FACILITY POST-EXAMINATION COMMENTS

FOR THE CLINTON INITIAL EXAMINATION - JANUARY 2004

AmerGen
An Exelon/British Energy Company

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U-603651
January 21, 2004

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Clinton Power Station
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Comments Regarding Reactor Operator License Examination Question Administered on January 15, 2004

This letter is to request that the answer key be modified for question #78, to indicate "B" as the correct answer on the Senior Reactor Operator License Examination administered on January 15, 2004. Enclosed are the question and associated documentation that justifies this request.

If you should have any questions concerning this matter please contact Mr. K. A. McCall at (217) 937-4001 or Mr. Michael R. Helton at (217) 937-4046.

Sincerely yours,

William S. Iliff
Regulatory Assurance Manager
Clinton Power Station

EET/blf

Attachments

cc: NRC Clinton Licensing Project Manager (w/o Attachment)
NRC Resident Office, V-690 (w/o Attachment)
M. A. Bies, NRC Region III Licensing Assistant

JAN 23 2004

U-603651
January 21, 2004

Subject: Comments Regarding Reactor Operator License Examination Question Administered on January 15, 2004

bcc: R. S. Bement, V-275 (w/o Attachment)
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NRC Document Control Desk (w/o Attachment)
Director – Licensing, Mid-West Regional Operating Group (w/o Attachment)
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Clinton Power Station
2003 NRC Written Exam
ILT 02-1

RECORD #78 SRO EXAM

Discussion

Answer B is correct for the operational condition. In this condition the normal supply for sealing steam has been lost (seal steam evaporator) and the question indicates that the alternate supply (Main Steam) is available since the MSIVs are open. The proper action is per CPS No. 3107.01 GLAND SEAL 8.1.4, INFREQUENT OPERATION, Operating Without the Gland Steam Seal Evaporator, which has you place the Main Steam Supply in service.

Two limitations are associated with this action in CPS No. 3107.01:

Limitation 6.2 states, "Main Steam should not be applied directly to the Gland Steam Seal Header except in an emergency and then only as a last resort and until Auxiliary Steam can be made available to supply the header." Since the pressure regulator bypass valve has failed to open and Auxiliary Steam will not be available for 20 minutes then Main Steam is the last resort. If Main Steam is not used then two emergency conditions may occur: break vacuum and the condenser would be lost as a heat sink or vacuum is not broken and cool air drawn across the condenser seals may damage them.

Limitation 6.3 states, "Following a loss of steam supply to the Steam Seal Evaporator tubes, the stored energy of the system will provide sealing steam for less than 5 minutes. The operator must supply the seal header from Main Steam or Auxiliary Steam within this time or air will be drawn in across the turbine glands." This limitation indicates the concern is seal damage and that seal steam supply should be restored within 5 minutes. Since Main Steam is available it should be aligned per the procedure.

Answer A was the original answer specified. This was based on CPS 3112.01 CONDENSER VACUUM (CA) that contains a caution that states "During shutdown, if gland sealing steam is lost, condenser vacuum must be broken immediately to prevent drawing cool air across the seals." Given the conditions of the question, Gland Steam can be readily supplied by Main Steam thus restoring gland sealing steam pressure. This action is preferable to breaking condenser vacuum since it would prevent drawing cool air across the seals and prevent a loss of the condenser as the heat sink.

CPS N0. 3107.01 and 3112.01 are attached with these above sections highlighted.

CPS has initiated an issue (196251) to clarify the use of the caution in CPS 3112.01.

Recommendation/Justification

Accept B as the correct answer / Main Steam is available to support gland seal.

A is incorrect since Main Steam can restore the gland seal pressure.

C is still incorrect since the system cannot be operated without any seal header pressure for greater than 5 minutes per Limitation 6.3.

D is still incorrect because these switches are used as directed by CPS No. 3101.01, MAIN STEAM for recovery of MSLs and the MSIVs are currently open.

Clinton Power Station
2003 NRC Written Exam
ILT 02-1

Question	RO SRO:	TIER:	GROUP:	Topic No:	KA No:	RO:	SRO:	Cog Level:
78	SRO	1	1	295006	2950062132	3.4	3.8	High

System/Evolution Name: SCRAM

Category Statement: Conduct of Operations

KA Statement: Ability to explain and apply system limits and precautions.

UserID: Topic Line:

Question Stem:
A plant shutdown is in progress with all rods in and MDRFP running. The MSIVs are open and condenser vacuum is 28" HG VAC. The Aux boiler will be available in 20 minutes. Annunciator HIGH OR LOW PRESSURE STEAM SEAL HEADER 5019-3D alarmed and the operator reports steam seal pressure is 0 psig. The operator tries to open the pressure regulator bypass valve with no success.

What action is required and Why?

A: Break condenser vacuum to prevent drawing relatively cool air across the turbine seals.
B: Use Main Steam to supply the steam seal header to prevent a loss of condenser vacuum.
C: When the Aux Boiler is available, Shift to steam seals Aux Steam to prevent a loss of vacuum.
D: Place the Div 1, 2, 3 & 4 Cond Low Vacuum Bypass Switches on 1H13-P601 to BYPASS to prevent MSIV closure.

Answer:	Task	Question Source:	Question Difficulty
A	Objective LP85256.1.14	New	Medium

Reference Provided:
None

Reference:
CPS 3112.01 CONDENSER VACUUM (CA)
Explanation:
CPS 3112.01 CONDENSER VACUUM (CA) contains a caution that states "During shutdown, if gland sealing steam is lost, condenser vacuum must be broken immediately to prevent drawing cool air across the seals."

Distracters:

B is incorrect main steam should only be used in an emergency, the plant is being shutdown and all rods are already inserted.
C is incorrect as breaking vacuum is required. Aux steam will not be available for 20 minutes.
D is incorrect as breaking vacuum is required.

55.43 section(s): (5)

SRO Justification: SRO assess plant conditions during an abnormal events to determine appropriate procedure/actions to mitigate the event, as required. SRO from-memory knowledge of system precautions and limitations is required to make this assessment.

Date Written: 10/22/2003 Author: Pickley

TURBINE GLAND SEAL (GS)

SCOPE OF REVISION:

- Incorporated Specific Revision 12a/b/c and Temp Change 12d, which added missing step (8.1.2.3.2).

❶ Specific Rev. 13a [Landin]: EDITORIAL - CR 130068-04: Added 4.6 PRECAUTION and trigger notes to capture lessons learned regarding SPE vacuum impact on OG effluent flow.

ROUTINE USE

ORIGINATOR: *Brian Zimmerman* **CLASS CODE:** *NNND*

SQR: *N/A* **APPROVAL DATE:** *10/21/02*

CURRENT CHANGES TO GENERAL REVISION

	Change #	Date	List of Affected Pages
❶	13a	01/22/03	1, 4, 9, 10, 12, 13, 14, 16, 19, 21
❷			
❸			
❹			
❺			

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1.0 **PURPOSE**

The purpose of this procedure is to provide instructions for placing the Gland Seal Supply System and Steam Packing Exhauster System in their normal operational modes and to provide corrective action in case of abnormal operation.

2.0 **DISCUSSION/DEFINITIONS**

2.1 **Discussion**

2.1.1 The purpose of the Gland Seal System is to supply steam at the required pressure to serve the following components:

2.1.2 Main Turbine Shaft Seals

2.1.3 Reactor Feed Pump Turbine Shaft Seals

2.1.4 Packing Seal Steam

1. Main Turbine Stop Valves

2. Main Turbine Control Valves

3. Combined Intermediate Valves

1) The Gland Seal System performs the above functions so that air will not leak into the Main Condenser past the seals and to ensure radioactive steam does not leak out to the Turbine Building.

2.1.5 The purpose of the Steam Packing Exhauster System is to condense the sealing steam exhaust and return the water to the Main Condenser, also to get rid of any non-condensable gasses and discharge them to the Common Station HVAC Vent.

2.2 **Definitions**

2.2.1 The sources of steam available to the Steam Seal System are:

1. AUXILIARY STEAM: supplies seal header directly.
2. MAIN STEAM: can supply seal header directly or supply gland steam seal evaporator.
3. SEVENTH STAGE EXTRACTION STEAM: supplies gland steam seal evaporator.

3.0 **RESPONSIBILITY**

The Operations department head is responsible for ensuring the proper implementation of this procedure.

4.0 PRECAUTIONS

4.1 When operating the Aux Stm Supply To Stm Seal Hdr Byp, 1GS-S7 and Evap Mn Stm Supply Bypass Vlv, 1GS-ESFV-2; open the valves slowly and monitor pressures closely as the pressure controllers are bypassed.

4.2 If the Gland Seal System is incapable of maintaining a supply of steam at the required pressure during normal operation to its loads, the following events may happen:

1. Decreased condenser vacuum
2. Turbine trip
3. Subsequent reactor scram (turbine trip > 33.3% RTP)
4. Group 1 isolation
5. Possible high airborne radiation in Turbine Building

4.3 When supplying the Gland Seal System header directly from Main Steam, verify that radioactive steam is not blowing to the Turbine Building and release limits to the Common Station HVAC Vent are not exceeded.

4.4 Do not apply sealing steam to a stationary turbine, as local heating and subsequent rotor bowing may occur. Prior to Gland Seal System startup, ensure that the turbines are jacking. Exceptions may be made with verbal concurrence from the associated System Managers.

4.5 Coordinate with ROC Operator when changing Aux Steam loads.

4.6 SPE Inlet Pressure is normally maintained at the optimal ~ 11" H_2O vacuum (normal range is 10 - 14" H_2O).

When SPE vacuum drifts high (i.e., cooler lake temps), the Off-Gas effluent flow will trend higher (possibly due to flashing in the SPE Condenser loop seal at the higher SPE vacuum).

5.0 PREREQUISITES

5.1 Verify the following systems are available to support startup of the Gland Seal Systems:

1. Required portions of Cycled/Makeup Condensate in operation per CPS 3208.01, Cycled/Makeup Condensate (CY/MC).
2. Required portions of Plant Air in operation per CPS 3214.01, Plant Air (IA & SA).
3. All required 480 VAC power distribution energized per CPS 3502.01, 480V Distribution System.

5.1 (cont'd)

4. Required portions of Condensate, Condensate Booster in operation per CPS 3104.01, Condensate/Condensate Booster (CD/CB).
5. Required portions of Auxiliary Steam in operation per CPS 3202.01, Operating Electrode Boilers And Reboilers.
6. Required portions of Circulating Water in operation per CPS 3113.01, Circulating Water (CW).

5.2 Verify the following lineups are available to support system startup:

1. Required portions of CPS 3107.01V001, Turbine Gland Seal Valve Lineup completed.
2. Required portions of CPS 3107.01V002, Turbine Gland Seal Instrument Valve Lineup completed.
3. Required portions of CPS 3107.01E001, Turbine Gland Seal Electrical Lineup completed.

0 5.3 Steam Packing Exhauster Blowers discharge to the vent stack.

1. Contact RP prior to starting a blower.
2. Ensure that stack effluent is being monitored.

5.4 Prior to supplying sealing steam to turbine glands, the turbine must be rotating to prevent local heating and turbine rotor bowing. Exceptions may be made with verbal concurrence from the associated System Managers.

6.0 LIMITATIONS

6.1 A minimum pressure of 50 psig Main Steam is needed at the inlet to the Gland Steam Seal Evaporator to seal the turbine with normal packing clearances.

6.2 Main Steam should not be applied directly to the Gland Steam Seal Header except in an emergency and then only as a last resort and until Auxiliary Steam can be made available to supply the header.

6.3 Following a loss of steam supply to the Steam Seal Evaporator tubes, the stored energy of the system will provide sealing steam for less than 5 minutes. The operator must supply the seal header from Main Steam or Auxiliary Steam within this time or air will be drawn in across the turbine glands.

7.0 MATERIALS/TEST EQUIPMENT - None

8.0 PROCEDURE

8.1 Normal System Operation

8.1.1 Normal Startup

1. Steam Packing Exhauster (SPE) System

NOTE

If SPE has been out of service for an extended period of time, then filling and venting of 1LT-GS030(032) reference legs may be required.

Annunciator 5019-3B(C), HIGH LEVEL STM PACKING EXH "A"("B") DRN PIPE may alarm during the fill and vent.

Without a Steam Packing Exhauster Blower running, level should be no higher than the overflow line to the equipment drain system. This corresponds to an indicated level of ~ –6"(i.e., level in the green band with the tape set at -6").

1) Perform the following to place SPE Drain Level Controller, 1LIC-GS030(032), in service [1LIC-GS030(032) is located at 1PA05J]:

   a) Verify/place 1LIC-GS030(032) in manual and close.

   b) Place 1LIC-GS030(032) tape setpoint at ≈ -8".

   c) **IF** SPE has been out of service for an extended period of time, **THEN** contact C&I to fill and vent reference legs of 1LT-GS030(032) per CPS 8801.12, Local Mounted Instrument Valve Operation and Venting.

8.1.1.1 (Cont'd)

NOTE

Maintaining SPE/Cdsr drain level too high will cause annunciator 5019-3B(C), HIGH LEVEL STM PACKING EXH "A"("B") DRN PIPE to alarm, and may result in unnecessary water being sent to the equipment drain system.

d) **IF** indicated level on 1LIC-GS030(032) is: in **OR** above the green band, **THEN** perform either:
a. **OR** b. below;

a. Place 1LIC-GS030(032) in AUTO, **AND IF** indicated level is above the green band, **THEN** verify that 1LIC-GS030(032) positions 1GS022A(B) to control level.

CAUTION

SPE/Cdsr drain level staying or returning above the green band, may indicate the presence of a SPE condenser tube leak.

b. **IF** indicated level on 1LIC-GS030(032) is above the green band, **THEN** level, in the SPE/Cdsr drain line, may be lowered by performing the following:

i) Manually operate 1GS022A(B) using 1LIC-GS030(032) Open/Close pushbuttons.

ii) **When** indicated level on 1LIC-GS030(032) is in the green band, place 1LIC-GS030(032) in auto.

iii) SPE/Cdsr 1A(1B) Drn, 1GS024A(B) may be operated as necessary to assist in maintaining level.

iv) **When** no longer needed for level control, shut/verify shut 1GS024A(B).

8.1.1.1 (Cont'd)

NOTE

If level in the SPE/Cdsr drain line is maintained too low, a condenser air in-leakage path may be created from the equipment drain system to the condenser due to leakage through 1GS022A(B).

e) **IF** indicated level on 1LIC-GS030(032) is below the green band, **THEN** fill the SPE drain line loop seal by opening 1GS020A(B), SPE Cdsr 1A(1B) CY Sys Supp Isol, AND **WHEN** indicated level on 1LIC-GS030(032) is in the green band:

- Shut 1GS020A(B).
- Place 1LIC-GS030(032) in AUTO

f) Adjust 1LIC-GS030(032) tape setpoint to 0".

2) Establish/verify condensate system flow through the on-coming SPE Condenser as follows:

a) Verify oncoming SPE Condenser Outlet Valve, 1CD005A(B) is open.

b) At 1H13-P870, verify/place SPE Cdsr 1A/1B Selector Switch to the on-coming SPE 1A(1B) position and verify the following:

- On-coming SPE Condenser Inlet Valve, 1CD004A(B) is open.
- Off-going/standby SPE Condenser Inlet Valve, 1CD004B(A) is closed.

3) Line up SPE/Cdsr 1A(1B) for service as follows:

a) Place SPE 1A(1B) Isol Vlv 1GS-E1(1GS-E2) switch in ISOL VLV OPEN position.

b) Verify associated drain valve SPE 1A(B) Drn Vlv, 1GS043A(B) is closed.

c) Place control switch for the opposite SPE 1B(1A) Isol Vlv, 1GS-E2(E1) in DRN VLV OPEN position.

d) Verify associated drain valve SPE 1B(A) Drn Vlv, 1GS043B(A) opens.

4) Start one associated blower.

SPE/Cdsr 1A, 1GS01SA	SPE Blower 1A1, 1GS01CA SPE Blower 1A2, 1GS01CB
SPE/Cdsr 1B, 1GS01SB	SPE Blower 1B1, 1GS02CA SPE Blower 1B2, 1GS02CB

8.1.1.1 (Cont'd)

5) Adjust SPE Inlet Pressure to ~ 11" H_2O vacuum (normal range is 10 - 14" H_2O) by locally operating SPE Blower Suct Isol Valve, 1GS604AA (AB/BA/BB).

☞ See 4.6 PRECAUTION related to SPE vacuum.

6) After SPE Inlet Pressure is stabilized, verify that level is being properly maintained by SPE Drain Level Controller 1LIC-GS030(032).
Repeat step 8.1.1.1.1.d)-f) as necessary.

2. Startup of Sealing Steam System Using Aux Steam

CAUTION

Do not apply sealing steam to a stationery turbine, as local heating and subsequent rotor bowing may occur. Exception may be made with verbal concurrence from the associated System Managers.

1) Ensure turbines are jacking.

2) Open Aux Stm Supply To Stm Seal Hdr, 1GS041.

CAUTION

If condenser is not under a vacuum, Condenser Vacuum Breaker should be open prior to placing steam seals in service to prevent over pressurizing condenser and rupturing blowout diaphragms.

3) **IF** condenser is not under a vacuum,
THEN ensure Cdsr Vacuum Bkr, 1CA007 is open.

CAUTION

When opening Aux Stm Supply To Stm Seal Hdr Byp, 1GS-S7 do it in small increments to allow steam seal header to pressurize slowly to ~ 4 psig.

4) Slowly operate Aux Stm Supply To Stm Seal Hdr Byp, 1GS-S7 to obtain ~ 4 psig in the steam seal header.

NOTE

Perform the next two steps simultaneously to maintain steam seal header pressure.

5) Open Aux Stm Supply to Stm Seal Hdr Vlv, 1GS-S6.

8.1.1.2 (Cont'd)

6) **IF** while opening Aux Stm Supply To Stm Seal Hdr Vlv, 1GS-S6 the steam seal header pressure begins increasing, **THEN** operate Aux Stm Supply To Stm Seal Hdr Byp, 1GS-S7 to maintain ~ 4 psig until 1GS-S6 is fully open.

7) Slowly close Aux Stm Supply To Stm Seal Hdr Byp, 1GS-S7 while maintaining ~ 4 psig steam seal header pressure.

8) **IF** unable to maintain steam seal header pressure at ~ 4 psig with 1GS-S7 fully closed, **THEN** operate Aux Stm Supply To Stm Seal Hdr Byp, 1GS-S7 as necessary to maintain steam seal header at ~ 4 psig.

9) Verify Stm Seal Aux Feed Header Cont Valve, 1GS-SSAFV is controlling steam seal header pressure at ~ 4 psig.

10) Adjust SPE Inlet Pressure to ~ 11" H_2O vacuum (normal range is 10 - 14" H_2O) by locally operating SPE Blower Suct Isol Valve, 1GS604AA (AB/BA/BB).

❶ ☞ See 4.6 PRECAUTION related to SPE vacuum.

11) Verify that level is being properly maintained by SPE Drain Level Controller 1LIC-GS030(032). Repeat step 8.1.1.1.1.d)-f) as necessary.

3. Steam Seal Supply System

CAUTION

Do not apply sealing steam to a stationary turbine, as local heating and subsequent rotor bowing may occur. Exception may be made with verbal concurrence from the associated System Managers.

1) Ensure turbines are jacking.

2) Locally, open and lock open the following:

- Steam Seal Evap Blowdown header isolation, 1GS046.
- Steam Seal Evaporator Vent, 1GS047.

8.1.1.3 (Cont'd)

NOTE

When a Steam Seal Evaporator (SSE) Hi-Hi Level of 4 inches (3.4 - 4.6 inches) exists, SSE Feedwater Isolation Valve, 1GS-S9 will not open.

3) **IF** A SSE Hi-Hi Level of 4" exists,

THEN Drain the SSE shell locally via 1TF064, SSE Shell Drain Valve to a level of ~ 0".

4) Open SSE Feedwater Isol Vlv, 1GS-S9.

- Verify level in SSE is established at ~ 0".

CAUTION

Do not open Evap Mn Stm Supp Byp Vlv, 1GS-ESFV-2 or Evap Mn Stm Supply Vlv, 1GS-S8 unless Main Steam lines are pressurized or isolated from reactor to prevent drawing a vacuum in reactor vessel.

5) Slowly operate Evap Mn Stm Supply Byp Vlv, 1GS-ESFV-2 until a small increase of < 5 psig is seen in SSE tube pressure.

6) Allow SSE to soak for ~ 30 minutes.

- During this soak period, operate 1GS-ESFV-2 as necessary to keep SSE tube pressure between 0 and 5 psig.

7) At completion of soak period, slowly operate 1GS-ESFV-2 to raise SSE tube pressure at a rate not to exceed 5 psig per minute.

8) **WHEN** SSE tube pressure is □ 45 psig, and SSE shell pressure is □ 10 psig,

THEN Slowly operate Stm Seal Supply Bypass Vlv, 1GS-S2 as necessary to maintain ~ 4 psig in steam seal header.

9) Open Stm Seal Supply Vlv, 1GS-S1 while closing 1GS-S2.

- Verify regulator maintains steam seal pressure at ~ 4 psig.

8.1.1.3 (Cont'd)

NOTE

Opening 1GS-S8 places the Evap Mn Stm Supp Cont Vlv, 1GS-ESFV-1 on line. 1GS-ESFV-1 should throttle to control SSE tube side supply pressure based on system demand.

10) Open Evap Mn Stm Supply Vlv, 1GS-S8 while controlling SSE tube pressure with 1GS-ESFV-2.

11) **WHEN** 1GS-ESFV-1 is maintaining tube pressure between ~ 50 psig and 80 psig,

THEN Fully close 1GS-ESFV-2.

12) **IF** System was started up on Aux Steam System,

THEN Perform the following to shift steam seal header to SSE:

a) Shut 1GS-S6, Aux Stm Supply To Stm Seal Hdr Vlv

b) Verify steam seal header pressure is ~ 4 psig.

c) Shut 1GS041, Aux Stm Supply To Stm Seal Hdr Vlv

13) Locally, open Ext Stm To SSE Supply, 1GS057.

- Using local indicating lights behind 1PL23J, south of SSE room, verify Ext Stm Supp Line Drn Valve, 1GS058 closed.

14) **IF** Main Turbine is reset and 7th stage extraction steam pressure is greater than Main Steam supply to the SSE,

THEN:

a) At 1PL01J, verify open both Ext Stm Feed To SSE Chk Valves:
- 1GS001
- 1GS002

b) At 1H13-P870, verify Ext Stm Drn Vlv, 1GS042 closes.

15) Adjust SPE Inlet Pressure to ~ 11" H_2O vacuum (normal range is 10 - 14" H_2O) by locally operating SPE Blower Suct Isol Valve, 1GS604AA (AB/BA/BB).

☞ See 4.6 PRECAUTION related to SPE vacuum.

16) Verify that level is being properly maintained by SPE Drain Level Controller 1LIC-GS030(032). Repeat step 8.1.1.1.1.d)-f) as necessary.

8.1.2 **NORMAL OPERATION**

1. **Gland Steam Seal System**

1) Normal operation consists of 7th stage extraction steam supplying Gland Steam Seal Evaporator.

2) The Gland Steam Seal Evaporator should be controlling the following parameters indicated in the control room:

- SSE Shell Level ~ 0 inches.

NOTE

There is no regulator when operating SSE on #7 extraction. Shell pressure is load dependent.

- SSE Shell Pressure 10 - 50 psig when supplied from Main Steam and 35 - 80 psig when supplied by Extraction Steam.
- SSE drain level - no level alarms.
- Steam Seal Header Pressure ~ 4 psig.
- SSE tube pressure ~ 50 - 126 psig with normal seal clearances, higher when operating with worn glands, but not to exceed ~ 145 psig.

2. **Steam Packing Exhauster System**

1) Normal operation of this system consists of running one Steam Packing Exhauster Blower and Condenser pair.

2) As necessary, adjust SPE Inlet Pressure to maintain ~ 11" H_2O vacuum (normal range is 10 - 14" H_2O) by locally operating SPE Blower Suct Isol Valve, 1GS604AA (AB/BA/BB).

☞ See 4.6 PRECAUTION related to SPE vacuum.

3) Verify that level is being properly maintained by SPE Drain Level Controller 1LIC-GS030(032).

Repeat step 8.1.1.1.1.4)-6) as necessary.

8.1.2 **NORMAL OPERATION** (cont'd)

3. **Switching to Non-running SPE Blower**

1) Start the non-running blower for the operating SPE/Cdsr.

2) Shutdown the off-going blower for the operating SPE/Cdsr.

3) Adjust SPE Inlet Pressure to ~ 11" H_2O vacuum (normal range is 10 - 14" H_2O) by locally operating SPE Blower Suct Isol Valve, 1GS604AA (AB/BA/BB).

☞ See 4.6 PRECAUTION related to SPE vacuum.

4. **Switching to Non-running SPE-Condenser/Blower**

1) Line up condensate flow to the non-running SPE Condenser per CPS 3104.01, Condensate/Condensate Booster (CD/CB).

2) Perform the following to place the on-coming SPE Drain Level Controller, 1LIC-GS030(032), in service (1LIC-GS030(032) is located at 1PA05J):

a) Verify/place 1LIC-GS030(032) in manual and close.

b) Place 1LIC-GS030(032) tape setpoint at ≈ -8".

c) **IF** SPE has been out of service for an extended period of time, **THEN** contact C&I to fill and vent reference legs of 1LT-GS030(032) as follows per CPS 8801.12, Local Mounted Instrument Valve Operation And Venting.

NOTE

Maintaining SPE/Cdsr drain level too high will cause annunciator 5019-3B(C), HIGH LEVEL STM PACKING EXH "A"("B") DRN PIPE to alarm and may result in unnecessary water being sent to the equipment drain system.

d) **IF** indicated level on 1LIC-GS030(032) is: in **OR** above the green band, **THEN** perform either bulleted items below;

- Place 1LIC-GS030(032) in AUTO, **AND IF** indicated level is above the green band, **THEN** verify that 1LIC-GS030(032) positions 1GS022A(B) to control level.

8.1.2.4 (Cont'd)

CAUTION

SPE/Cdsr drain level staying or returning above the green band, may indicate the presence of a SPE condenser tube leak.

- **IF** indicated level on 1LIC-GS030(032) is above the green band, **THEN** level, in the SPE/Cdsr drain line, may be lowered by performing the following:
  - i) Manually operate 1GS022A(B) using 1LIC-GS030(032) Open/Close pushbuttons.
  - ii) When indicated level on 1LIC-GS030(032) is in the green band, place 1LIC-GS030(032) in auto.
  - iii) SPE/Cdsr 1A(1B) Drn, 1GS024A(B) may be operated as necessary to assist in maintaining level.
  - iv) When no longer needed for level control, shut/verify shut 1GS024A(B).

NOTE

If level in the SPE/Cdsr drain line is maintained too low, a condenser air inleakage path may be created from the equipment drain system to the condenser due to leakage through 1GS022A(B).

e) **IF** indicated level on 1LIC-GS030(032) is below the green band, **THEN** fill the SPE drain line loop seal by opening 1GS020A(B), SPE Cdsr 1A(1B) CY Sys Supp Isol, **AND** When indicated level on 1LIC-GS030(032) is in the green band:

- Shut 1GS020A(B).
- Place 1LIC-GS030(032) in AUTO

f) Adjust 1LIC-GS030(032) tape setpoint to 0".

3) Line up Steam Packing Exhauster/Condenser 1A(1B) for service as follows:

a) Place SPE 1A(1B) Isol Vlv 1GS-E1(1GS-E2) switch in ISOL VLV OPEN position.

b) Verify associated SPE 1A(1B) Drn Vlv, 1GS043A(B) is closed.

8.1.2.4 (Cont'd)

4) Start one associated blower.

SPE/Cdsr 1A, 1GS01SA	SPE Blower 1A1, 1GS01CA SPE Blower 1A2, 1GS01CB
SPE/Cdsr 1B, 1GS01SB	SPE Blower 1B1, 1GS02CA SPE Blower 1B2, 1GS02CB

5) Shut down previously running SPE Blower.

6) Adjust, as necessary, SPE Inlet Pressure to ~ 11" H_2O vacuum (normal range is 10 - 14" H_2O) by locally operating SPE Blower Suct Isol Valve, 1GS604AA (AB/BA/BB).

❶ ☞ See 4.6 PRECAUTION related to SPE vacuum.

7) Verify that level is being properly maintained by SPE Drain Level Controller 1LIC-GS030(032).

Repeat step 8.1.2.4.2.4)-6) as necessary.

❶ 8) Isolate previously running SPE/Cdsr as follows:

a) Place SPE 1A(1B) Isol Vlv 1GS-E1(1GS-E2) switch in DRN VLV OPEN position.

b) Verify 1GS-E1(1GS-E2) closes.

c) Verify 1GS043A(B) opens

9) Approximately 30 minutes to 1 hour after shutting SPE 1A(B) Isol Vlv, 1GS-E1(1GS-E2) condensate flow may be isolated from the non-running SPE Cdsr per CPS 3104.01, Condensate/Condensate Booster (CD/CB).

5. Running an Out Of Service Gland Seal Exhauster Blower 1GS01CA (1GS01CB) (1GS02CA) (1GS02CB)

1) Start the non running gland seal exhauster blower 1GS01CA (1GS01CB) (1GS02CA) (1GS02CB).

2) Stop the blower started in Step 8.1.2.5.1.

3) Repeat Steps 8.1.2.5.1 and 8.1.2.5.2 for the other non running gland seal exhauster blowers as necessary.

8.1.3 **NORMAL SHUTDOWN**

1. **Gland Steam Seal Evaporator**

1) Ensure Auxiliary Steam or Main Steam is ready to supply the gland steam seal header.

2) **IF** Aux Steam is to be used, **THEN** Open 1GS041, Aux Stm Supply To Stm Seal Hdr Vlv.

3) **IF** Main Steam is to be used, **THEN** Open1GS003, Mn Stm Supply To Stm Seal Hdr Vlv.

4) Slowly operate Aux Stm Supply To Stm Seal Hdr Byp, 1GS-S7 to obtain ~ 4 psig in steam seal header.

NOTE

Perform the next two steps simultaneously to maintain steam seal header pressure.

5) Open Aux Stm Supply To Stm Seal Hdr Vlv, 1GS-S6.

6) **IF** While opening Aux Stm Supply To Stm Seal Hdr Vlv, 1GS-S6 the steam seal header pressure begins increasing,

THEN Operate Aux Stm Supply To Stm Seal Hdr Byp, 1GS-S7 to maintain ~ 4 psig until 1GS-S6 is fully open.

7) Slowly close Aux Stm Supply To Stm Seal Hdr Byp, 1GS-S7 while maintaining approximately 4 psig steam seal header pressure.

8) Close Evap Mn Stm Supply Vlv, 1GS-S8.

9) Locally, close Ext Stm To SSE Supp Vlv, 1GS057.

- Verify Ext Stm Supp Line Drn Valve, 1GS058 opens.

10) Close Stm Supply Vlv, 1GS-S1.

11) Close SSE Feedwater Isol Vlv, 1GS-S9.

12) To prevent draining the SSE and exposing it to Main Condenser vacuum, locally unlock and close the following:

- Stm Seal Evap Blowdown Hdr Isol Vlv, 1GS046.
- Stm Seal Evap Vent Vlv, 1GS047.

8.1.3 (Cont'd)

2. **Gland Seal System**

> CAUTION
>
> *Do not shutdown sealing steam with vacuum in the main condenser or turbine seal damage may occur.*

1) Refer to CPS 3006.01, Unit Shutdown With Condenser to ensure plant requirements for a shutdown of Turbine Gland Sealing Steam are met.

2) **IF** steam seal header is being supplied by Aux or Main Steam, **THEN** close the following:

   - Aux Stm Supply To Stm Seal Hdr Vlv, 1GS-S6.
   - Aux Stm Supply To Stm Seal Hdr Byp, 1GS-S7.

3) **IF** steam seal header is being supplied by Steam Seal Evaporator, **THEN** perform the following:

   - Close Stm Seal Supply Vlv, 1GS-S1.
   - Close Stm Seal Supply Byp Vlv 1GS-S2.
   - Shutdown Steam Seal Evaporator per step 8.1.3.1.

4) Verify the following are closed:

   - Mn Stm Supply To Stm Seal Hdr Vlv, 1GS003.
   - Aux Stm Supply To Stm Seal Hdr Vlv, 1GS041.

5) Stop the running SPE Blower.

6) Isolate both SPE/Cdsrs per the following:

   a) Take switch SPE 1A Isol Vlv, 1GS-E1 to BOTH CLOSE position.

   b) Take switch SPE 1B Isol Vlv, 1GS-E2 to BOTH CLOSE position.

   c) Verify the following are closed:

      - SPE 1A Isol Vlv, 1GS-E1.
      - SPE 1B Isol Vlv, 1GS-E2.
      - SPE 1A Drn Vlv, 1GS043A.
      - SPE 1B Drn Vlv, 1GS043B.

8.1.3.2 (Cont'd)

7) Approximately 30 minutes to 1 hour after closing SPE 1A(1B) Isol Vlv, 1GS-E1(1GS-E2) condensate flow may be shifted through the other non-running SPE Cdsr per CPS 3104.01, Condensate/Condensate Booster (CD/CB).

8.1.4 **INFREQUENT OPERATION**

NOTE

Two sources of steam are available to supply the Gland Steam Seal Header, AS and MS.

1. **Operating Without the Gland Steam Seal Evaporator**

1) Refer to 8.1.3.1 for switching steam supplies from Gland Steam Seal Evaporator to Aux Steam supply.

2) **IF** Auxiliary steam is not available, **THEN**:

a) Line up Main Steam supply by opening Mn Stm Supply To Stm Seal Hdr Vlv, 1GS003.

b) Ensure steam does not blow to atmosphere from the glands.

c) Verify at least one Steam Packing Exhauster Blower running.

d) Verify ~ 11" H_2O vacuum exists at SPE inlet.

☞ See 4.6 PRECAUTION related to SPE vacuum.

NOTE

It is expected that over the lifetime of the system the Main Turbine and Reactor Feed Pump Turbine Glands will wear. The Gland Steam Seal System has been designed to handle the extra steam flow required.

CAUTION

Operate 1GS-S7 and 1GS-S2 slowly and in incremental steps, watching Steam Seal Header pressure closely.

2. **Operating with Worn Glands**

1) **IF** steam is being supplied by the Gland Steam Seal Evaporator, **THEN** operate Stm Seal Supply Byp Vlv, 1GS-S2 as necessary to maintain steam seal header pressure at ~ 4 psig.

8.1.4.2 (Cont'd)

2) **IF** steam is being supplied by the Auxiliary or Main Steam Systems, **THEN** operate Aux Stm Supply To Stm Seal Hdr Byp, 1GS-S7 as necessary to maintain steam seal header pressure at ~ 4 psig.

3) **IF** Main Steam is supplying the SSE, **THEN** operate Evap Mn Stm Supply Byp Vlv, 1GS-ESFV-2 as necessary to maintain tube pressure in the SSE.

8.2 ABNORMAL PERFORMANCE

8.2.1 Abnormal Levels in the Gland Steam Seal Evaporator

1. Evaporator Shell Level Control

1) Low level

IF shell level is low, **THEN** operate SSE Feedwater Bypass Vlv, 1GS-S10 as necessary to maintain level.

2) High level

NOTE

SSE Feedwater Isol Vlv, 1GS-S9 will close on a High-High level of 4 inches (3.4 –6 inches.

3) **IF** shell level is high, **THEN** operate SSE Feedwater Isol Vlv, 1GS-S9 as necessary to maintain level.

4) **IF** level in Gland Steam Seal Evaporator cannot be controlled, **THEN** shutdown Steam Seal Evaporator per step 8.1.3.1 and 8.1.4.1.

2. Evaporator Drain Level Control

NOTE

When Low Pressure Feedwater Heater 3B receives a High-High level, it trips closed the Evap Drn Cont Vlv, 1GS007 from the Gland Steam Seal Evaporator to Feedwater Heater 3B. Level will be controlled by the Evap Emerg Drn Vlv, 1GS010 going to the Main Condenser.

0 1) **IF** SSE level is high or low, **THEN** operate the following as necessary to maintain level.

a) 1GS007, Evap Drn Cont Vlv

b) 1GS010, Evap Emerg Drn Cont Vlv

2) **IF** level control system is malfunctioning and level cannot be maintained between high and low level alarms, **THEN** shutdown SSE per 8.1.3.1 and 8.1.4.1.

8.2.2 Steam Packing Exhauster/Condenser Level Control

NOTE

The SPE/Cdsr drain line is equipped with 4" auxiliary drain line that drains to the Turbine Building Equipment Drain system in the event that the normal level control system cannot maintain level.

- *Maintaining SPE/Cdsr drain level to high will cause annunciator 5019-3B(C), HIGH LEVEL STM PACKING EXH "A"("B") DRN PIPE to alarm and may result in unnecessary water being sent to the equipment drain system.*
- *If level in the SPE/Cdsr drain line is maintained too low, a condenser air inleakage path may be created from the equipment drain system to the condenser due to leakage through 1GS022A(B).*

1. Adjust, as necessary, SPE Inlet Pressure to ~ 11" H_2O vacuum (normal range is 10 - 14" H_2O) by locally operating SPE Blower Suct Isol Valve, 1GS604AA (AB/BA/BB).

   ☞ See 4.6 PRECAUTION related to SPE vacuum.

2. Verify/place 1LIC-GS030(032) tape setpoint at 0".

3. **IF** failure of the SPE Drain Level Controller is suspected,
   THEN take manual control of 1LIC-GS030(032), and using the Open/Close pushbuttons, maintain level such that:
   a) drainage to the equipment drain system from the SPE is minimized.
   b) air inleakage from the SPE drain to the Main Condenser is minimized.

4. SPE/Cdsr 1A(1B) Drn, 1GS024A(B) may be operated as necessary to assist in maintaining level.

5. **IF** air inleakage from the SPE drain to the Main Condenser is suspected,
   THEN fill the SPE drain line loop seal by opening 1GS020A(B), SPE Cdsr 1A(1B) CY Sys Supp Isol,
   AND when Main Condenser air inleakage returns to normal, Shut 1GS020A(B).

6. **IF** level cannot be returned to normal **AND/OR** the SPE Drain Level Controller cannot be returned to Automatic,
   THEN switch to non-running SPE/Cdsr per step 8.1.2.4.

CAUTION

To minimize pressure transients, operate pressure regulator bypass valves (1GS-S2, 1GS-S7 and 1GS-ESFV-2) slowly and in incremental steps, watching Steam Seal Header and/or SSE tube and shell pressure(s) closely.

8.2.3 **Abnormal Steam Seal Supply Header/Evaporator Pressure**

1. **IF** Sealing steam pressure is lost **AND** cannot be promptly recovered,

   THEN Trip main turbine and break condenser vacuum.

2. **IF** Steam Seal Header is being supplied by the Gland Steam Seal Evaporator **AND** 1GS-SSFV, Stm Seal Hdr Press Control Vlv is unable to maintain pressure at ~ 4 psig, **THEN:**

   1) Operate Stm Seal Supply Byp Vlv, 1GS-S2 as necessary to maintain steam seal header pressure at ~ 4 psig.

   2) If desired, shut 1GS-S1, Stm Seal Supply Vlv.

   3) If evaporator supply pressure to steam seal header cannot be maintained, then shift to an alternate steam supply; refer to section 8.1.3.1.

3. **IF** Steam Seal Header is being supplied by the Auxiliary or Main Steam Systems **AND** 1GS-SSAFV, Main/Aux Stm To Stm Seal Hdr Press Control Vlv is unable to maintain pressure at ~ 4 psig, **THEN:**

   1) Operate Aux Stm Supply To Stm Seal Hdr Byp, 1GS-S7 as necessary to maintain steam seal header pressure at ~ 4 psig.

   2) If desired, shut 1GS-S6, Aux Stm Supply To Stm Seal Hdr.

   3) **IF** Auxiliary Steam is being supplied by the Electrode Boilers/Reboilers,

      THEN Ensure that the Electrode Boiler and Reboiler are operating properly.

4. **IF** Main Steam is supplying the SSE **AND** 1GS-ESFV-1, Evap Mn Stm Supp Cont Vlv is unable to maintain SSE tube pressure between ~ 50 psig and 80 psig, **THEN:**

   1) Operate Evap Mn Stm Supply Byp Vlv, 1GS-ESFV-2 as necessary to maintain tube pressure between ~ 50 psig and 80 psig.

   2) If desired, shut 1GS-S8, Evap Mn Stm Supply Vlv.

9.0 **ACCEPTANCE CRITERIA** - None

10.0 **FINAL CONDITIONS** - None

11.0 **REFERENCES**

11.1 G.E. STEAM TURBINE-GENERATOR K2804-0007

11.2 CPS 3208.01, Cycled/Makeup Condensate (CY/MC)

11.3 CPS 3214.01, Plant Air (IA & SA)

11.4 CPS 3502.01, 480V Distribution System

11.5 CPS 3104.01, Condensate/Condensate Booster (CD/CB)

11.6 CPS 3202.01, Operating Electrode Boilers And Reboilers

11.7 CPS 3113.01, Circulating Water (CW)

11.8 CPS 3006.01, Unit Shutdown With Condenser

11.9 USAR TBL 13.5-3

11.10 CPS 8801.12, Local Mounted Instrument Valve Operation And Venting

12.0 **APPENDICES**

A. Power Operated Valve Location List

13.0 **DOCUMENTS**

CPS 3107.01V001, Turbine Gland Seal Valve Lineup

CPS 3107.01V002, Turbine Gland Seal Instrument Valve Lineup

CPS 3107.01E001, Turbine Gland Seal Electrical Lineup

APPENDIX A: Power Operated Valve Location List

MOTOR OPERATED VALVES

TB 781': Room East of SSE Room	1GS-S6	Aux Stm Supply to Stm Seal Hdr Vlv
	1GS-S7	Aux Stm Supply to Stm Seal Hdr Byp
	1GS-003	Mn Stm Supply to Stm Seal Hdr Vlv
	1GS-041	Aux Stm Supply to Stm Seal Hdr Vlv
TB-781': SSE Room	1GS-ESFV-2	Evap Mn Stm Supply Bypass Vlv
	1GS-S8	Evap Mn Stm Supply Vlv
TB 781': Mezz South of SSE Room	1GS-S1	Stm Seal Supply Vlv
	1GS-S2	Stm Seal Supply Bypass Vlv
TB 781': SPE Rm 1A	1GS-E1	SPE 1A Isol Vlv
TB 781': SPE Rm 1B	1GS-E2	SPE 1A Isol Vlv
TB 762': South of LP Htr 3B	1GS-S9	SSE Feedwater Isol Vlv
	1GS-S10	SSE Feedwater Bypass Vlv

CONTROL VALVES

TB 781': SSE Room	1GS-ESFV-1	SSE Supp from MS
	1GS-001	Ext Stm Feed to SSE
	1GS-002	Ext Stm Feed to SSE
	1GS-042	Ext Stm Drn Valve
TB 781': Room East of SSE Room	1GS-SSAFV	Stm Seal Hdr from MS
	1GS-058	Ext Stm Supp Line Drn
TB 762': 40 ft. up on the South Side of G-108	1GS-022B	Stm Pk Exh 1B Drn Lvl Vlv
TB 762': 40 ft. up on the North Side of G-108	1GS-022A	Stm Pk Exh 1A Drn Lvl Vlv
TB 762': At J-108 East side of Flash Tank 1B	1GS-010	SSE Drn Tank Emerg Lvl Vlv
TB 762': South of LP Htr 3B	1GS-EWFV	SSE Feed from CB
	1GS-007	SSE Drn Tnk Norm Lvl Vlv
TB 781': Mezz South of SSE Room	1GS-SSFV	SSE Outlet Cont Vlv
TB 781': SPE Room 1A	1GS-043A	SPE 1A Drn Vlv
TB 781': SPE Room 1B	1GS-043B	SPE 1B Drn Vlv

CONDENSER VACUUM (CA)

SCOPE OF REVISION:

- C1R08: Incorporated EC 332064 (EPU-T0507 ATI 52839-06-29): new ORM OR 2.2.16 MSLRM Prerequisite.
- Incorporated EC 335251: 0CA012A/B operation description enhancements.

❶ Specific Rev. 17a [Landin]: EDITORIAL - Incorporated CR 130048-04 verification check of 0CY152A(B) valves shut on shutdown due to potential for vibration induced movement.

❷ Specific Rev. 17b [Sheffield]: EDITORIAL - Developed a stand alone attachment (3112.01P001) for Emergency/Post SCRAM Vacuum Pump Startup.

❸ Specific Rev 17c [Bartsch}: EDITORIAL - Separated out multiple steps. Re worded sections to eliminate vague direction.

❹ Specific rev. 17d - [Sheffield]: - CR 163899-05: - [Editorial]: Added to notify Radiation Protection to perform survey of the pump area after Vacuum pump startup.

ROUTINE USE

ORIGINATOR: *Thomas J. Landin* **CLASS CODE:** *NNND*

SQR: *Doug Hunter* **APPROVAL DATE:** *JAN 29 2002*

CURRENT CHANGES TO GENERAL REVISION

	Change #	Date	List of Affected Pages
❶	17a	12/30/02	1, 10, 12
❷	17b	02/08/03	1, 6, 14
❸	17c	04/30/03	1, 6, 8, 13, 14. 15
❹	17d	08/27/03	1, 10, 14
❺			

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1.0 **PURPOSE**

To provide instructions for placing Condenser Vacuum (CA) System in its normal operational modes and to provide corrective action in case of abnormal operation.

2.0 **DISCUSSION/DEFINITIONS**

2.1 **Discussion**

2.1.1 The purpose of the CA System is to:

1. Evacuate the condenser, turbine, extraction steam piping, moisture separator reheaters, and feedwater heaters from unit startup through normal unit operation.
2. Remove non-condensable gases (including air in-leakage and disassociation products from the reactor) from the condenser and discharge the gases through the plant vent stack or to the off-gas system.

2.1.2 When necessary, this system provides an air path to the condenser to break vacuum and slow the turbine quickly when shutting down the unit in an emergency.

2.2 **Definitions**

2.2.1 AMBIENT TEMPERATURE: The motor is at equilibrium temperature with its environment.

2.2.2 LARGE MOTOR: Motors powered from 6.9KV or 4.16KV busses.

2.2.3 OPERATING TEMPERATURE: The maximum steady state temperature of the motor windings.

This temperature is reached after the motor is running at operating speed for 15 minutes.

2.2.4 START: The motor has come up to operating speed.

3.0 **RESPONSIBILITY**

Operations Department Head is responsible for ensuring the proper implementation of this procedure.

4.0 **PRECAUTIONS**

4.1 Running mechanical vacuum pumps at power may be a radiological and hydrogen hazard.

4.2 Do not take suction on the main condenser with the mechanical vacuum pumps > 5% Rx power.

4.0 **PRECAUTIONS** (cont'd)

4.3 During startup of the CA system, the mechanical vacuum pumps should not be started until gland sealing steam is applied to prevent drawing air across the turbine seals except as provided for in CPS 3112.01C001, Drawing Vacuum Without CW and/or GS Checklist.

4.4 During shutdown, if gland sealing steam is lost, condenser vacuum must be broken immediately to prevent drawing cool air across the seals.

NOTE

Unless otherwise stated, "in operation, energized, in service, etc." refers to those portions of the system required to support the plant condition as defined in the operating procedure.

5.0 **PREREQUISITES**

5.1 To preclude drawing a vacuum in the Rx vessel with Reactor pressure < 50 psig, the following systems may have to be isolated from the Reactor.

- Main Steam (MS, IS & ADS)
- Main Steam Drains
- Off-gas Recombiner Preheater

5.2 Prior to drawing vacuum in the main condenser with the mechanical vacuum pump, verify:

1. RP notified that Mechanical Vacuum Pumps will be run.
2. Following lineups complete:
   1) CPS 3112.01E001, Condenser Vacuum Electrical Lineup
   2) CPS 3112.01V001, Condenser Vacuum Valve Lineup
   3) CPS 3112.01V002, Condenser Vacuum Instrument Valve Lineup
3. Following system in operation to support CA:
   1) CPS 3107.01, Turbine Gland Seal (GS), except as provided for in CPS 3112.01C001, Drawing Vacuum without CW and/or GS Checklist.
   2) CPS 3113.01, Circulating Water (CW), except as provided for in CPS 3112.01C001, Drawing Vacuum Without CW and/or GS Checklist.
   3) CPS 3204.01, Turbine Building Closed Cooling Water
   4) CPS 3208.01, Cycled/Makeup Condensate (CY/MC)
   5) CPS 3214.01, Plant Air (IA & SA)
   6) CPS 3501.01, High Voltage Auxiliary Power System

0 5.3 Verify Main Steam Line Radiation Monitoring Instrumentation is OPERABLE per ORM OR 2.2.16, MSLRM.

6.0 LIMITATIONS

6.1 Do not open 1CA007, Vacuum Breaker Valve unless turbine speed is < 1200 rpm, except in the case of the following Main Turbine emergencies, at which time vacuum is broken immediately.

- Loss of main turbine lube oil.
- Loss of gland sealing steam.
- High main turbine vibration.

6.2 Ensure that a continuous supply of seal water is present while operating the Mechanical Vacuum Pumps.

6.3 Notify MCR prior to switching from the SJAE/Recombiner Trains to the Vacuum Pumps or vice versa so that the proper Process Radiation Monitor (PRM) may be placed in service.

6.4 With sealing steam applied to the main turbine, ensure that 1CA007, Condenser Vacuum Breaker Valve is maintained open until a vacuum pump is started to preclude overpressurizing the main condenser.

6.5 Vacuum Pump Motor Restart Requirements:

1. With the windings at ambient temperature, the motor can be started and brought to speed 2 times in succession, coasting to rest between stops.

2. With the windings at operating temperature, the motor can be started and brought to speed once.

3. If the motor has been started once from operating temperature, restart may be attempted after the following time constraints.

   The motor windings can be assumed to have returned to operating temperature after 60 minutes unenergized or after 30 minutes running at operating speed.

   More frequent starts may cause damage to motor windings.

   Consult the technical manual or the motor supplier.

7.0 MATERIALS/TEST EQUIPMENT

Lengths of tygon tube approx. 15' each, or other suitable material (used in CPS 3112.01C001, Drawing Vacuum Without CW and/or GS Checklist)

8.0 PROCEDURE

8.1 NORMAL OPERATION

CAUTION

Do not take suction on the main condenser with the mechanical vacuum pumps > 5% Rx power.

Do not run mechanical vacuum pumps when Off Gas System is shut down, unless a positive purge air flow has been established to preclude reverse flow.

Ensure Charcoal Absorbers are bypassed prior to initiating air flow through the OG System. «CM-1»

NOTE

One vacuum pump will maintain 25" Hg vac.

NOTE

If performing a vacuum pump start up following a SCRAM proceed to 3112.01P001 for Emergency/Post SCRAM Startup of a Vacuum Pump.

8.1.1 Vacuum Pump Startup

NOTE

With 1N66-F060 shut or the SJAE in service reverse flow will not occur through the OG System

❸ 1. **IF** 1N66-F060 is shut

OR

SJAE is in service

THEN Proceed to 8.1.1.2

1) Contact MCR to ensure monitors are in service on Off-Gas prior to initiating air flow in the Off-Gas System.

a) Verify Off-Gas System lined up for startup per CPS 3215.01, Off Gas (OG).

b) Establish purge air flow by throttling open 1N66-F004A(B), OG Purge Air Valve until OG Stream Flow Recorder, 1N66-R620 indicates 30 scfm. *«CM-1»*

3) Monitor 1N66-R620 during vacuum pump startup and operation.

4) Adjust 1N66-F004A(B) as necessary to maintain a positive purge air flow.

8.1.1 **Vacuum Pump Startup** (cont'd)

NOTE

Steps 8.1.1.2 through 8.1.1.7 may be done in any order.

2. **IF** Starting vacuum pump following a Reactor Scram or plant shutdown,

   THEN Perform/verify Off-Gas System is shutdown per CPS 3215.01, Off Gas (OG).

3. Establish a cooling water flow path to Vacuum Pump, 0CA01PA(B) per CPS 3204.01, Turbine Building Closed Cooling Water.

4. (Local)

   Check Condenser Vacuum Separator Tank, 0CA01TA(B) water level, midway in sightglass, if not fill per 8.1.1.10.

   Open 0CA014A(B), Sep Tank A(B) Loop Seal Fill for 30 seconds to fill the Loop Seal drain line.

5. (Local) Start Seal Water Pump A(B), 0CA02PA(B).

   1) Allow seal water pump to run for 5 minutes prior to starting vacuum pump.

   2) Verify seal water pressure is > 20 psig as read on 0PI-CA011(012). *«CM-2»*

      IF Seal water pressure is low,

      THEN Vent the seal water pump by opening, venting and closing 0CA601A(B), Seal Water Pump A(B) Vent.

8.1.1 **Vacuum Pump Startup** (cont'd)

NOTE

Proper oil level is extremely important. If the pump is allowed to run with too low an oil level, poor distribution and lack of proper lubrication will result. A high oil level will result in churning, which will generate excessive heat and foaming, thus reducing oil life.

*Normal **operating** oil level for vacuum pump outboard bearing should be at the top of the red indicating line on the bearing housing oil sightglass. The level may rise above the red line with the vacuum pump shutdown.*

*Normal **standby** oil level for vacuum pump gear housing should be at the top of the red indicating line on the gear housing oil sightglass. The level may rise above the red and white indicating lines with the vacuum pump operating. Do not drain out any oil when this occurs. Experience shows that oil level will rise approximately 3/8" after pump starts*

Motor oil level should be slightly above the center of the sightglass.

❸ 6. (Local) Verify normal oil levels in the following per above NOTE criteria:

1) Vacuum pump bearing housing ,

2) Gear housing oil sight glasses and

3) Motor oil sight glass

7. Contact MCR prior to starting the Vacuum Pump to verify radiation monitors are in service.

8. Open 1CA003, Vac Pump Suction Vlv.

NOTE

0HS-CA030A(B) is a spring return switch for the 0CA006A(B), Separator A(B) Discharge Valve, and must be held in the "OPEN" position until Vac Pump is started.

9. (Local) Open 0CA006A(B) Separator A(B) Discharge Valve by holding C/S in "OPEN" position until 0CA01PA(B) is started.

(MCR) Verify 0CA006A(B) indicates full open.

CAUTION

Do not stand close to separator tank loop seal as water will splash when vacuum pump is started.

10. Start Vac Pump, 0CA01PA(B).

11. (Local)

Open 0CY152A(B), Separator Tank A(B) Startup Fill Valve to raise water level in separator tank.

Shut 0CY152A(B) when water level reaches the middle of separator tank sight glass.

8.1.1 **Vacuum Pump Startup** (cont'd)

12. (Local) Verify normal oil level in vacuum pump bearing housing oil sightglass per 8.1.1.5 NOTE criteria.

NOTE

Steps 8.1.1.13 through 8.1.1.15 may be N/A'd if not required to support plant operation.

13. Shut 1CA007, Condenser Vacuum Breaker Valve.

NOTE

The vacuum breaker loop seal level indicator 1LI-CA005 will be used only when loop seal water level is to be verified locally.

During normal operation the level indicator remains isolated by having its isolation valve 1CA011 shut. This prevents damage to the level indicator in case vacuum breaker is opened.

14. (I&C) Fill and vent vacuum breaker loop seal level indicator 1LI-CA005 sensing lines per CPS 8801.12, Local Mounted Instrument Valve Operation and Venting. «CM-2»

15. (Local) Fill Vacuum Breaker Loop Seal by:

    1) Open 1CA011, Level Indicating Valve.

    2) Open 1CA009, Loop Seal Supply, and

       Fill vacuum breaker loop seal between 75% and 100% as indicated on Level Indicator, 1LI-CA005.

    3) Shut 1CA009.

    4) Shut 1CA011.

16. If two vacuum pump operations are desired:

    1) Ensure sufficient cooling water is available per CPS 3204.01, Turbine Building Closed Cooling Water.

    2) Start second vacuum pump by repeating steps 8.1.1.3 through 8.1.1.14 (exclude 8.1.1.6 and 8.1.1.7).

8.1.1 **Vacuum Pump Startup** (cont'd)

NOTE

0CA012A(B), Seal Water A(B) Orifice Bypass Valve will open at a vacuum pump suction vacuum of 20 in. HG vac or greater, and will shut at 17 in. HG vac or lower to supply additional seal water to the vacuum pumps.

17. (Local) At 20" Hg vac or greater, verify 0CA012A(B), Seal Water A(B) Orifice Bypass Valve opens.

18. Shut 1TD018, Seal Leakoff Tank Level Regulator Bypass Valve.

19. Notify Radiation Protection to perform survey of the Vacuum pump area after Vacuum pump startup for possible contamination.

8.1.2 **Routine Operation**

To shift vacuum pumps,

1. Start the desired Vacuum Pump, 0CA01PA(B) per steps 8.1.1.2 through 8.1.1.11 (exclude 8.1.1.6 and 8.1.1.7).

2. Secure the other vacuum pump per step 8.1.3.2.

CAUTION

Do not attempt to operate a SJAE < 200 psig MS supply pressure due to 1B21-F437(A)B, SJAE Steam Inlet Control Valve Bypass being gagged shut.

8.1.3 **Vacuum Pump Shutdown**

1. If plant startup is in progress, coordinate this section with CPS 3215.01, Off Gas (OG).

2. **IF** both vacuum pumps are operating, **AND** only one is to be shutdown:

   THEN

   1) Stop the desired Vacuum Pump, 0CA01PA(B).

   2) (Locally or MCR) Verify shut 0CA006A(B), Separator A(B) Discharge Valve.

   3) (Local) Stop Seal Water Pump 0CA02PB(A).

   4) Realign WT for single vacuum pump operation per CPS 3204.01, Turbine Building Closed Cooling Water.

8.1.3 **Vacuum Pump Shutdown** (cont'd)

3. **IF** both vacuum pumps are to be shutdown, **OR** only one is running and is to be shutdown:

   THEN

   1) Shut 1CA003, Condenser Vacuum Pump Combined Suction Isolation Valve.

   2) Stop Vacuum Pump(s) 0CA01PB(A).

   3) Shut OG Purge Air Valve 1N66-F004A(B), unless required by CPS 3215.01, Off-Gas (OG).

   4) (Local or MCR) Verify shut 0CA006B(A), Separator A(B) Discharge Valve.

   5) (Local) Stop Seal Water Pump 0CA02PB(A).

   6) Verify shut 0CY152A(B), Separator Tank A(B) Startup Fill Valve.

      ☞ Valve is prone to vibration induced opening.

   7) Notify RP after vacuum pumps shutdown.

   8) Secure the cooling water flow path to Vacuum Pump 0CA01PA(B) per CPS 3204.01, Turbine Building Closed Cooling Water.

8.2 INFREQUENT OPERATION

CAUTION

The following events occur when vacuum is broken:

- *Main Turbine Trip:* *21.6" Hg vac*
- *Rx Feed Pump Turbine Trip:* *18.5" Hg vac*
- *Group 1 Isolation:* *8.5" Hg vac*
- *Bypass Valve Inhibit:* *7.5" Hg vac*

8.2.1 Breaking Vacuum

1. **IF** Breaking vacuum for a Main Turbine emergency, **THEN:**
   1) SCRAM, enter CPS 4100.01, Reactor Scram.
   2) Trip the Main Turbine,
   3) Open 1CA007, Condenser Vacuum Breaker Valve.
   4) Monitor for lowering vacuum.

2. Ensure plant conditions are suitable for breaking vacuum per CPS 3006.01, Unit Shutdown.

NOTE

The following step allows Inboard MSIVs to remain open when breaking vacuum as provided by CPS 3101.01 (MS, IS & ADS) for MSL Shutdown.

3. **IF** Desired to keep MSIVs open, and the MODE switch is in SHUTDOWN with Main Turbine Stop Valves shut,

   THEN Place the Div 1, 2, 3 & 4 Cond Low Vacuum Bypass Switches on 1H13-P601 to BYPASS.

NOTE

The following step prevents the RFP Seal Tank from overflowing when vacuum is broken.

4. Open 1TD018, Seal Leakoff Tank Level Regulator Bypass Valve.

5. Open 1CA007, Condenser Vacuum Breaker Valve, and monitor for lowering vacuum.

6. If it is desirable to ventilate the Main Condenser, leave 1CA007 open and refer to step 8.1.1.1 thru 8.1.1.11 for starting the mechanical vacuum pump.

7. When ventilation is no longer desired, stop the mechanical vacuum pumps per 8.1.3.

8.2.2 **Weekly Jog of Condenser Vacuum Pump(s)**

1. (MCR) Shut/verify shut 1CA003, Condenser Vac Pump Combined Suction Vlv

2. Start Seal Water Pump A(B), 0CA02PA(B).

   ☞ Allow seal water pump to run for 5 minutes prior to starting vacuum pump.

3. Verify seal water pressure is > 20 psig as read on 0PI-CA011(012). «CM-3»

   IF Seal water pressure is low,

   THEN Vent seal water pump by opening, venting and closing 0CA601A(B), Seal Water Pump A(B) Vent.

NOTE

Proper oil level is extremely important. If the pump is allowed to run with too low an oil level, poor distribution and lack of proper lubrication will result. A high oil level will result in churning, which will generate excessive heat and foaming, thus reducing oil life.

*Normal **operating** oil level for vacuum pump outboard bearing should be at the top of the red indicating line on the bearing housing oil sightglass. The level may rise above the red line with the vacuum pump shutdown.*

*Normal **standby** oil level for vacuum pump gear housing should be at the top of the red indicating line on the gear housing oil sightglass. The level may rise above the red and white indicating lines with the vacuum pump operating. Do not drain out any oil when this occurs. Experience shows that oil level will rise approximately 3/8" after pump starts*

Motor oil level should be slightly above the center of the sightglass.

❸ 4. (Local) Verify normal oil levels in the following per above NOTE criteria:

   1) Vacuum pump bearing housing ,

   2) Gear housing oil sight glasses and

   3) Motor oil sight glass

5. Contact MCR prior to starting vacuum pump to verify radiation monitors are in service.

NOTE

0HS-CA030A(B) is a spring return switch for the 0CA006A(B), Separator A(B) Discharge Valve, and must be held in the "OPEN" position until Vac Pump is started.

6. (Local) Open 0CA006A(B) Separator A(B) Discharge Valve by holding C/S in "OPEN" position until 0CA01PA(B) is started.

   (MCR) Verify 0CA006A(B) indicates full open.

8.2.2 **Weekly Jog of Condenser Vacuum Pump(s)** (cont'd)

CAUTION

Do not stand close to separator tank loop seal as water will splash when vacuum pump is started.

7. Start Vac Pump, 0CA01PA(B), and run for ~ 30 secs.

NOTE

Proper oil level is extremely important. If the pump is allowed to run with too low an oil level, poor distribution and lack of proper lubrication will result. A high oil level will result in churning, which will generate excessive heat and foaming, thus reducing oil life.

*Normal **operating** oil level for vacuum pump outboard bearing should be at the top of the red indicating line on the bearing housing oil sightglass. The level may rise above the red line with the vacuum pump shutdown.*

*Normal **standby** oil level for vacuum pump gear housing should be at the top of the red indicating line on the gear housing oil sightglass. The level may rise above the red and white indicating lines with the vacuum pump operating. Do not drain out any oil when this occurs. Experience shows that oil level will rise approximately 3/8" after pump starts*

Motor oil level should be slightly above the center of the sightglass.

❸ 8. (Local) Verify normal oil levels in the following per above NOTE criteria:

1) Vacuum pump bearing housing ,

2) Gear housing oil sight glasses and

3) Motor oil sight glass

9. Stop Vac Pump, 0CA01PA(B).

10. (Local or MCR) Verify shut 0CA006A(B), Separator A(B) Discharge Valve.

11. Stop Seal Water Pump, 0CA02PA(B).

❶ 12. Verify shut 0CY152A(B), Separator Tank A(B) Startup Fill Valve.

❶ ☞ Valve is prone to vibration induced opening.

❹ 13 Notify Radiation Protection to perform survey of the Vacuum pump area after Vacuum pump startup for possible contamination.

8.2.3 **Measurement of Condenser Air In Leakage**

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1. (Local) Open both of the following Condenser Vacuum Pump Combined Suction Isolation Test Connection Isolations. (TB 762', K-115.1):
   1) 1CA019A
   2) 1CA019B
2. Shut 1CA003, Cdsr Vac Pump Combined Suction Isol.
3. Monitor Condenser Vacuum.
   IF Rapid lowering in vacuum is noted,
   THEN Reopen 1CA003.
4. Obtain flow readings as desired.
5. Upon completion of measurement:
   1) Open 1CA003.
   2) (Local) Shut 1CA019A.
   3) (Local) Shut 1CA019B.

8.3 **ABNORMAL OPERATION**

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NOTE

0CA012A(B), Seal Water A(B) Orifice Bypass Valve will open at a vacuum pump suction vacuum of 20 in. HG vac or greater, and will shut at 17 in. HG vac or lower to supply additional seal water to the vacuum pumps.

8.3.1 **Seal Water Heat Exchanger High Temperature**

1. (Local) Check 0CA012A(B), Seal Water A(B) Orifice Bypass Valve for proper operation.
2. **IF** Cooling Water supply is lost to the vacuum pump seal water heat exchanger,
   THEN Refer to CPS 3204.01, Turbine Building Closed Cooling Water.

9.0 **ACCEPTANCE CRITERIA** - None

10.0 **FINAL CONDITIONS** - None

11.0 **REFERENCES**

11.1 **Licensing Basis Documents**

❶ 11.1.1 ORM OR 2.2.16, MSLRM

11.2 **Procedures**

11.2.1 CPS 3006.01, Unit Shutdown

11.2.2 CPS 3101.01, Main Steam (MS, IS & ADS)

11.2.3 CPS 3104.01, Condensate/Condensate Booster (CD/CB)

11.2.4 CPS 3107.01, Turbine Gland Seal (GS)

11.2.5 CPS 3113.01, Circulating Water (CW)

11.2.6 CPS 3204.01, Turbine Building Closed Cooling Water

11.2.7 CPS 3208.01, Cycled/Makeup Condensate (CY/MC)

11.2.8 CPS 3214.01, Plant Air (IA & SA)

11.2.9 CPS 3215.01, Off Gas (OG)

11.2.10 CPS 3501.01, High Voltage Auxiliary Power System

11.3 **Design/Vendor/Print/Other**

11.3.1 CA Pump Technical Manual K2852-0004

11.4 **Commitments**

11.4.1 *CM-1*: CR1-92-05-059: Charcoal Bed Fire Concerns *«8.1.1.1 CAUTION, 8.1.1.1»*

11.4.2 *CM-2*: CR1-97-07-040: 1LI-CA005 Flush/Vent *«8.1.1.13»*

11.4.3 *CM-3*: CR1-98-12-113: Seal Pressure *«8.1.1.4.2, 8.2.2.3»*

12.0 **APPENDICES** - None

13.0 **DOCUMENTS**

CPS 3112.01E001, Condenser Vacuum Electrical Lineup

CPS 3112.01V001, Condenser Vacuum Valve Lineup

CPS 3112.01V002, Condenser Vacuum Instrument Valve Lineup

CPS 3112.01C001, Drawing Vacuum Without CW and/or GS Checklist

❷ CPS 3112.01P001, Emergency/Post SCRAM Startup of a Vacuum Pump.