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Exelon Nuclear

RS-10-045
March 9, 2010

10 CFR 50.90

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Response to Request for Additional Information Regarding the One-Time Extension of the Essential Service Water Train Completion Time

References:

1. Letter from P. R. Simpson (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time," dated September 24, 2009

2. Letter from P. R. Simpson (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Clarification Regarding License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time," dated November 13, 2009

3. Letter from M. J. David (U. S. Nuclear Regulatory Commission) to C. G. Pardee (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Request for Additional Information Related to One-Time Extension of Essential Service Water Train Completion Time (TAC Nos. ME2293 and ME2294)," dated December 18, 2009

4. Letter from P. R. Simpson (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Additional Information Supporting License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time," dated January 19, 2010

5. Letter from M. J. David (U. S. Nuclear Regulatory Commission) to C. G. Pardee (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Request for Additional Information Related to One-Time Extension of Essential Service Water Train Completion Time (TAC Nos. ME2293 and ME2294)," dated February 19, 2010

A001
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6. Letter from P. R. Simpson (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Additional Information Supporting License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time," dated March 1, 2010

7. Email from M. J. David (U. S. Nuclear Regulatory Commission) to P. R. Simpson (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Request for Additional Information Related to One-Time Extension of Essential Service Water Train Completion Time (TAC Nos. ME2293 and ME2294)," dated March 3, 2010

In Reference 1, Exelon Generation Company, LLC, (EGC) requested a license amendment for Byron Station, Units 1 and 2, to revise Technical Specifications (TS) Limiting Condition for Operation (LCO) 3.7.8, "Essential Service Water (SX) System," to extend the Completion Time (CT) from 72 hours to 144 hours. This proposed change will only be used one time during the Byron Station Unit 2 spring 2010 refueling outage (i.e., B2R15) to restore a unit-specific SX train to operable status. In Reference 2, EGC supplemented the request to provide clarification regarding the inventory control function.

In Reference 3, the NRC requested that EGC provide additional information in support of their review of Reference 1 as supplemented by Reference 2. Reference 4 provided the requested information.

In Reference 5, the NRC requested that EGC provide additional information in support of their review of Reference 1 as supplemented by References 2 and 4. Reference 6 provided the requested information.

In Reference 7, the NRC requested that EGC provide additional information in support of their review of Reference 1 as supplemented by References 2, 4, and 6. Attachments 1 and 2 of this submittal provide the requested information.

Procedures provided in Reference 4, Attachment 3, have recently been revised. Attachment 2 of this submittal contains the revised procedures. The procedure changes do not affect the responses provided in Reference 4 but are being provided for completeness given that the NRC has not completed review of Reference 1.

EGC has reviewed the information supporting a finding of no significant hazards consideration that was previously provided to the NRC in Reference 1 as supplemented by References 2, 4, and 6. The additional information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), a copy of this letter and attachment are being provided to the designated State of Illinois official.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this letter, please contact Ms. Lisa A. Schofield at (630) 657-2815.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 9th day of March 2010.

Respectfully,

Patrick R. Simpson
Manager – Licensing
Exelon Generation Company, LLC

Attachment:
1. Additional Information Supporting License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time
2. Supporting Documentation

cc:

NRC Regional Administrator, Region III
NRC Senior Resident Inspector, Byron Station
NRR Project Manager, Byron Station
Illinois Emergency Management Agency – Division of Nuclear Safety

ATTACHMENT 1
Additional Information Supporting License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time

In an email dated March 3, 2010, the NRC requested that Exelon Generation Company, LLC, (EGC) provide additional information related to the application for a one-time extension of the essential service water (SX) train Completion Time (CT). Attachments 1 and 2 of this submittal provide the requested information.

References:

1. Exelon submittal for Byron Station, Units 1 and 2, "Additional Information Supporting License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time," dated March 1, 2010.

2. Letter from M. J. David (U. S. Nuclear Regulatory Commission) to C. G. Pardee (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 Request for Additional Information Related to One-Time Extension of Essential Service Water Train Completion Time (TAC Nos. ME2293 and ME2294)," dated December 18, 2009.

3. Exelon submittal for Byron Station, Units 1 and 2, "Additional Information Supporting License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time," dated January 19, 2010.

4. Exelon submittal for Byron Station, Units 1 and 2, "License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time," dated September 24, 2009.

Question 1

In Reference 1, the licensee responded to Question 1.a by stating, "EGC has evaluated the crosstied SX train configuration and concluded that a single SX pump is capable of providing adequate cooling water to both trains of SX loads under normal and accident conditions." The NRC staff requests more information about the above mentioned evaluation. Specifically,

1. Is the licensee's evaluation based on a safety-related calculation?
2. Does the licensee's evaluation/calculation consider all design basis accidents and all normal and transient events including loss of offsite power, for which the SX system must perform? Explain.
3. Does the evaluation/calculation consider SX system degradation as determined by the licensee's test and maintenance program for the SX system? Explain.
4. Does SX flow test data support the conclusions of the evaluation/calculation? Explain.

ATTACHMENT 1
Additional Information Supporting License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time

Response to Question 1.1

The evaluation is based on safety-related calculations and system flow testing. One calculation was performed to determine the minimum required SX flow to the Component Cooling (CC) heat exchanger for accident conditions. A second calculation was done using the SX flow model to show that one SX pump serving two cross-tied trains is capable of providing the minimum required CC heat exchanger flow while maintaining design flow to the other SX components. The flow analysis showed that one SX pump was capable of supporting two trains and the minimum required SX flow to the CC heat exchanger provided the system was adequately balanced. Periodic system flow testing and monitoring is performed with one pump aligned to two trains of equipment to confirm that adequate SX flow is provided.

The calculations were originally prepared in 1991 and 1992 as part of the Byron ultimate heat sink (UHS) Design Basis Reconstitution effort.

Response to Question 1.2

The flow calculation is based on a bounding loss of offsite power/loss of coolant accident (LOOP/LOCA) accident lineup. The LOOP/LOCA event bounds all normal and transient events because system flow demand is maximized during the event. In the LOOP/LOCA configuration all of the safety-related heat exchangers cooled by the SX system are in service. The SX system response to an engineered safety features (ESF) signal opens the reactor containment fan coolers (RCFC) inlet and outlet isolation valves (if the valves are closed), opens the emergency diesel generator (EDG) outlet isolation valves, opens the containment chiller bypass valves and closes the containment chiller inlet and outlet isolation valves. Additionally the auxiliary feedwater (AF) diesel driven SX booster pump increases SX flow in the "B" AF pump component flow path with the auto-start of the diesel driven AF pump. Operator action is taken to re-align SX cooling tower flow (open riser valves and close bypass valves) to maximize cooling. When transferring to cold leg recirculation post-LOCA operator action is taken to check and throttle SX flow to the CC heat exchangers to obtain greater than 6,000 gpm of flow. Additionally, the maximum SX supply water temperature occurs during a LOOP/LOCA event.

The SX system also serves as the safety-related water source for the AF pumps when the normal water source from Condensate Storage Tank (CST) is not available. The CST is not credited for availability following an earthquake or tornado. Accidents such as a LOCA or main steam line break (MSLB) that challenge the containment cooling system are not required to be postulated concurrent with an earthquake or tornado that result in AF suction switchover from the CST to the SX. Per the requirements of UFSAR Sections 9.2.1.2.1 and 10.4.9.3, in the case of a design basis earthquake or tornado, the SX system must be capable of providing cooling water to support safe shutdown of both units. Each AF pump requires approximately 1,000 gpm of SX water. Supply of SX to AF would occur before any operator action to increase SX flow to the CC heat exchangers because the RCS needs to be cooled down via AF before the RH system can be put into service. Thus use of SX to supply AF does not result in a more limiting condition.

The flow calculations and system testing do not include the short-term intermittent flow associated with operation of the SX strainer back wash. One strainer is provided in the discharge line of each SX pump. High differential pressure initiates a local alarm and a subsequent manually controlled backwash of the strainers. The SX pump discharge strainer functions as the final filter to remove debris that may have entered the SX system. Normal and emergency makeup water for the SX system is provided from the Rock River. Traveling screens at the River Screen House provide the first rough screening of SX water. Trash racks located in the SX cooling tower basins provide a second level of debris screening. During normal plant operations the SX strainer aligned to the operating SX pumps are back washed pro-actively on a routine basis to prevent any significant debris buildup. The strainer is designed with a large strainer element flow area to maximize the time required between backwashing. With the traveling screens at the river, trash racks in the SX cooling tower, and the tendency of debris to settle out in the SX cooling tower basins (due to low water velocities), debris accumulation in the pump strainers is gradual. Based on the gradual debris accumulation rate, large strainer element flow area, and the pro-active back flush actions that keep the strainer clean prior to an event it is judged that manual action to backwash would not be required until a few days into any accident or event.

The SX system also serves as a seismically qualified backup water supply to the Seismic Category I portions of the fire suppression (standpipe systems) located in safety-related areas. A fire is not considered to occur simultaneously with other accidents, events, or phenomena such as a design-basis accident. As indicated in Revision 2 of Branch Technical Position CMEB 9.5-1, the fire water supply should be based on the largest expected flow for a 2-hour period. Thus, for a fire event, supply of SX to FP would conclude before the need to increase SX flow to CC for safe shutdown.

Response to Question 1.3

The flow calculations assume a 5% degraded pump curve. The model uses a pipe absolute roughness input based on old steel pipe. Additionally the SX flow model was calibrated to actual system flow and pressure measurements obtained during testing.

The 1B SX pump was replaced in the fall 2009 outage. The 2B pump was replaced in the fall 2008 outage. The pumps were replaced with refurbished pump casings and new impellers. ASME pump performance test data shows that both of the pumps are currently performing above the 5% degraded pump curve used in the flow analysis.

Required design flows for the SX system heat exchangers are based on the design fouling and design allowed tube plugging. The Generic Letter 89-13 Essential Service Water Fouling Monitoring Program, monitors and controls system piping and heat exchanger conditions within the design parameters.

ATTACHMENT 1
Additional Information Supporting License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time

Response to Question 1.4

The flow model calculations indicate that with an optimized flow balance one SX pump can deliver design flow to two trains of equipment with 13,400 gpm of flow to the CC heat exchanger. The calculated minimum required SX flow to the CC heat exchanger for accident conditions is 5,400 gpm. Actual flow balance testing obtained design flows to two trains of equipment with a maximum Unit 1 CC heat exchanger flow of 12,000 gpm with one SX pump aligned to both SX trains. The SX system flow balance was performed with SX discharge pressure at the low discharge pressure alarm setpoint of 90 psig.

To trend system performance, the monthly RCFC Technical Specifications surveillance test is performed with one SX pump in operation serving two trains of SX equipment. The test is performed with SX flow to all four RCFCs and both EDGs. Flow to the diesel AF components is without the SX booster pump in operation and the SXCT tower valves are not realigned to post-accident conditions. The CC heat exchanger flow is increased until the SX discharge header pressure is 94±2 psig. Performing the RCFC testing at a higher pressure results in lower measured CC heat exchanger flows when compared to the flow model or flow balance test. In the region of normal pump operation, one psig of discharge header pressure equates to approximately 1,300 gpm of pump flow. The last two RCFC monthly surveillance tests performed with the 1B SX pump running had measured CC heat exchanger flows of 7,740 gpm (October 15, 2009) and 8,800 gpm (February 5, 2010). When adjusted for test conditions, maximum CC heat exchanger flow is similar to the flow balance value of 12,000 gpm.

Question 2

For defense in depth considerations the NRC staff asked Question 8 in Reference 2. In response to Question 8.c, the licensee stated in Reference 3 that, "If the Unit 1 (i.e. the operating unit) SX pump were lost during the extended CT, Byron Abnormal Operating Procedure 1BOA PRI-7 provides guidance on aligning Unit 2 (i.e., the shutdown unit) SX to Unit 1 SX through the unit crosstie valves, 1/2SX005. Aligning Unit 2 SX to Unit 1 SX will provide SX to the Unit 1 EDGs [emergency diesel generators]."

In Section 2.1 of Attachment 5 of Reference 4, the licensee stated, "A best estimate flow analysis has shown that a single pump can provide cooling to all loads on both units with the exception of the Reactor Containment Fan Coolers (RCFC) and Emergency Diesel Generators (EDGs) on the unit without an SX pump and one train of RCFCs on the unit with an available SX pump."

Considering these two statements, it is not clear whether the 2B SX pump could be used to supply cooling to the Unit 1 EDGs. Please explain.

ATTACHMENT 1
Additional Information Supporting License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time

Response to Question 2

If the Unit 1 (i.e., the operating unit) SX pump were lost during the extended CT, Byron Abnormal Operating Procedure 1BOA PRI-7, "Essential Service Water Malfunction Unit 1," Revision 105, provides direction for aligning the Unit 2 (i.e., the shutdown unit) SX pump to Unit 1 SX through the unit crosstie valves, 1/2SX005. Aligning Unit 2 SX to Unit 1 SX will provide SX to the Unit 1 emergency diesel generators (EDGs). Using the SX flow model described above in the Response to Question 1, a safety-related flow analysis calculation was performed for a Station Blackout Out (SBO) event which shows that one SX pump operating and serving two units has the capability of providing sufficient flow to support operation of the opposite units EDGs. As indicated in 1/2BOA PRI-7, when operating the units cross-tied to a single SX pump, pump motor amps and system pressure are monitored and loads are isolated/throttled to prevent SX pump runout.

The Byron PRA model does not credit the use of SX from the non-transient unit to provide cooling flow to the EDGs associated with the transient unit. For the specific configuration described above, the PRA model used to evaluate and determine the risk associated with the requested extended CT does not credit the use of SX flow from Unit 2 to cool the EDGS for Unit 1. The best estimate flow analysis referred to in Attachment 5 of Reference 4, supports that defense in depth is maintained, in part, because it has shown that a single SX pump can provide cooling on both units with the exception of the reactor containment fan coolers (RCFC) and EDGs on the unit without an SX pump and one train of RCFCs on the unit with an available SX pump.

In conclusion, the 2B SX pump could be used to supply cooling to the Unit 1 EDGs in the event the 1B SX pump were lost while in the extended SX CT configuration. However, the PRA risk analysis supporting the extended SX CT does not take credit for that capability.

Copies of 1BOA PRI-7, Revision 105, and 2BOA PRI-7, Revision 106, are provided in Attachment 2.

ATTACHMENT 2
Supporting Documentation

List of Attached Documents

1. 1BOA PRI-7, "Essential Service Water Malfunction Unit 1," Revision 105
2. 2BOA PRI-7, "Essential Service Water Malfunction Unit 2," Revision 106

A. PURPOSE

This procedure provides actions required in the event of a malfunction of the Essential Service Water system.

B. SYMPTOMS OR ENTRY CONDITIONS

1) The following conditions may cause entry into this procedure:

- o SX basin level rapidly dropping.
- o Indications of a SX break in the Aux Bldg.
- o Indications of a SX break in the CNMT.
- o Abnormal temperatures on equipment cooled by SX.

2) The following annunciators may cause entry into this procedure:

- o CNMT DRAIN LEAK DETECT FLOW HIGH (1-1-A2)
- o SX PUMP TRIP (1-2-A1)
- o SX PUMP DSCH HDR PRESS LOW (1-2-A2)
- o SX PUMP DSCH HDR TEMP HIGH LOW (1-2-B2)
- o SX PUMP SUCT PRESS LOW (1-2-C1)
- o SX STRN DP HIGH (1-2-C2)
- o SX PUMP SUCT VLV PIT LEVEL HIGH (1-2-D2)
- o SX MAKEUP PP AUTO START (0-37-B7)
- o SX CLG TWR BASIN LEVEL HIGH LOW (0-37-A8)
- o SX CLG TWR LOW SPEED FAN TRIP (0-37-A6)
- o SX CLG TWR HIGH SPEED FAN TRIP (0-37-B6)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

****
* NOTE *
* With this procedure in effect the *
* Emergency Director shall evaluate *
* for EMERGENCY PLAN conditions. *
****

****
* NOTE *
* Both Units may be affected by a *
* malfunction in one or both Essential *
* Service Water trains. *
****

****
* NOTE *
* If a loss of SX is due to a loss of *
* the SX MDCT, 0BOA PRI-7. LOSS OF *
* ULTIMATE HEAT SINK should be *
* referenced. *
****

****
* NOTE *
* IF Aux Building leakage is *
* indicated, 0BOA PRI-8 AUX BUILDING *
* FLOODING UNIT 0 should be *
* referenced. *
****

1 CHECK SX PUMPS:

a. SX pump(s) - AT LEAST ONE RUNNING

a. Perform the following to start the standby pump:

1) Manually open RCFC SX inlet and outlet valves:

- o 1A SX pump:
  - 1SX016A
  - 1SX027A
- o 1B SX pump:
  - 1SX016B
  - 1SX027B

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 1 (continued)

2) Start the SX pump.

IF the pump can NOT be started,
THEN **GO TO** ATTACHMENT A (Page 18).
IF NO SX pump is available on Unit 2,
THEN **GO TO** 0BOA PRI-7. LOSS OF ULTIMATE HEAT SINK.

b. SX STRN DP HIGH (1-2-C2) - NOT LIT

b. Locally backwash strainer(s) per BOP SX-4, ESSENTIAL SERVICE WATER STRAINER MANUAL OPERATION.

c. SX PUMP DSCH HDR PRESS LOW (1-2-A2) - NOT LIT

c. Perform the following:

1) Start an additional SX pump.

2) Locally verify the SX Strainers are NOT backwashing.

3) Locally adjust SX outlet from CC heat exchanger valve(s) while maintaining outlet temperature(s) less than
105°F (Normal)
120°F (RH in S/D Cooling)
130°F (Post LOCA):

- o 1SX007 (346 M16)
- o 0SX007 (346 L16 AB1)

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 1 (continued)

IF SX pump discharge header pressure can NOT be restored, THEN perform the following:

1) Monitor temperatures to equipment cooled by SX.

2) Shutdown ANY unnecessary equipment:

   - o DG(s)
   - o MCR chiller(s)
   - o SI pump(s)
   - o RCFC(s)
   - o CNMT chiller(s)

3) Close the SX outlet valve for ANY shutdown RCFC train(s):

   - o 1SX027A
   - o 1SX027B

4) IF CENT CHG pump temperatures are approaching the limits of TABLE A (Page 25), THEN align FP to CENT CHG pump lube oil cooler per ATTACHMENT B (Page 23) while continuing with this procedure:

   - o CENT CHG pump 1A
   - o CENT CHG pump 1B

5) Shutdown any vital equipment exceeding the limits of TABLE A (Page 25).

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 1 (continued)

6) At Shift Manager discretion align **UNIT 2** SX to cool unit 1 CC loads via the Unit 0 CC HX:

   a) Open CC HX 0 SX inlet valve:

      - 2SX005 (330 P19 AB2)

   b) Open CC HX 0 SX outlet valve:

      - 0SX146
      - 0SX147

   c) Align the Unit 0 CC HX to Unit 1 per BOP CC-10, ALIGNMENT OF THE U-0 CC PUMP AND U-0 HX TO A UNIT.

d. Locally check tripped SX pump(s) - <u>NOT ROTATING</u>

d. Perform the following:

1) Dispatch an operator to energize the affected pump's suction valve:

   o 1SX001A at 131X3 cub E4
   o 1SX001B at 132X1 cub C1

2) Close the affected pump's suction valve:

   o 1SX001A
   o 1SX001B

<u>IF</u> 1A SX pump continues rotating,
<u>THEN</u> closing valve:

- 1SX143A (locally at pump)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2 CHECK SX PUMP DISCHARGE HEADER TEMPERATURE:

a. Temperature - GREATER THAN 50°F

a. Perform the following:

1) Verify SX tower hot water basin bypass valves for running pumps are OPEN:

- o 1A SX pump:
  - o 0SX162A
  - o 0SX162C
- o 1B SX pump:
  - o 0SX162B
  - o 0SX162D

2) Stop ALL SX tower fans:

- 0SX03CA through 0SX03CH

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 2 (continued)		
b. Temperature - LESS THAN 80°F		b. Start ALL SX tower fans by performing the following: 1) Open ALL riser valves: • 0SX163A through 0SX163H 2) Verify the hot water basin bypass valves are closed: • 0SX162A • 0SX162B • 0SX162C • 0SX162D 3) Start ALL fans in high speed: • 0SX03CA through 0SX03CH 4) IF any fan fails to start in high speed, THEN close its associated riser valve unless needed for the running SX pump(s) return flowpath(s). 5) Refer to Tech Spec 3.7.9. Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 2 (continued)

IF ALL SX tower fans fail to start,
THEN perform the following to establish an alternate method of SX cooling:

1) Verify WW sand filters are shutdown.

2) Close both SX basin CW makeup valves:

   - 0CW100A
   - 0CW100B

3) Establish WW makeup flow to SX basins from the MCR:

   a) Place WW makeup valves in AUTO:

      - 0WW019A
      - 0WW019B

   b) Place SX basin level controllers in MANUAL and raise demand until WW makeup valves indicate dual valve position:

      - 0LK-SX064
      - 0LK-SX065

   c) Start both WW pumps.

4) Verify SX blowdown flow established.

   - 0SX161A (400 C6 GL)
   - 0SX161B (400 C6 GL)

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 2 (continued)

5) Adjust SX basin level controllers as necessary to maintain SX basin levels between 90% to 100%.

IF WW makeup flow can NOT be established from the MCR,
THEN perform the following:

1) Dispatch an operator to locally open WW makeup valves:
   - 0WW019A (860 J1 SXCT)
   - 0WW019B (860 J1 SXCT)

2) Start both WW pumps.

3) Locally throttle WW makeup valve(s) as necessary to maintain basin levels between 90% to 100%.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

****
* NOTE *
* A loss of IA pressure will cause the *
* SX basin levels indication to slowly *
* fail low as the IA header *
* depressurizes. *
****

****
* NOTE *
* The SX tower basins are crosstied *
* above 64%. A leak from one basin *
* will cause both basin levels to *
* drop. *
****

3 CHECK SX TOWER BASIN:

a. Level - LESS THAN 100%

a. Perform the following:

1) Close any open SX basin CW makeup valve(s):

   - o 0CW100A
   - o 0CW100B

2) Secure WW makeup to SX basins:

   a) Stop any running deep well pump(s) aligned to a SX basin.

   b) Close associated SX basin deep well makeup valve(s):

      - o 0WW019A
      - o 0WW019B

3) Stop running SX makeup pump(s).

4) Realign riser and bypass valves as necessary to maintain basin levels.

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 3 (continued)		
		5) Dispatch operator to check for basin overflow.
b. Level - GREATER THAN 80% AND STABLE		b. Perform the following: 1) Makeup to SX basin(s) as necessary to restore level: o Establish CW makeup: 1) Place CW makeup valve(s) in AUTO: o 0CW100A o 0CW100B 2) Adjust SX basin level controller(s) as necessary to restore level: o 0LK-SX064 o 0LK-SX065 o Establish WW makeup: 1) Place WW makeup valve(s) in AUTO: o 0WW019A o 0WW019B 2) Place SX basin level controller(s) in MANUAL and raise demand until WW makeup valve(s) indicate dual valve position: o 0LK-SX064 o 0LK-SX065 3) Start WW pump(s). Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 3 (continued)		
		2) Dispatch an operator to close SX blowdown valves: • 0SX161A (400 C6 GL) • 0SX161B (400 C6 GL) 3) Dispatch Operator to look for leaks SXCT area. 4) Verify SX strainer backwash isolated. IF basin level continues to drop then start both SX makeup pumps.
c. Level - GREATER THAN 60%		c. Perform the following: 1) Dispatch operator(s) to check for leaks in the Aux Bldg. 2) Verify both SX makeup pumps running. 3) Shutdown ANY equipment exceeding the limits of TABLE A (Page 25). 4) Refer to Tech Spec 3.7.9.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

4 CHECK CC OUTLET TEMPERATURE:

a. CC heat exchanger outlet temperature(s) - LESS THAN 105°F:

- 1TI-674 (Unit 1 CC HX)
- 0TI-675 (Unit 0 CC HX)

a. Perform the following:

1) Locally throttle SX outlet from CC heat exchanger valve(s) to maintain CC temperature less than 105°F:

   o 1SX007 (346 M16)
   o 0SX007 (346 L16 AB1)

2) IF RCP THERMAL BARR CC WTR TEMP HIGH (1-7-E3) is LIT,
THEN maintain seal injection flow between 8 GPM and 13 GPM per pump.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

5 CHECK SX SYSTEM INTACT:

a. Running CENT CHG pump oil temperature(s) - NORMAL

- o 1A CENT CHG pump
  - • Computer Group #59
- o 1B CENT CHG pump
  - • Computer Group #59

a. Align emergency FP cooling per ATTACHMENT B (Page 23).

b. Check running equipment temperature - LESS THAN MAXIMUM LIMITS:

- • Refer to TABLE A (Page 25)

b. Shutdown ANY equipment exceeding the limits of TABLE A (Page 25).

c. SX PUMP DSCH HDR PRESS LOW (1-2-A2) - NOT LIT

c. Dispatch operator(s) to perform the following:

- • Check for leaks in the Aux Bldg.
- • Dispatch Operator to look for leaks SXCT area.
- • Verify SX strainer backwash isolated.

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 5 (continued)

d. CNMT indications - NORMAL:

- CNMT sump flow recorders (1PM12J) - NORMAL:
  - Floor Drain Sump (1FT-RF008)
  - RX Cavity Sump (1FT-RF010)

d. Perform the following to isolate one RCFC train:

1) Shutdown NON-running SX pump's train RCFCs:
   - o Train 1A:
     - 1A and 1C RCFCs
   - o Train 1B:
     - 1B and 1D RCFCs
2) Close associated RCFC train isol valves:
   - o 1SX016A and 1SX027A
   - o 1SX016B and 1SX027B

IF leak is NOT stopped, THEN perform the following:

1) Unisolate previously isolated RCFC train.
2) Swap running SX pumps.
3) Isolate other RCFC train.

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 5 (continued)

e. Aux Bldg indications - NORMAL:

1) No report of locally observed leak

2) SX PUMP SUCT VLV PIT LEVEL HIGH (1-2-D2) - NOT LIT

3) Contact Radwaste Operator to verify following:

- Leak detection sumps - NOT IN ALARM
- Aux Bldg sumps - NORMAL

e. Perform the following:

1) Locate and isolate the leak.

- o IF flooding is indicated in the Aux building, THEN GO TO 0BOA PRI-8, AUXILIARY BUILDING FLOODING UNIT 0.
- o IF Unit 1 CC HX must be isolated, THEN align Unit 0 CC HX to cool Unit 1 loads per BOP CC-10, ALIGNMENT OF THE U-0 CC PUMP AND U-0 HX TO A UNIT.
- o IF one SX train must be isolated, THEN swap running equipment to the NON-affected train.
- o IF a SX break beyond the capacity of system makeup can NOT be isolated, THEN perform the following:
  1) Stop Unit 1 SX pumps.
  2) Close the riser and bypass valves on the SX tower with the lowest level.

2) Evaluate potential equipment damage due to flooding.

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 5 (continued)

3) WHEN SX system integrity has been restored, THEN perform the following:

   a) Vent affected portions of the SX system as necessary per BOP SX-7, FILLING AND VENTING THE SX SYSTEM.

   b) **RETURN TO** Step 1 (Page 2).

6 REFER TO TECH SPECS:

- 3.5.2
- 3.7.8
- 3.7.9
- Other Tech Specs as applicable

7 RETURN TO PROCEDURE AND STEP IN EFFECT

-END-

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A (PG 1 OF 5)
ESSENTIAL SERVICE WATER SYSTEM CROSSTIE

1 START STANDBY UNIT 2 SX PUMP:

a. Check RCFC SX isol valves for standby SX pump - OPEN:

- o 2A SX pump:
  - 2SX016A
  - 2SX027A
- o 2B SX pump:
  - 2SX016B
  - 2SX027B

a. Manually or locally open valve(s):

- o 2SX016A (374 +29 RXB2 P-15)
- o 2SX027A (374 +29 RXB2 P-14)
- o 2SX016B (401 +2 RXB2 P-7)
- o 2SX027B (401 +2 RXB2 P-9)

b. Start standby **UNIT 2** SX pump

b. **GO TO** Step 3 (Next Page).

*** 2 CROSSTIE TO BOTH UNIT 2 SX PUMPS:**

a. Open Unit 0 CC HX inlet valves:

- 1SX005
- 2SX005

a. Locally open valve(s):

- o 1SX005 (330 P19 AB2)
- o 2SX005 (330 P19 AB2)

b. Check SX pump crosstie valves - OPEN:

- 1SX033
- 1SX034
- 2SX033
- 2SX034

b. Manually or locally open valve(s):

- o 1SX033 (330 Q17 AB1)
- o 1SX034 (330 Q19 AB2)
- o 2SX033 (330 P16 AB1)
- o 2SX034 (330 P20 AB2)

c. Check **UNIT 2** SX pump discharge pressure - GREATER THAN 90 PSIG

c. **GO TO** Step 5 (Page 21).

d. **GO TO** Step 6 (Page 22)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A (PG 2 OF 5)
ESSENTIAL SERVICE WATER SYSTEM CROSSTIE

3 ALIGN FOR SINGLE PUMP CROSSTIE:

a. Stop RCFCs for non-running **UNIT 2** SX pump:

- o 2A SX pump:
  - 2A RCFC
  - 2C RCFC
- o 2B SX pump:
  - 2B RCFC
  - 2D RCFC

b. Close RCFC SX isol valves for non-running **UNIT 2** SX pump:

- o 2A SX pump:
  - 2SX016A
  - 2SX027A
- o 2B SX pump:
  - 2SX016B
  - 2SX027B

b. IF NEITHER SX isol valves can be manually closed, THEN locally close the SX inlet isol valve:

- o 2SX016A (374 +29 RXB2 P-15)
- o 2SX016B (401 +2 RXB2 P-7)

c. Stop ONE pair of UNIT 1 RCFCs for SX isol:

- o 1A and 1C RCFCs
- o 1B and 1D RCFCs

d. Close associated UNIT 1 RCFC train SX isol valves:

- o 1SX016A and 1SX027A
- o 1SX016B and 1SX027B

d. IF NEITHER SX isol valves can be manually closed, THEN locally close the SX inlet isol valve:

- o 1SX016A (374 +29 RXB1 P-15)
- o 1SX016B (401 +2 RXB1 P-7)

e. Monitor CNMT temperature and pressure on both units

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A (PG 3 OF 5)
ESSENTIAL SERVICE WATER SYSTEM CROSSTIE

4 CROSSTIE TO SINGLE UNIT 2 SX PUMP:

a. Open Unit 0 CC HX inlet valves:

- 1SX005
- 2SX005

a. Locally open valve(s):

- o 1SX005 (330 P19 AB2)
- o 2SX005 (330 P19 AB2)

b. Check SX pump crosstie valves - OPEN:

- 1SX033
- 1SX034
- 2SX033
- 2SX034

b. Manually or locally open valve(s):

- o 1SX033 (330 Q17 AB1)
- o 1SX034 (330 Q19 AB2)
- o 2SX033 (330 P16 AB1)
- o 2SX034 (330 P20 AB2)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A (PG 4 OF 5)
ESSENTIAL SERVICE WATER SYSTEM CROSSTIE

5 MONITOR SX SYSTEM:

a. Maintain the following:

- **UNIT 2** SX pump(s):
  - Motor amps - LESS THAN 180 AMPS
  - Discharge pressure - GREATER THAN 90 PSIG
- CC heat exchanger outlet temperature - LESS THAN 105°F:
  - 1TI-674 (Unit 1 CC HX)
  - 2TI-674 (**UNIT 2** CC HX)
  - 0TI-675 (Unit 0 CC HX)

a. Perform the following:

- o Isolate SX to Unit 1 RCFC train(s):
  - a) Shutdown RCFC train(s):
    - o 1A and 1C RCFC
    - o 1B and 1D RCFC
  - b) Close RCFC SX outlet valve(s):
    - o 1SX027A
    - o 1SX027B
  - c) Monitor CNMT temperature and pressure.
- o Locally throttle CC heat exchanger(s) SX outlet valve(s) as necessary:
  - o 0SX007 (346 L16 AB1)
  - o 1SX007 (346 M16)
  - o 2SX007 (346 M20)
- o Shutdown ANY unnecessary DGs.

b. Check running CENT CHG pump oil temperature(s) on computer group #59 - NORMAL

- o 1A CENT CHG pump
- o 1B CENT CHG pump
- o 2A CENT CHG pump
- o 2B CENT CHG pump

b. Align emergency FP cooling per ATTACHMENT B (Page 23).

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A (PG 5 OF 5)
ESSENTIAL SERVICE WATER SYSTEM CROSSTIE

Step 5 (continued)

c. Monitor temperatures on UNIT 1 equipment cooled by SX per TABLE A (Page 25)

d. Shutdown ANY equipment exceeding the limits of TABLE A (Page 25)

e. Realign riser and bypass valves per BOP SX-T2, SX TOWER OPERATION GUIDELINES

6 CHECK CHILLERS OPERATING:

a. Control room chillers - ONE RUNNING

a. Start one chiller per BOP VC-10, STARTUP OF THE CONTROL ROOM CHILLED WATER SYSTEM.

b. CNMT chillers - ONE RUNNING

b. IF SX flowpath to one RCFC train is available, THEN start the associated chiller per BOP VP-1, RCFC REFRIGERATION UNIT AND CHILLED WATER SYSTEM STARTUP.

7 RETURN TO MAIN BODY, Step 2 (Page 6)

-END-

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT B (PG 1 OF 2)
ALIGNING EMERGENCY FP COOLING TO CENT CHG PUMP OIL COOLER

****
* NOTE *
* Consideration should be given to *
* aligning the standby pump to ensure *
* cooling upon an auto start. *
****

****
* NOTE *
* Initiating emergency FP cooling to *
* the 1B and 2B CENT CHG pump oil *
* coolers may cause a Fire Suppression *
* Alarm in Zone(s) 1S-60 and 2S-53. *
****

1 ALIGN FP COOLING TO AFFECTED CENT CHG PUMP(S):

a. Connect FP supply hose(s).

b. Open FP hose supply isol valve:

- o 1A Cent Chg pump 0FP5170 (364 +2 V18 AB2)
- o 1B Cent Chg pump 1FP5162 (364 X13 RXB1)
- o 2A Cent Chg pump 0FP5171 (364 +3 V18 AB2)
- o 2B Cent Chg pump 2FP5162 (364 X21 RXB2)

c. Open CENT CHG pump oil cooler FP supply valve:

- o 1A Cent Chg pump 1SX2200A (364 +1 V15 RXB1)
- o 1B Cent Chg pump 1SX2200B (364 +2 Z15 RXB1)
- o 2A Cent Chg pump 2SX2200A (364 +2 V21 RXB2)
- o 2B Cent Chg pump 2SX2200B (364 +2 Z21 RXB2)

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT B (PG 2 OF 2)
ALIGNING EMERGENCY FP COOLING TO CENT CHG PUMP OIL COOLER

Step 1 (continued)

d. Close CENT CHG pump oil cooler SX supply valve:

- o 1A Cent Chg pump 1SX2199A (364 +4 V15 RXB1)
- o 1B Cent Chg pump 1SX2199B (364 +2 Z15 RXB1)
- o 2A Cent Chg pump 2SX2199A (364 +2 V21 RXB2)
- o 2B Cent Chg pump 2SX2199B (364 +2 Z21 AB2)

e. Place a portable fan in door opening as necessary to maintain running CENT CHG pump room(s) temperature - NORMAL

2 **RETURN TO PROCEDURE AND STEP IN EFFECT**

-END-

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

TABLE A (PG 1 OF 1)
VITAL EQUIPMENT TEMPERATURE LIMITS

1 MONITOR RUNNING EQUIPMENT TEMPERATURE LIMITS:

- o RCPs temperature (Computer Groups #10 and #11) - LESS THAN MAXIMUM LIMITS:
  - RCP Mtr Radial Brng - 195°F
  - RCP Mtr Thrust Brng - 195°F
  - RCP Lower Radial Brng - 225°F
  - RCP Seal Leakoff - 235°F
- o CENT CHG Pumps temperature (Computer Group #59) - LESS THAN MAXIMUM LIMITS:
  - Inbd Brng - 205°F
  - Outbd Brng - 205°F
  - Thrust Brng - 195°F
- o SX Pumps temperature (Computer Group #64) - LESS THAN MAXIMUM LIMITS:
  - Inbd Brng - 175°F
  - Outbd Brng - 175°F
- o SI Pumps temperature (Computer Group #52) - LESS THAN MAXIMUM LIMITS:
  - Inbd Brng - 205°F
  - Outbd Brng - 205°F
  - Thrust Brng - 205°F
- o Motor Driven AF Pump temperatures (Computer Group #74) - LESS THAN MAXIMUM LIMITS:
  - Inbd Brng - 165°F
  - Outbd Brng - 165°F
  - Thrust Brng - 165°F
- o Diesel Driven AF Pump temperatures - LESS THAN MAXIMUM LIMITS:
  - Maximum temperatures per BOP AF-7T1, DIESEL DRIVEN AUXILIARY FEEDWATER PUMP OPERATING LOG
- o DGs temperature - LESS THAN MAXIMUM LIMITS:
  - Maximum temperatures per BOP DG-11T2, DIESEL GENERATOR OPERATING LOG

-END-

A. PURPOSE

This procedure provides actions required in the event of a malfunction of the Essential Service Water system.

B. SYMPTOMS OR ENTRY CONDITIONS

1) The following conditions may cause entry into this procedure:

- o SX basin level rapidly dropping.
- o Indications of a SX break in the Aux Bldg.
- o Indications of a SX break in the CNMT.
- o Abnormal temperatures on equipment cooled by SX.

2) The following annunciators may cause entry into this procedure:

- o CNMT DRAIN LEAK DETECT FLOW HIGH (2-1-A2)
- o SX PUMP TRIP (2-2-A1)
- o SX PUMP DSCH HDR PRESS LOW (2-2-A2)
- o SX PUMP DSCH HDR TEMP HIGH LOW (2-2-B2)
- o SX PUMP SUCT PRESS LOW (2-2-C1)
- o SX STRN DP HIGH (2-2-C2)
- o SX PUMP SUCT VLV PIT LEVEL HIGH (2-2-D2)
- o SX MAKEUP PP AUTO START (0-37-B7)
- o SX CLG TWR BASIN LEVEL HIGH LOW (0-37-A8)
- o SX CLG TWR LOW SPEED FAN TRIP (0-37-A6)
- o SX CLG TWR HIGH SPEED FAN TRIP (0-37-B6)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

****
* NOTE *
* With this procedure in effect the *
* Emergency Director shall evaluate *
* for EMERGENCY PLAN conditions. *
****

****
* NOTE *
* Both Units may be affected by a *
* malfunction in one or both Essential *
* Service Water trains. *
****

****
* NOTE *
* If a loss of SX is due to a loss of *
* the SX MDCT, 0BOA PRI-7. LOSS OF *
* ULTIMATE HEAT SINK should be *
* referenced. *
****

****
* NOTE *
* IF Aux Building leakage is *
* indicated, 0BOA PRI-8 AUX BUILDING *
* FLOODING UNIT 0 should be *
* referenced. *
****

1 CHECK SX PUMPS:

a. SX pump(s) - AT LEAST ONE RUNNING

a. Perform the following to start the standby pump:

1) Manually open RCFC SX inlet and outlet valves:

- o 2A SX pump:
  - 2SX016A
  - 2SX027A
- o 2B SX pump:
  - 2SX016B
  - 2SX027B

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 1 (continued)		
		2) Start the SX pump. IF the pump can NOT be started, THEN **GO TO** ATTACHMENT A (Page 18). IF NO SX pump is available on Unit 1, THEN **GO TO** 0BOA PRI-7. LOSS OF ULTIMATE HEAT SINK.
b. SX STRN DP HIGH (1-2-C2) - NOT LIT		b. Locally backwash strainer(s) per BOP SX-4, ESSENTIAL SERVICE WATER STRAINER MANUAL OPERATION.
c. SX PUMP DSCH HDR PRESS LOW (1-2-A2) - NOT LIT		c. Perform the following: 1) Start an additional SX pump. 2) Locally verify the SX Strainers are NOT backwashing. 3) Locally adjust SX outlet from CC heat exchanger valve(s) while maintaining outlet temperature(s) less than 105°F (Normal) 120°F (RH in S/D Cooling) 130°F (Post LOCA): o 2SX007 (346 M20) o 0SX007 (346 L16 AB1)
		Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 1 (continued)

IF SX pump discharge header pressure can NOT be restored, THEN perform the following:

1) Monitor temperatures to equipment cooled by SX.

2) Shutdown ANY unnecessary equipment:

   - o DG(s)
   - o MCR chiller(s)
   - o SI pump(s)
   - o RCFC(s)
   - o CNMT chiller(s)

3) Close the SX outlet valve for ANY shutdown RCFC train(s):

   - o 2SX027A
   - o 2SX027B

4) IF CENT CHG pump temperatures are approaching the limits of TABLE A (Page 25), THEN align FP to CENT CHG pump lube oil cooler per ATTACHMENT B (Page 23) while continuing with this procedure:

   - o CENT CHG pump 2A
   - o CENT CHG pump 2B

5) Shutdown any vital equipment exceeding the limits of TABLE A (Page 25).

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 1 (continued)		
		6) At Shift Manager discretion align **UNIT 1** SX to cool unit 2 CC loads via the Unit 0 CC HX: a) Open CC HX 0 SX inlet valve: • 1SX005 (330 P19 AB2) b) Open CC HX 0 SX outlet valve: • 0SX146 • 0SX147 c) Align the Unit 0 CC HX to Unit 2 per BOP CC-10, ALIGNMENT OF THE U-0 CC PUMP AND U-0 HX TO A UNIT.
d. Locally check tripped SX pump(s) - <u>NOT ROTATING</u>		d. Perform the following: 1) Dispatch an operator to energize the affected pump's suction valve: o 2SX001A at 231X3 cub E4 o 2SX001B at 232X1 cub C1 2) Close the affected pump's suction valve: o 2SX001A o 2SX001B <u>IF</u> SX Pump suction valve can not be closed, <u>THEN</u> locally closed associated SX pump discharge valve: o 2SX143A o 2SX143B

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2	**CHECK SX PUMP DISCHARGE HEADER TEMPERATURE:** a. Temperature - GREATER THAN 50°F	a. Perform the following: 1) Verify SX tower hot water basin bypass valves for running pumps are OPEN: o 2A SX pump: o 0SX162A o 0SX162C o 2B SX pump: o 0SX162B o 0SX162D 2) Stop ALL SX tower fans: • 0SX03CA through 0SX03CH

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 2 (continued)

b. Temperature - LESS THAN 80°F

b. Start ALL SX tower fans by performing the following:

1) Open ALL riser valves:

- 0SX163A through 0SX163H

2) Verify the hot water basin bypass valves are closed:

- 0SX162A
- 0SX162B
- 0SX162C
- 0SX162D

3) Start ALL fans in high speed:

- 0SX03CA through 0SX03CH

4) IF any fan fails to start in high speed, THEN close its associated riser valve unless needed for the running SX pump(s) return flowpath(s).

5) Refer to Tech Spec 3.7.9.

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 2 (continued)

IF ALL SX tower fans fail to start,
THEN perform the following to establish an alternate method of SX cooling:

1) Verify WW sand filters are shutdown.

2) Close both SX basin CW makeup valves:

   - 0CW100A
   - 0CW100B

3) Establish WW makeup flow to SX basins from the MCR:

   a) Place WW makeup valves in AUTO:

      - 0WW019A
      - 0WW019B

   b) Place SX basin level controllers in MANUAL and raise demand until WW makeup valves indicate dual valve position:

      - 0LK-SX064
      - 0LK-SX065

   c) Start both WW pumps.

4) Verify SX blowdown flow established.

   - 0SX161A (400 C6 GL)
   - 0SX161B (400 C6 GL)

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 2	(continued)	5) Adjust SX basin level controllers as necessary to maintain SX basin levels between 90% to 100%. IF WW makeup flow can NOT be established from the MCR, THEN perform the following: 1) Dispatch an operator to locally open WW makeup valves: • 0WW019A (860 J1 SXCT) • 0WW019B (860 J1 SXCT) 2) Start both WW pumps. 3) Locally throttle WW makeup valve(s) as necessary to maintain basin levels between 90% to 100%.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

****
* NOTE *
* A loss of IA pressure will cause the *
* SX basin levels indication to slowly *
* fail low as the IA header *
* depressurizes. *
****

****
* NOTE *
* The SX tower basins are crosstied *
* above 64%. A leak from one basin *
* will cause both basin levels to *
* drop. *
****

3 CHECK SX TOWER BASIN:

a. Level - LESS THAN 100%

a. Perform the following:

1) Close any open SX basin CW makeup valve(s):

   - o 0CW100A
   - o 0CW100B

2) Secure WW makeup to SX basins:

   a) Stop any running deep well pump(s) aligned to a SX basin.

   b) Close associated SX basin deep well makeup valve(s):

      - o 0WW019A
      - o 0WW019B

3) Stop running SX makeup pump(s).

4) Realign riser and bypass valves as necessary to maintain basin levels.

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 3 (continued)

5) Dispatch operator to check for basin overflow.

b. Level - GREATER THAN 80% AND STABLE

b. Perform the following:

1) Makeup to SX basin(s) as necessary to restore level:

- o Establish CW makeup:

  1) Place CW makeup valve(s) in AUTO:

     - o 0CW100A
     - o 0CW100B

  2) Adjust SX basin level controller(s) as necessary to restore level:

     - o 0LK-SX064
     - o 0LK-SX065

- o Establish WW makeup:

  1) Place WW makeup valve(s) in AUTO:

     - o 0WW019A
     - o 0WW019B

  2) Place SX basin level controller(s) in MANUAL and raise demand until WW makeup valve(s) indicate dual valve position:

     - o 0LK-SX064
     - o 0LK-SX065

  3) Start WW pump(s).

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 3 (continued)		
		2) Dispatch an operator to close SX blowdown valves: • 0SX161A (400 C6 GL) • 0SX161B (400 C6 GL) 3) Dispatch Operator to look for leaks SXCT area. 4) Verify SX strainer backwash isolated. IF basin level continues to drop then start both SX makeup pumps.
c. Level - GREATER THAN 60%		c. Perform the following: 1) Dispatch operator(s) to check for leaks in the Aux Bldg. 2) Verify both SX makeup pumps running. 3) Shutdown ANY equipment exceeding the limits of TABLE A (Page 25). 4) Refer to Tech Spec 3.7.9.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

4 CHECK CC OUTLET TEMPERATURE:

a. CC heat exchanger outlet temperature(s) - LESS THAN 105°F:

- 2TI-674 (Unit 2 CC HX)
- 0TI-675 (Unit 0 CC HX)

a. Perform the following:

1) Locally throttle SX outlet from CC heat exchanger valve(s) to maintain CC temperature less than 105°F:

   o 2SX007 (346 M20)
   o 0SX007 (346 L16 AB1)

2) IF RCP THERMAL BARR CC WTR TEMP HIGH (2-7-E3) is LIT, THEN maintain seal injection flow between 8 GPM and 13 GPM per pump.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

5 CHECK SX SYSTEM INTACT:

a. Running CENT CHG pump oil temperature(s) - NORMAL

- o 2A CENT CHG pump
  - Computer Group #59
- o 2B CENT CHG pump
  - Computer Group #59

a. Align emergency FP cooling per ATTACHMENT B (Page 23).

b. Check running equipment temperature - LESS THAN MAXIMUM LIMITS:

- Refer to TABLE A (Page 25)

b. Shutdown ANY equipment exceeding the limits of TABLE A (Page 25).

c. SX PUMP DSCH HDR PRESS LOW (2-2-A2) - NOT LIT

c. Dispatch operator(s) to perform the following:

- Check for leaks in the Aux Bldg.
- Dispatch Operator to look for leaks SXCT area.
- Verify SX strainer backwash isolated.

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 5 (continued)

d. CNMT indications - NORMAL:

- CNMT sump flow recorders (2PM12J) - NORMAL:
  - Floor Drain Sump (2FT-RF008)
  - RX Cavity Sump (2FT-RF010)

d. Perform the following to isolate one RCFC train:

1) Shutdown NON-running SX pump's train RCFCs:
   - o Train 2A:
     - 2A and 2C RCFCs
   - o Train 2B:
     - 2B and 2D RCFCs
2) Close associated RCFC train isol valves:
   - o 2SX016A and 2SX027A
   - o 2SX016B and 2SX027B

IF leak is NOT stopped, THEN perform the following:

1) Unisolate previously isolated RCFC train.
2) Swap running SX pumps.
3) Isolate other RCFC train.

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 5 (continued)

e. Aux Bldg indications - NORMAL:

1) No report of locally observed leak

2) SX PUMP SUCT VLV PIT LEVEL HIGH (2-2-D2) - NOT LIT

3) Contact Radwaste Operator to verify following:

- Leak detection sumps - NOT IN ALARM
- Aux Bldg sumps - NORMAL

e. Perform the following:

1) Locate and isolate the leak.

- o IF flooding is indicated in the Aux building, THEN **GO TO** 0BOA PRI-8, AUXILIARY BUILDING FLOODING UNIT 0.
- o IF Unit 2 CC HX must be isolated, THEN align Unit 0 CC HX to cool Unit 2 loads per BOP CC-10, ALIGNMENT OF THE U-0 CC PUMP AND U-0 HX TO A UNIT.
- o IF one SX train must be isolated, THEN swap running equipment to the NON-affected train.
- o IF a SX break beyond the capacity of system makeup can NOT be isolated, THEN perform the following:

  1) Stop Unit 2 SX pumps.

  2) Close the riser and bypass valves on the SX tower with the lowest level.

2) Evaluate potential equipment damage due to flooding.

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 5 (continued)

3) WHEN SX system integrity has been restored, THEN perform the following:

   a) Vent affected portions of the SX system as necessary per BOP SX-7, FILLING AND VENTING THE SX SYSTEM.

   b) **RETURN TO** Step 1 (Page 2).

6 REFER TO TECH SPECS:

- 3.5.2
- 3.7.8
- 3.7.9
- Other Tech Specs as applicable

7 RETURN TO PROCEDURE AND STEP IN EFFECT

-END-

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A (PG 1 OF 5)
ESSENTIAL SERVICE WATER SYSTEM CROSSTIE

1 START STANDBY UNIT 1 SX PUMP:

a. Check RCFC SX isol valves for standby SX pump - OPEN:

- o 1A SX pump:
  - 1SX016A
  - 1SX027A
- o 1B SX pump:
  - 1SX016B
  - 1SX027B

a. Manually or locally open valve(s):

- o 1SX016A (374 +29 RXB1 P-15)
- o 1SX027A (374 +29 RXB1 P-14)
- o 1SX016B (401 +2 RXB1 P-7)
- o 1SX027B (401 +2 RXB1 P-9)

b. Start standby **UNIT 1** SX pump

b. **GO TO** Step 3 (Next Page).

*** 2 CROSSTIE TO BOTH UNIT 1 SX PUMPS:**

a. Open Unit 0 CC HX inlet valves:

- 2SX005
- 1SX005

a. Locally open valve(s):

- o 2SX005 (330 P19 AB2)
- o 1SX005 (330 P19 AB2)

b. Check SX pump crosstie valves - OPEN:

- 2SX033
- 2SX034
- 1SX033
- 1SX034

b. Manually or locally open valve(s):

- o 2SX033 (330 P16 AB1)
- o 2SX034 (330 P20 AB2)
- o 1SX033 (330 Q17 AB1)
- o 1SX034 (330 Q19 AB2)

c. Check **UNIT 1** SX pump discharge pressure - GREATER THAN 90 PSIG

c. **GO TO** Step 5 (Page 21).

d. **GO TO** Step 6 (Page 22)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A (PG 2 OF 5)
ESSENTIAL SERVICE WATER SYSTEM CROSSTIE

3 ALIGN FOR SINGLE PUMP CROSSTIE:

a. Stop RCFCs for non-running **UNIT 1** SX pump:

- o 1A SX pump:
  - 1A RCFC
  - 1C RCFC
- o 1B SX pump:
  - 1B RCFC
  - 1D RCFC

b. Close RCFC SX isol valves for non-running **UNIT 1** SX pump:

- o 1A SX pump:
  - 1SX016A
  - 1SX027A
- o 1B SX pump:
  - 1SX016B
  - 1SX027B

b. IF NEITHER SX isol valves can be manually closed, THEN locally close the SX inlet isol valve:

- o 1SX016A (374 +29 RXB1 P-15)
- o 1SX016B (401 +2 RXB1 P-7)

c. Stop ONE pair of UNIT 2 RCFCs for SX isol:

- o 2A and 2C RCFCs
- o 2B and 2D RCFCs

d. Close associated UNIT 2 RCFC train SX isol valves:

- o 2SX016A and 2SX027A
- o 2SX016B and 2SX027B

d. IF NEITHER SX isol valves can be manually closed, THEN locally close the SX inlet isol valve:

- o 2SX016A (374 +29 RXB2 P-15)
- o 2SX016B (401 +2 RXB2 P-7)

e. Monitor CNMT temperature and pressure on both units

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A (PG 3 OF 5)
ESSENTIAL SERVICE WATER SYSTEM CROSSTIE

4 CROSSTIE TO SINGLE UNIT 1 SX PUMP:

a. Open Unit 0 CC HX inlet valves:

- 2SX005
- 1SX005

a. Locally open valve(s):

- o 2SX005 (330 P19 AB2)
- o 1SX005 (330 P19 AB2)

b. Check SX pump crosstie valves - OPEN:

- 2SX033
- 2SX034
- 1SX033
- 1SX034

b. Manually or locally open valve(s):

- o 2SX033 (330 P16 AB1)
- o 2SX034 (330 P20 AB2)
- o 1SX033 (330 Q17 AB1)
- o 1SX034 (330 Q19 AB2)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A (PG 4 OF 5)
ESSENTIAL SERVICE WATER SYSTEM CROSSTIE

5 MONITOR SX SYSTEM:

a. Maintain the following:

- **UNIT 1** SX pump(s):
  - Motor amps - LESS THAN 180 AMPS
  - Discharge pressure - GREATER THAN 90 PSIG
- CC heat exchanger outlet temperature - LESS THAN 105°F:
  - 2TI-674 (Unit 2 CC HX)
  - 1TI-674 (**UNIT 1** CC HX)
  - 0TI-675 (Unit 0 CC HX)

a. Perform the following:

- o Isolate SX to Unit 2 RCFC train(s):
  - a) Shutdown RCFC train(s):
    - o 2A and 2C RCFC
    - o 2B and 2D RCFC
  - b) Close RCFC SX outlet valve(s):
    - o 2SX027A
    - o 2SX027B
  - c) Monitor CNMT temperature and pressure.
- o Locally throttle CC heat exchanger(s) SX outlet valve(s) as necessary:
  - o 0SX007 (346 L16 AB1)
  - o 2SX007 (346 M20)
  - o 1SX007 (346 M16)
- o Shutdown ANY unnecessary DGs.

b. Check running CENT CHG pump oil temperature(s) on computer group #59 - NORMAL

- o 2A CENT CHG pump
- o 2B CENT CHG pump
- o 1A CENT CHG pump
- o 1B CENT CHG pump

b. Align emergency FP cooling per ATTACHMENT B (Page 23).

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A (PG 5 OF 5)
ESSENTIAL SERVICE WATER SYSTEM CROSSTIE

Step 5 (continued)

c. Monitor temperatures on UNIT 2 equipment cooled by SX per TABLE A (Page 25)

d. Shutdown ANY equipment exceeding the limits of TABLE A (Page 25)

e. Realign riser and bypass valves per BOP SX-T2, SX TOWER OPERATION GUIDELINES

6 CHECK CHILLERS OPERATING:

a. Control room chillers - ONE RUNNING	a. Start one chiller per BOP VC-10, STARTUP OF THE CONTROL ROOM CHILLED WATER SYSTEM.
b. CNMT chillers - ONE RUNNING	b. IF SX flowpath to one RCFC train is available, THEN start the associated chiller per BOP VP-1, RCFC REFRIGERATION UNIT AND CHILLED WATER SYSTEM STARTUP.

7 RETURN TO MAIN BODY, Step 2 (Page 6)

-END-

ATTACHMENT B (PG 1 OF 2)
ALIGNING EMERGENCY FP COOLING TO CENT CHG PUMP OIL COOLER

****
* NOTE *
* Consideration should be given to *
* aligning the standby pump to ensure *
* cooling upon an auto start. *
****

****
* NOTE *
* Initiating emergency FP cooling to *
* the 1B and 2B CENT CHG pump oil *
* coolers may cause a Fire Suppression *
* Alarm in Zone(s) 1S-60 and 2S-53. *
****

1 ALIGN FP COOLING TO AFFECTED CENT CHG PUMP(S):

a. Connect FP supply hose(s).

b. Open FP hose supply isol valve:

- o 2A Cent Chg pump 0FP5171 (364 +3 V18 AB2)
- o 2B Cent Chg pump 2FP5162 (364 X21 RXB2)
- o 1A Cent Chg pump 0FP5170 (364 +2 V18 AB2)
- o 1B Cent Chg pump 1FP5162 (364 X13 RXB1)

c. Open CENT CHG pump oil cooler FP supply valve:

- o 2A Cent Chg pump 2SX2200A (364 +2 V21 RXB2)
- o 2B Cent Chg pump 2SX2200B (364 +2 Z21 RXB2)
- o 1A Cent Chg pump 1SX2200A (364 +1 V15 RXB1)
- o 1B Cent Chg pump 1SX2200B (364 +2 Z15 RXB1)

Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT B (PG 2 OF 2)
ALIGNING EMERGENCY FP COOLING TO CENT CHG PUMP OIL COOLER

Step 1 (continued)

d. Close CENT CHG pump oil cooler SX supply valve:

- o 2A Cent Chg pump 2SX2199A (364 +2 V21 RXB2)
- o 2B Cent Chg pump 2SX2199B (364 +2 Z21 AB2)
- o 1A Cent Chg pump 1SX2199A (364 +4 V15 RXB1)
- o 1B Cent Chg pump 1SX2199B (364 +2 Z15 RXB1)

e. Place a portable fan in door opening as necessary to maintain running CENT CHG pump room(s) temperature - NORMAL

2 **RETURN TO PROCEDURE AND STEP IN EFFECT**

-END-

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

TABLE A (PG 1 OF 1)
VITAL EQUIPMENT TEMPERATURE LIMITS

1 MONITOR RUNNING EQUIPMENT TEMPERATURE LIMITS:

- o RCPs temperature (Computer Groups #10 and #11) - LESS THAN MAXIMUM LIMITS:
  - RCP Mtr Radial Brng - 195°F
  - RCP Mtr Thrust Brng - 195°F
  - RCP Lower Radial Brng - 225°F
  - RCP Seal Leakoff - 235°F
- o CENT CHG Pumps temperature (Computer Group #59) - LESS THAN MAXIMUM LIMITS:
  - Inbd Brng - 205°F
  - Outbd Brng - 205°F
  - Thrust Brng - 195°F
- o SX Pumps temperature (Computer Group #64) - LESS THAN MAXIMUM LIMITS:
  - Inbd Brng - 175°F
  - Outbd Brng - 175°F
- o SI Pumps temperature (Computer Group #52) - LESS THAN MAXIMUM LIMITS:
  - Inbd Brng - 205°F
  - Outbd Brng - 205°F
  - Thrust Brng - 205°F
- o Motor Driven AF Pump temperatures (Computer Group #74) - LESS THAN MAXIMUM LIMITS:
  - Inbd Brng - 165°F
  - Outbd Brng - 165°F
  - Thrust Brng - 165°F
- o Diesel Driven AF Pump temperatures - LESS THAN MAXIMUM LIMITS:
  - Maximum temperatures per BOP AF-7T1, DIESEL DRIVEN AUXILIARY FEEDWATER PUMP OPERATING LOG
- o DGs temperature - LESS THAN MAXIMUM LIMITS:
  - Maximum temperatures per BOP DG-11T2, DIESEL GENERATOR OPERATING LOG

-END-