP	Computer Generated
RCP BUS UV RX K0103 TRIP, %	75% of Bus voltage
RCP BUS UF RX K0301 TRIP, Hz	57.5
RCL LO FLW ABOVE P8 RX K0105 TRIP, %	90
RCL LO FLW ABOVE P7 RX K0104 TRIP, %	90
RCP 21A AUTO STOP	NA
RCP 21B AUTO STOP	NA
RCP 21C AUTO STOP	NA
PRZR HI PRESS RX TRIP K0203 TRIP, PSIG	2375
PRZR LO PRESS RX TRIP K0202 TRIP, PSIG	1945
PRZR LO PRESS SI CAUS RX K0201 TRIP, PSIG	1856

Main Logs/Reports Applications Alarms Groups/Trends Point List P&IDs Print Help

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S C H P Z I

SELECT

GROUP: TEMGRP04
DESCR: ** dynamic group **

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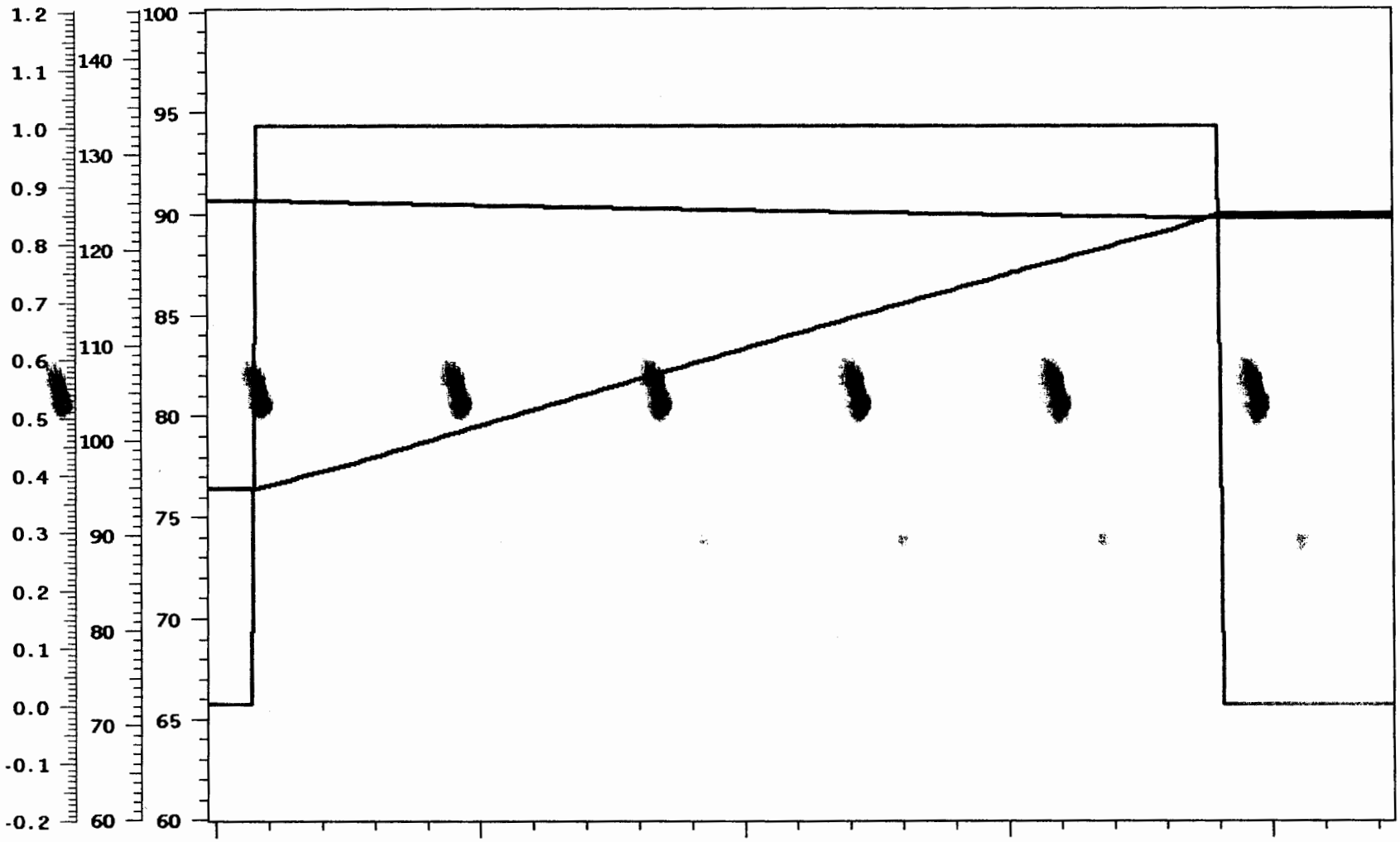
THREE PLOTS



L0485A	PRT LVL	RCS-LT470			%	-9999.0
T0485A	PRT TEMP	RCS-TE471			F	-9999.0
Y6346D	PRT SPRAY VLV	RCS-MOV516	GOOD	CLOSED		-9999.0

Canc Prev Back Fore | MENU | NEXT 60 | HISTORY | PREV 60 | PRINT GRP

Ready

BV2 Simulator CPU 5 TT087 MK-000/W0N-02 SEC LVL-06

Question 41

Recommendation: The facility recommends accepting two correct answers for question #41.

Reason: Question has an unclear stem that did not provide all necessary information as to the intent of the knowledge being tested.

41. Given the following conditions:

- The plant was at 100% power when all 3 Steam Generators Faulted in Containment
- Containment Pressure is 31 psig and RISING
- Quench Spray Pumps [2QSS*P21A and P21B] failed to start

1) What is(are) the minimum required Engineered Safety Features Actuation System (ESFAS) switch manipulations required to start BOTH Quench Spray Pumps?

A. 1

B. 2

C. 3

D. 4

The initial power level for the question was 100% power when all 3 Steam Generators faulted in containment resulting in a rising containment pressure currently at 31 PSIG which is above the CIB set point which is a start signal for the Quench Spray Pumps. This indicates a potential failure of both trains of CIB to automatically actuate.The question asks what the minimum number of ESFAS switches are that are **"REQUIRED"** to be manipulated to start the Quench Spray pumps. However the question does not specify if this is the minimum number required electrically or procedurally.

If the candidate assumed the question was asking for the minimum number of switches electrically then answer "B" is correct as manual actuation of a single train of CIB will start both the A & B Quench Spray pumps.

However if the candidate assumed the minimum number of switches required by procedure then answer "D" is correct as 2OM-53A.1.A-0.11, "Verification of Automatic Actions" requires "Both Switches for Both Trains" to be actuated for any failure of CIB equipment to properly actuate. 2OM-53A.1.A-0.11, "Verification of Automatic Actions" is directed to be performed by E-0 "Reactor Trip or SI". This is the procedure that would be in effect at the start of the casualty listed in the stem of question #41.

Based on the above information the facility recommends accepting two answers for question 41.

Answer "A" 2 Switches if the candidate assumed minimum REQUIRED Electrically.

Answer "D" 4 Switches if the candidate assumed minimum REQUIRED Procedurally.

Number E-0	Title Reactor Trip Or Safety Injection	Issue 2 Revision 0

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9	Verify AFW Status	
	a. Motor-driven AFW Pumps - RUNNING	a. Manually start AFW pumps.
	b. Turb Driven AFW Pump Stm Supply Isol Valves - OPEN	b. Manually open steam supply valves.
	c. AFW Throttle Valves - FULL OPEN	c. Manually open AFW throttle valves.
	d. Total AFW Flow - GREATER THAN 340 GPM	d. IF SG narrow range level greater than 12% [31% ADVERSE CNMT] in any SG, THEN control feed flow to maintain narrow range level AND GO TO Step 10. IF narrow range level less than 12% [31% ADVERSE CNMT] in all SGs, THEN restore total AFW flow greater than 340 GPM. IF AFW flow can NOT be established greater than 340 GPM, THEN GO TO FR-H.1, "Response To Loss Of Secondary Heat Sink", Step 1.
10	Perform Attachment A-0.11, "Verification Of Automatic Actions", In A Timely Manner	

Number	Title	Revision
A-0.11	Verification of Automatic Actions	Revision 9

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE

The RSS pumps will not start until RWST level drops to the low level setpoint.

9	Check CIB And CNMT Spray Status • Containment pressure – HAS REMAINED LESS THAN 11 PSIG	Verify CIB initiated: a. Check BLUE CIB marks - LIT IF NOT, THEN manually initiate CIB (both switches for both trains). Check BLUE CIB marks - LIT IF CIB NOT actuated, THEN manually align equipment. IF necessary, refer to Attachment A-0.5, "Containment Isolation Phase B Checklist". b. Stop all RCPs. c. Request BV-1 operator perform the following: 1) Verify CREVS equipment actuation. 2) Place intake and exhaust damper control switches in CLOSE: • [1VS-D-40-1A] • [1VS-D-40-1B] • [1VS-D-40-1C] • [1VS-D-40-1D] d. IF service water flow can NOT be established to a RSS HX(s), THEN place associated RSS pumps(s) in PULL-TO-LOCK.

Question 59

Recommendation: The facility recommends accepting two correct answers for question #59.

Reason: The question Stem did not provide all the necessary information to definitively exclude one of the distractors.

59. The following conditions exist.
    - A large break LOCA has occurred
    - TSC has been activated
    - Annunciator A1-2B, Hydrogen Level High/High-High is in alarm

    Complete the following statements. Assume the TSC has been contacted and concurs with the decision.

    The High-High Hydrogen concentration in Containment setpoint is _____(1)_____.

    In accordance with the Hydrogen Level High/High-High ARP, the crew will _____(2)_____ in response to the High-High Hydrogen level in Containment.

A. 1) 2.5%
   2) intentionally ignite the Containment atmosphere

B. 1) 2.5%
   2) start [2HCS-FN21] Containment Atmosphere Purge Blower

C. 1) 4.5%
   2) intentionally ignite the Containment atmosphere

D. 1) 4.5%
   2) start [2HCS-FN21] Containment Atmosphere Purge Blower

The stem of the question asks for the crew's actions based on a High containment H2 concentration. The annunciator referenced illuminates at 4.5% H2 concentration and therefore eliminates choices A & B. The second half of the question asks for actions the crew should take. The Annunciator Response Procedure (2OM-46.4.ABD) for the referenced Alarm (A1-2B) directs the crew to start the Containment Atmosphere Purge Blower in accordance with 2OM-46.4.D, "Containment Atmosphere Purge Blower Operation".

2OM-46.4.D has 3 Initial Conditions that must be met prior to starting the blower

III. INITIAL CONDITIONS

A. The Technical Support Center (TSC) has recommended the starting of [2HCS-FN21], Containment Atmosphere Purge Blower.

B. The Supplementary Leak Collection System is available to receive [2HCS-FN21], Containment Atmosphere Purge Blower exhaust.

C. Radiation Protection has been informed that this procedure is to be implemented.

The stem of the question indicates that the TSC concurs with the decision but makes no mention of Initial conditions as to the status of the Supplementary Leak Collection System or the notification of Radiation Protection. Per the Exam writers guide the candidates can assume that the SLCRS system is operating

properly as that is an expected system response. However without the notification of Radiation Protection being listed candidates had to assume whether or not this action occurred or would be appropriate.

If the candidates assumed this notification of Radiation Protection occurred then the operator would proceed with the procedure and start the Containment Atmosphere Purge Blower. (Answer D)

However if the candidates assumed this notification of Radiation Protection did not occur or was not authorized, then answer "C" would be correct as it was the only remaining answer with a value of 4.5% H2 concentration. This choice is acceptable as the procedure for Hydrogen ignition (2OM-53E.1.SAG-7, Reduce Containment Hydrogen) only requires TSC concurrence. The notification of RP is required to ensure the radiological safety of all workers during an accident by utilizing special emergency response procedures. This is the responsibility of the OSC, not the TSC. The OSC has the responsibility of dispatching personel to perform field actions while the TSC controls the overall mitigation strategies of the event. It is highly possible that RP would not grant permission for personnel to access the areas required for the implementation of the CNMT Purge procedure (2OM-46.4.D) (contiguous areas to CNMT) because of elevated radiation levels. The stem of this question stated that H2 concentration was elevated to the alarm setpoint (4.5%). This concentration is not normal for a DBA LOCA and indicates that a significant zirc-water reaction was occurring thus significant fuel cladding damage would be occurring, resulting in elevated dose rates in the areas contiguous to CNMT.

Further, candidates were introduced to the concept of Hydrogen Burn in an accident per lesson plan 2SQS-46.1, "Post DBA H_2 Control System" Page 5, during Initial Licensed Operator Systems training.

Based on this information and the lack of Radiation Protection concurrence listed in the Stem of the question. The facility recommends accepting two correct answers (C and/or D) for question 59.

C. H2 CONC HCS*HA100A HIHI

SETPOINTS: 4.5% Hydrogen Concentration(H.2)

DISCONNECT SWITCH: 2-S3808 (Bay 39)

INITIATING DEVICE: 99-OSB1-BJ (2HCS*PNL100A CQ)

PROBABLE CAUSE NO. 1

Containment hydrogen concentration ≥4.5% on [2HCS*HA100A], Hydrogen Analyzer

CORRECTIVE ACTIONS

1. Determine actual Containment hydrogen concentration in accordance with 2OM-46.4.G, "Containment Hydrogen Analyzer - Running".
2. Notify the Technical Support Center (TSC) of actual hydrogen concentration.
   a. With TSC concurrence, Start [2HCS-FN21], Containment Atmosphere Purge Blower in accordance with 2OM-46.4.D, "Containment Atmosphere Purge Blower Operation".

I. PURPOSE

This procedure describes the startup and shutdown of the Containment Atmosphere Purge Blower. The Containment Atmosphere Purge Blower is to be used as directed by the TSC.

II. PRECAUTIONS AND LIMITATIONS

A. The Containment Atmosphere Purge Blower is not to be started before 8 hours following a Loss of Coolant Accident (DBA). This is to allow radiation levels to decay prior to Purge Blower operation.

B. To limit high radiation exposure during the performance of this procedure, Radiation Protection procedure 2-HPP-5.05.001 will be followed.

III. INITIAL CONDITIONS

A. The Technical Support Center (TSC) has recommended the starting of [2HCS-FN21], Containment Atmosphere Purge Blower.

B. The Supplementary Leak Collection System is available to receive [2HCS-FN21], Containment Atmosphere Purge Blower exhaust.

C. Radiation Protection has been informed that this procedure is to be implemented.

IV. INSTRUCTIONS

A. **Containment Atmosphere Purge Blower Start Preparation**

1. Inform Radiation Protection to implement 2-HPP-5.05.001, "Access And Dose Control At BVPS Unit 2 For Vital Area Operations During Emergency Situations".

2. Obtain key SR 23

B. **Starting [2HCS-FN21], Containment Atmosphere Purge Blower**

1. Verify Closed [2HCS*MOV112A], 21A Hydrogen Recombiner Inlet Isol Vlv.

2. Unlock **AND** Close [MCC*2-E11] Cub 6C, [2HCS*MOV110A], Cnmt Atm Purge Isol, located in Safeguards 733'. (Key SR 23) Contiguous to Containment

3. Open the following valves from [PNL*2HCP], Post Accident H2 Control Panel, located in AE Switchgear Room, 730':

   a. [2HCS*MOV110A], Purge Blower Inlet Recombiner 21A Isol

   b. [2HCS*SOV114A], Cnmt Isol to Recombiner 21A

   c. [2HCS*SOV115A], B/U Isolation to Recombiner 21A

4. Start [2HCS-FR120], Cnmt Purge Blower Disch Flow by placing the power ON/OFF switch to the ON position, located on the left side of the recorder at [PNL*2HCP], Post Accident H2 Control Panel in AE Switchgear Room, 730'.

Record Type #A9.350C

Beaver Valley Power Station

UNIT 2

2OM-53E.1.SAG-7

Reduce Containment Hydrogen

Revision 4

Prepared by T.J. Esper	Date 06/18/15	Pages Issued 1 through 17	Effective Date 08/19/15
Reviewed by M.P. Flynn	Date 06/18/15	Validated by N/A	Date
PORC Meeting No. PORC Not Required	Date	PAF-15-01027	

Number	Title	
SAG-7	**Reduce Containment Hydrogen**	**Revision 4**

A. PURPOSE

The purposes of reducing containment hydrogen are:

- To prevent hydrogen from accumulating to the point where the containment may be severely challenged by intentionally igniting the hydrogen in containment
- To prevent the hydrogen from igniting by maintaining the containment steam inert

B. ENTRY CONDITIONS

This guideline is entered from DFC, "TSC Diagnostic Flow Chart" based on high containment hydrogen concentration.

C. COMPUTATIONAL AIDS REFERENCED BY THIS GUIDELINE

- CA-3, "Hydrogen Flammability In Containment"
- CA-7, "Hydrogen Impact When Depressurizing Containment"

Number	Title	
SAG-7	**Reduce Containment Hydrogen**	**Revision 4**

DIAGNOSTIC SECTION
Page 1 of 3

Number SAG-7	Title Reduce Containment Hydrogen	Revision 4

1 Determine Hydrogen Control Strategy

a. Refer to CA-7, "Hydrogen Impact When Depressurizing Containment".

b. Determine applicable hydrogen control strategies.

Matrix of Applicable Hydrogen Control Strategies	
C-7 Region	Applicable Strategies
Future Hydrogen Severe Challenge	Prevent Hydrogen Burn
Future Hydrogen Burn	Intentional Hydrogen Burn
	No Action
Hydrogen Burn	Prevent Hydrogen Burn
	Intentional Hydrogen Burn
	No Action
No Hydrogen Concern	No Action

(step continued on next page)

DIAGNOSTIC SECTION

Number	Title	Revision
SAG-7	**Reduce Containment Hydrogen**	**4**

1 (step continued from previous page)

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c. Determine impacts of applicable hydrogen control strategies.

Positive and Negative Impacts of Hydrogen Control Strategies		
Strategy	Positive Impacts	Negative Impacts
Prevent Hydrogen Burn	• Hydrogen in the containment will not burn	• Fission product leakage will increase at higher containment pressures • This strategy will be a temporary solution, and other long term solutions to the hydrogen concern will be required • Raising containment pressure may result in passing through the severe hydrogen challenge region of CA-3, "Hydrogen Flammability In Containment"
Intentional Hydrogen Burn	• The containment hydrogen concern will be mitigated at least in the short-term	• There will be a pressure and temperature spike in containment
No Action	• Manpower and resources can be used to perform other strategies	• Hydrogen will continue to accumulate

d. Determine appropriate hydrogen control strategy.

1) Consideration should be given to an Intentional Hydrogen Burn prior to reaching the "Hydrogen Severe Challenge" region as defined by 2OM-53E.1.CA-3, "hydrogen Flammability In Containment."

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DIAGNOSTIC SECTION
Page 3 of 3

2 Identify Appropriate Guidance

- IF an intentional hydrogen burn strategy has been selected, THEN GO TO Section A of this guideline.
- IF a prevent hydrogen burn strategy has been selected, THEN GO TO Section B of this guideline.

3 RETURN TO DFC, "TSC Diagnostic Flow Chart" Or Guideline And Step In Effect

- END -

Number SAG-7	Title Reduce Containment Hydrogen	Revision 4

Section A
INTENTIONAL HYDROGEN BURN
Page 1 of 3

A.1 Identify Available Hydrogen Ignition Sources

a. Determine the availability of hydrogen ignition sources.

HYDROGEN IGNITION SOURCES	REQUIREMENTS	AVAILABILITY
PORV Block Valve	• Power available	Yes/No
RHR Pump	• Power available	Yes/No
CRDM Ventilation Fans	• Power available	Yes/No
Containment Lighting	• Power available	Yes/No
Other Ignition Sources	• Power available	Yes/No

b. IF any hydrogen ignition source is available, THEN GO TO Step A.2.

c. Consult Control Room on alternate hydrogen ignition sources.

d. IF NO hydrogen ignition sources are available at this time, THEN perform the following:

1) Identify the reasons why the hydrogen ignition sources are not available.

2) Prioritize actions to restore a hydrogen ignition source with other actions in progress and initiate restoration actions as appropriate.

3) RETURN TO Step 1 of the Diagnostic Section of this guideline.

A.2 Identify Preferred Hydrogen Ignition Source

A.3 Determine If Containment Depressurization Is Required

a. Determine if a hydrogen burn can occur under current conditions using CA-7.

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b. IF containment pressure is too high for a hydrogen burn, THEN reduce containment pressure using SAG-6 until a hydrogen burn is possible.

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Section A
INTENTIONAL HYDROGEN BURN
Page 2 of 3

A.4 Direct Control Room To Implement Strategy

a. Provide the following information to the control room:

- Preferred ignition source
- Any special parameters to monitor
- Other information, as appropriate

A.5 Verify Strategy Implementation

A.6 Determine If A Hydrogen Burn Has Occurred

a. Monitor plant response:

- Containment pressure - SPIKE OCCURRED
- Containment temperature - SPIKE OCCURRED
- Containment hydrogen - DROPPING

b. Determine if the hydrogen burn is adequate.

- Refer to CA-7, "Hydrogen Impact When Depressurizing Containment".

c. IF the hydrogen burn is not adequate AND another hydrogen ignition source is available, THEN RETURN TO Step A.2.

d. IF the hydrogen burn is not adequate AND another hydrogen ignition source is NOT available, THEN RETURN TO Step 1 of the Diagnostic Section of this guideline.

A.7 Identify Long Term Concerns Due To An Intentional Hydrogen Burn

a. Refer to Attachment A.1 for long term concerns.

b. Identify any additional parameters that should be monitored to address the long term concerns.

c. Identify any additional long term concerns.

d. GO TO SAEG-1, "TSC Long term Monitoring."

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Section A
INTENTIONAL HYDROGEN BURN
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A.8 RETURN TO Step 1 Of The Diagnostic Section Of This Guideline

-END OF SECTION A-

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Section B
PREVENT HYDROGEN BURN
Page 1 of 3

B.1 Evaluate Actions To Prevent A Hydrogen Burn

a. IF active containment heat sinks are operating, THEN determine if the containment heat sinks should be stopped.

b. Open pressurizer PORVs.

	Pressurizer PORVs		
	2RCS*PCV455C	2RCS*PCV455D	2RCS*PCV456
Valve Operable (Refer to Attachment B.1)	Yes/No	Yes/No	Yes/No

c. Identify potential hydrogen ignition sources inside containment.

d. Determine if potential hydrogen ignition sources should be isolated.

e. IF NO strategies have been selected, THEN RETURN TO Step 1 of the Diagnostic Section of this guideline.

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Section B
PREVENT HYDROGEN BURN
Page 2 of 3

B.2. Direct Control Room To Implement Strategies

a. IF stopping active heat sinks has been selected as a strategy, THEN provide the following information to the control room:

- Strategy for stopping active heat sinks
- Any special parameters to monitor
- Other information, as appropriate

b. IF isolating potential hydrogen ignition sources has been selected as a strategy, THEN provide the following information to the control room:

- Strategy for isolating potential hydrogen ignition sources
- Any special parameters to monitor
- Other information, as appropriate

B.3. Verify Strategy Implementation

B.4 Determine If Strategy To Prevent A Hydrogen Burn Has Been Effective

a. Refer to CA-7, "Hydrogen Impact When Depressurizing Containment".

b. IF an additional hydrogen control strategy is needed, THEN RETURN TO Step 1 of the Diagnostic Section of this guideline.

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Section B
PREVENT HYDROGEN BURN
Page 3 of 3

B.5. Identify Long Term Concerns Due To Preventing A Hydrogen Burn

a. Refer to Attachment B.2 for the long term concerns.

b. Identify any additional parameters that should be monitored to address the long term concerns on Attachment B.2.

c. Identify any additional long term concerns on Attachment B.2.

d. GO TO SAEG-1, "TSC Long Term Monitoring" AND attach copy of Attachment B.2 to SAEG-1.

B.6. RETURN TO Step 1 Of The Diagnostic Section Of This Guideline

- END OF SECTION B -

Number SAG-7	Title Reduce Containment Hydrogen	Revision 4

Attachment A.1 (Page 1 of 1)

Long Term Concerns Due To Intentional Hydrogen Burn

Parameter to Monitor	Concern	Recovery Action(s)
Containment Conditions - "NOT FLAMMABLE" based on CA-3, "Hydrogen Flammability In Containment"	Hydrogen generation from sump radiolysis and corrosion	• Adjust sump pH

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Attachment B.1 (Page 1 of 1)

Availability Of Pressurizer PORVs

Plant Conditions Necessary For Using Pressurizer PORVs	
Plant Condition	PRZR PORV
Instrument Air	Available
Power Supply	Available
Block Valve	Open

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Attachment B.2 (Page 1 of 1)

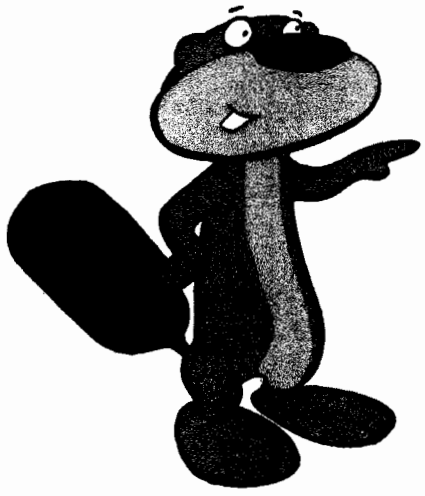
Long Term Concerns Due To Preventing A Hydrogen Burn

Parameter to Monitor	Concern	Recovery Action(s)
Containment Conditions - "NOT FLAMMABLE" based on CA-3, "Hydrogen Flammability In Containment"	Hydrogen burn	• Stop active heat sink • Isolate potential ignition sources • Open RCS vent paths
Containment Conditions - "NOT FLAMMABLE" based on CA-3, "Hydrogen Flammability In Containment"	Hydrogen generation from sump radiolysis and corrosion	• Adjust sump pH
Containment Pressure - LESS THAN 75 PSIG	Containment pressurization	• Start active heat sinks • Close RCS vent paths

CLASSROOM LESSON MATERIAL

OUTLINE OF INSTRUCTION

Outline of Instruction			Instructor/Student Activities
	c.	Hydrogen coming out of solution from the reactor coolant and hydrogen from the pressurizer gas space.	
	d.	Discuss EOP acknowledgement of Cnmt H_2 generation.	**PPNT, EOP Attachment, A-0.11**
2.	Current philosophy concerning expected amounts of hydrogen generation following a DBA:		10CFR50.44 BVPS UFSAR Unit 2
	a.	The hydrogen release postulated from a design-basis LOCA is not risk-significant because it is not large enough to lead to early containment failure.	**PPNTs, 10CFR50.44 & BVPS Commitments**
	b.	A "mixed atmosphere" will develop during a DBA. This is defined as a concentration of combustible gases in all parts of the containment being below a level that supports combustion or detonation that could lead to a loss of containment integrity.	**ELO-03** 4-19% Combustible 19-70% Explosive
	c.	The risk associated with hydrogen combustion is from "beyond design-basis accidents".	Note: The TMI and Fukushima events were "beyond design-basis accidents".
	d.	We are committed to ensuring a "mixed atmosphere" in containment and to include combustible gas control strategies in our Severe Accident Management Guidelines (SAMGs). Examples of such "strategies": 1) Intentionally burning the H_2. 2) Maintenance of the containment in "steam inert" condition.	Note: SAMGs do not rely on hydrogen recombiners or the hydrogen purge blower for beyond design-basis accidents.



BVPS is committed to the following two items:

1. The containment has a capability to ensure a "mixed atmosphere".
2. Combustible gas control strategies* are included in the Severe Accident Management Guidelines (SAMGs).

*Strategies such as:

- Intentionally burning the H_2
- Maintaining the containment "steam inert"

NRC Resolution of Post Exam Comments

NRC Resolution of Post-Exam Comments
2015 Beaver Valley Unit 2 Initial License Exam

Question 12

NRC Resolution

Valid as administered. Key Answer Choice B is the only correct answer.

Discussion

Four applicants chose Key Answer B. Four applicants chose Distractor Choice A. No applicants chose Distractor Choices C or D.

None of the applicants asked any question about this test item during exam administration.

This was a bank question, used as a RO level question on a prior Beaver Valley Unit 2 NRC Exam (Q#27, 2009 Exam).

The licensee proposed deleting Question 12 from the exam, based on their assessment that the question was at the SRO level and should therefore not have been on the RO portion of the exam. Their argument for this position was based on their interpretation of the SRO-only guidance flowchart contained NUREG-1021 (Revision 10), ES-401, Attachment 2.

NUREG-1021 in Section ES-401, D.1.c states that special attention required to ensure the SRO exam tests at the appropriate level. The SRO-only guidance is intended to ensure the SRO-only questions are selected/developed at the SRO level and not written specifically for the purpose of determining whether a question is appropriate on the RO portion of the exam. One flowchart block asks if "the question can be answered *solely* by knowing the purpose, overall strategy of events, or overall mitigative strategy of a procedure," with an affirmative answer indicating the question is at the RO level. The converse is not necessarily true. A negative answer to this block does not indicate a question is at the SRO level, but rather that additional assessment is necessary to determine whether or not it is at the SRO level. The subsequent flowchart block asks whether the question meets any of 4 criterion that would indicate it is a SRO-only question. The NRC does not think the question meets any of these criteria. The question requires assessing plant conditions and then applying this assessment to determine the proper course of action based on knowledge of plant operational considerations and knowledge of procedurally directed actions. The knowledge and ability necessary to correctly answer the question are appropriate for a RO applicant.

The question expected the RO applicant to assess RCS pressure and temperature conditions and then select the choice that stated that further depressurization below 1200 psig could not continue until a suitable reactor vessel head soak had been performed. Answering the question correctly required the applicant to know that the procedure (specified in the stem) contained

guidance that the RCS should be cooled down to less than 350°F with pressure maintained at 1200 psig for a lengthy period of time (9 hours). The NRC accepts this may have been one of the higher level of difficulty questions on the exam. However, level of difficulty and RO vs SRO exam level are different measures. A RO level question can have a higher level of difficulty and a SRO-only question can have a lower level of difficulty. The distinction between RO and SRO can be on the type of knowledge required as opposed to the depth of knowledge required.

In this case, the threshold parameters of temperature and pressure were provided in the choices (350°F, 1200 psig). The question expected applicants to select the correct answer based on their knowledge of plant design/operation and the overall mitigation strategy of the Natural Circulation Cooldown procedure. One high level action in the overall natural circulation mitigation strategy is to cooldown and depressurize the RCS with no upper head void growth. The RO applicant was appropriately expected to recognize this could only be accomplished in the absence of CRDM cooling by an extended time soak to allow vessel heat to slowly dissipate to the containment atmosphere while maintaining RCS pressure high enough to prevent void growth. The question was structured to point the applicants to the specific considerations of concern by asking "*what ramifications will the loss of these CRDM Shroud Fans have on the continued performance of ES-0.2, Natural Circulation Cooldown?*" Half of the applicants chose a distractor that incorrectly explained temperature must be maintained elevated as a way to address the loss of CRDM cooling, as opposed to the correct answer of maintaining pressure elevated. The correct choice between these two options could be made with application of conceptual understanding of thermodynamic conditions. Maintaining pressure, not temperature, would prevent upper head void growth.

The lesson plan used to teach initial license applicants, 3SQS-53.3, "Emergency Operating Procedures," specifically reviewed this particular exam question along with just 2 other questions as "student review activity of high miss questions from 2LOT6 [2009] NRC exam."

Both ROs and SROs are expected to have knowledge of the plant and associated operational procedures. The threshold for categorizing procedural knowledge as SRO vice RO is associated with supervisory level decision-making as indicated by applying detailed knowledge of administrative procedures to the decision-making process or of selecting transitions to other procedures. Judgment was applied in this RO versus SRO-only level determination through the exam development process because the criteria are guidelines and do not address the specifics of each question. Facility developers applied this judgment during the question selection and development process. Facility reviewers independently assessed the question level. Facility exam validators provided feedback on question level. And then multiple NRC examiners reviewed the question to ensure it was appropriate for the job and was testing at the appropriate level. This

extensive approval process concluded the question tested at an appropriate level for a RO applicant.

And, for this question, the screening process just described was applied twice, first for this same question on the RO portion of the 2009 Beaver Valley Unit 2 NRC exam, and again for its use on this 2015 NRC exam. There was no facility post-exam feedback challenging any aspect of this question on the 2009 exam.

Summary

The NRC has determined Question 12 was valid as administered with no changes required based on a re-assessment of the level of this question (RO versus SRO-only), the choices selected by the applicants and the question having been successfully used as an RO question on the 2009 Beaver Valley Unit 2 NRC Exam.

NRC Resolution of Post-Exam Comments
2015 Beaver Valley Unit 2 Initial License Exam

Question 29

NRC Resolution

Delete the question.

Discussion

Two of the applicants chose Key Answer D. Six applicants chose Distractor Choice B. No applicants chose Distractor Choices A or C.

None of the applicants asked any question about this test item during exam administration.

This was a new question.

The licensee proposed accepting two answers, Choices B and D, based on their assessment that statements in the question stem were confusing, in that:

1) the referenced procedure, 2OM-52.4.R.1.F, does not reference the use of 2OM-7.4.F until after initiation of a plant cooldown,
2) the stem erroneously states that 2OM-7.4.F is directed from 2OM-52.4.R.1.F,
3) the use of the phrase "to remove non-condensable gases" was confusing and misleading because hydrogen is typically added during at-power operations to remove non-condensable gases,
4) the reference to 2OM-7.4 .F and to "non-condensable gases" in the same question led to confusion as to the intent of the evolution
5) applicants demonstrated knowledge of the system by selecting the proper flow path.

Following detailed review, the NRC concludes there are not two valid answers. Choice B is not a correct answer for the question. 2OM-52.4.R.1.F does not specifically direct use of 2OM-7.4.F until after initiation of a plant cooldown. However it does ensure, through Initial Condition III.G, that 2OM-52.4.R.1.A, "Station Shutdown Mode 1 to Mode 6 Administrative and Local Actions," is in progress. The R.1.A procedure (Step 71) directs placing a nitrogen cover gas on the VCT and commencing purges as directed by chemistry in accordance with 2OM-7.4.F when the reactor is within 24 hours of shutdown for the refueling outage. The procedure linkage in the stem, while confusing, is not technically incorrect.

Both hydrogen and nitrogen can reasonably be referred to as "non-condensable gases" as they are used in the reactor coolant system. However, by general convention, the station appears to consider hydrogen separately from all the other "non-condensables." This appeared to cause confusion. To arrive at the correct answer the applicants would have to know from memory that 2OM-7.4.F, "Degassing the Reactor Coolant System From The VCT" is used when allowing nitrogen

Question 29

to force the removal of other entrained gases. The use of the 2OM-7.4.F procedure would not be directed until within 24 hours of reactor shutdown. The question stem did not state when the reactor would be shutdown, only that a shutdown was in progress for a refueling outage. Based on the confusion factors and the detailed knowledge required to answer the question and despite the fact that the question was facility developed, validated and approved, the NRC concludes this question should be deleted. In this rare case, the NRC concludes the question was not appropriate for the closed reference exam in that the required knowledge went beyond that answerable without references.

Summary

The NRC disagrees with the licensee arguments for two correct answers. However, the question is confusing and will be deleted from the exam.

References

1. 2OM-52.4.R.1.F, Station Shutdown From 100% Power to MODE 5, Revision 31
2. 2OM-52.4.R.1.A, Station Shutdown MODE 1 to MODE 6 Administrative and Local Actions, Revision 11
3. 2OM-7.4.F, Degassing the Reactor Coolant System From The VCT, Revision 19

Question 33

NRC Resolution

Accept two answers. Choice C and Original Key Choice A are both correct answers. No other answers are correct.

Discussion

Four applicants chose original Key Answer A. Four applicants chose Distractor Choice C. No applicants chose Distractor Choices B or D.

None of the applicants asked any question about this test item during exam administration.

This was a modified question, from a NRC exam at another facility.

The licensee proposed accepting two answers (Choices A and C), based on their assessment that the question could be interpreted as either asking what it takes to reduce temperature or as asking what is procedurally required to reduce temperature.

The NRC agrees that both Choices A and C are correct answers because either of the methods could be performed in accordance with the alarm response procedure to reduce tank temperature.

Justification for Choice A as a correct answer: Tank temperature would be adequately reduced if operators filled the tank to near, but below the high level isolation setpoint of 90.5%. The trouble alarm response procedure subsection on high temperature directs opening fill valves with a note explaining they will automatically close above 90.5% level. This subsection does not address opening the drain valve. Even conservatively assuming an initial tank level at the high end of the normal band, normal fill water temperature and without taking tank ambient heat losses into consideration, the mass and energy calculations demonstrate that final tank water volume, when mixed, would be at a temperature below the high temperature alarm setpoint. Based on the guidance in the trouble alarm procedure subsection on high temperature, it would be acceptable to raise level as much as possible, up to 90.5% prior to draining back into the normal band. Precaution and Limitation 76 of 2OM-6.2A states that PRT level "should" be maintained in the normal operating range between high and low level setpoints during normal operation. However, it is a "should" statement and describes "normal operation." It does not prohibit level from being raised above the high level setpoint for a short period of time for the specific purpose of lowering tank temperature. And Precaution and Limitation 71 states the tank contents should be cooled by spraying with primary water.

Question 33

Justification for Choice C as a second correct answer: The question asks for the choice that identifies all valves that would be opened to reduce temperature in accordance with the PRT Trouble Alarm Response Procedure. This procedure is divided into sub-procedures for trouble related to temperature, pressure or level. The temperature subsection, which would apply immediately based on question initial conditions directs opening the fill valves and filling until temperature is restored. Physical interlocks would close the fill valves if level reaches 90.5%. However, as described above, sufficient volume of colder water would have been added to reduce temperature below the high temperature setpoint of 120°F prior to reaching 90.5% level. Although normal practice would be to raise level beyond the high level alarm setpoint of 78% while intentionally filling to reduce temperature, the alarm procedure does not specifically direct the operator to ignore the resulting trouble alarm on high level. The high level trouble subsection directs operators to reduce level by opening the drain valve. Operators have the latitude to either remain in the high temperature section, adding sufficient water to cool the tank prior to initiating a tank drain evolution, or they could add water until the high level alarm actuates at 78%, then respond per the subsection on high level to reduce level to low in the normal band by draining. Assuming a normal initial PRT level of 76%, a normal fill water temperature of 70°F and complete mixing of the tank contents, calculations confirm that sufficient water cannot be added to cool the tank to 120°F before reaching the 78% high alarm setpoint level.

Summary

The NRC has determined Question 33 had two valid answers, Choices A and C, given that both choices describe acceptable methods for accomplishing the task.

References

1. 2OM-6.2.A, RCS Precautions and Limitations, Revision 22
2. 2OM-6.2.B, RCS Setpoints, Revision 13
3. 2OM-6.4.AAY, Pressurizer Relief Tank Trouble, Revision 10
4. Pressurizer Relief Tank 2RCS-TK-22 Curve (Volume vs Indicated Level), Approved 5/22/87

Question 41

NRC Resolution

Accept two answers. Accept original key Choice B and Choice D. No other answers are correct.

Discussion

Six applicants chose Key Answer B. Two applicants chose Distractor Choice D. No applicants chose Distractor Choices A or C.

During exam administration, one of the applicants asked whether the question was asking "individual switch manipulations." The proctor directed the applicant to re-read the test item.

This was a modified question, from a NRC exam at another facility.

The licensee proposed accepting two answers (Choices B and D), based on their assessment that an applicant could make either of two reasonable assumptions, each of which would support a different answer. In the first instance, if the applicant assumed that "minimum required" referred to the minimum number of switches that would have to be physically manipulated, then Choice B (2 switches) would be the correct answer. In the second instance, if the applicant assumed that "minimum required" referred to the minimum number of switches which must be operated by procedure, then Choice D (4 switches) would be the correct answer. EOP-0 (Step 10) directs performance of 20M-53.A.1.A.0.11, which requires (Step 9, RNO) operators to "manually initiate both switches for both trains." Choices B and D both describe switch configurations that would accomplish the task of starting both Quench Spray pumps. There is nothing in the stem to indicate that the first assumption is any more or less appropriate than the second.

Summary

The NRC determined Question 41 had two valid answers, Choices B and D, supported by reasonable examinee assumptions.

References

1. 2OM-53.A.1.A.0.11, Verification of Automatic Actions, Revision 9
2. 20M-53.A.1.E-0 (ISS2), Reactor Trip or Safety Injection, Issue 2, Revision 1
3. USFAR Figure 7.3-13, Functional Diagram - Safeguard Actuation Signal, Revision K

Question 59

NRC Resolution

Delete the question.

Discussion

Three applicants chose Key Answer D. Four applicants chose Distractor Choice C. One applicant chose Distractor Choice A. No applicants chose Distractor Choice B.

None of the applicants asked any question about this test item during exam administration.

This was a new question.

The licensee proposed accepting two answers, Original Key Answer D and Distractor Choice C, based on their assessment that Choice C would be correct if applicants assumed RP did not give permission to start the purge blower. The licensee further supports Choice C as a viable answer by explaining that conditions in the stem indicate significant fuel clad damage under which RP would not likely permit access to purge components.

The NRC does not agree that Choice C is a second correct answer because the question asks the action taken by the crew in accordance with the Hydrogen Level High/High-High Alarm Response Procedure. This procedure directs performance of 2OM-46.4.D, "Containment Atmosphere Purge Blower Operation" and does not address actions to intentionally ignite the hydrogen. Hydrogen ignition, if required, would be directed from severe accident management guidelines.

However, as explained by the licensee in their post-exam comment, there are issues with the original key answer. It is based on the assumption that Radiation Protection would allow access to the purge blower. One of the initial conditions of the blower operation procedure is that "Radiation Protection has been informed that this procedure is to be implemented." This should be interpreted as RP agrees / approves / grants permission for access to equipment necessary to implement the procedure. Stem conditions describe a hydrogen concentration in excess of that expected for a DBA LOCA, indicating core damage, which would reasonably result in elevated dose rates in areas immediately adjacent to the containment, including areas necessary for implementation of the purge blower operation procedure.

In any case, it remains that for the original answer to be valid, the applicants must assume a condition not stated in the stem. Starting the purge blower IAW the alarm procedure can only be valid if one assumes that Radiation Protection has been informed and authorizes entry into areas adjacent to containment. Per Appendix E of NUREG-1021, applicants are directed to "*not make assumptions regarding conditions that are not specified in the question unless they occur as a*

consequence of other conditions that are stated in the question." The assumption regarding Radiation Protection cannot be assumed as a consequence of stated conditions. Without making this assumption the key answer cannot be correct.

Summary

The NRC disagrees with the licensee arguments to accept two correct answers. However, no answer choices are correct for the given stem conditions. The question will be deleted from the exam.

References

1. 2OM-46.4.ABD, Hydrogen Level High/High - High, Revision 3
2. 20M-46.4.D, Containment Atmosphere Purge Blower Operation, Revision 3
3. NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," Revision 10