

RS-11-035
March 16, 2011

10 CFR 50.90

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-001

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: Additional Information Supporting Request for License Amendment Regarding Ultimate Heat Sink

- References:**
1. Letter from P. R. Simpson (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "License Amendment Regarding Ultimate Heat Sink," dated June 30, 2009
 2. Letter from P. R. Simpson (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Additional Information Supporting Request for License Amendment Regarding Ultimate Heat Sink," dated January 25, 2010
 3. Letter from J. L. Hansen (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Additional Information Supporting Request for License Amendment Regarding Ultimate Heat Sink," dated July 1, 2010
 4. Letter from J. L. Hansen (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Additional Information Supporting Request for License Amendment Regarding Ultimate Heat Sink," dated November 8, 2010
 5. Letter from N. J. DiFrancesco (U. S. Nuclear Regulatory Commission) to M. J. Pacilio (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Request For Additional Information Related to License Amendment Regarding Ultimate Heat Sink (TAC Nos. ME1669 and ME1670)," dated December 28, 2010
 6. Letter from J. L. Hansen (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Response to Request for Additional Information Related to License Amendment Regarding Ultimate Heat Sink," dated January 31, 2011
 7. Letter from M. Mahoney (U. S. Nuclear Regulatory Commission) to M. J. Pacilio (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Request For Additional Information Related to License Amendment Regarding Ultimate Heat Sink (TAC Nos. ME1669 and ME1670)," dated February 14, 2011

In Reference 1, Exelon Generation Company, LLC, (EGC) requested a license amendment for Byron Station, Units 1 and 2, to revise Technical Specifications (TS) to add additional essential service water (SX) cooling tower fan requirements as a function of SX pump discharge temperature to reflect results of a revised analysis for the ultimate heat sink (UHS).

EGC supplemented Reference 1 by letters dated January 25, July 1, and November 8, 2010, and January 31, 2011 (References 2, 3, 4, and 6).

In Reference 5, the NRC requested that EGC provide additional information in support of their review of Reference 1. The Attachment of Reference 6 provided the requested information, with the exception of Question 1.a of Reference 5. As discussed with the NRC on January 27, 2011, and documented in Reference 6, the response to Question 1.a would be provided in a separate submittal.

In Reference 7, the NRC requested that EGC provide additional information in support of their review of Reference 1. Attachments 1 and 2 provide the requested information of Reference 7. Attachments 1 and 3 provide the requested information for Question 1.a of Reference 5.

The proposed TS changes provided in Attachment 2 supersede the changes previously provided to the NRC in References 1 and 4. The proposed TS Bases changes provided in Attachment 3, which supersede the changes previously provided to the NRC in Reference 1, are provided for information only and do not require NRC approval.

EGC has reviewed the information supporting a finding of no significant hazards consideration and the environmental consideration that were previously provided to the NRC in Attachment 1 of Reference 1. 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 addition, the additional information provided in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), a copy of this letter and its attachments 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 16th day of March 2011.

Respectfully,

A handwritten signature in black ink, appearing to read "Jeffrey L. Hansen", written over a large, faint, circular stamp or watermark.

Jeffrey L. Hansen
Manager – Licensing
Exelon Generation Company, LLC

Attachments:

1. Response to Request for Additional Information
2. Markup of Technical Specifications Pages for Byron Station, Units 1 and 2
3. Markup of Technical Specifications Bases Pages for Byron Station, Units 1 and 2

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
Response to Request for Additional Information

By letter to the Nuclear Regulatory Commission (NRC) dated June 30, 2009, Exelon Generation Company, LLC, (EGC) requested a license amendment for Byron Station, Units 1 and 2, to revise Technical Specifications (TS) to add additional essential service water (SX) cooling tower fan requirements as a function of SX pump discharge temperature to reflect results of a revised analysis for the ultimate heat sink (UHS). EGC supplemented this request by letters dated January 25, July 1, and November 8, 2010, and January 31, 2011.

In letters dated December 28, 2010, and February 14, 2011, the NRC requested that EGC provide additional information related to the June 30, 2009, request. Attachments 1, 2, and 3 provide the requested information for Question 1.a of the December 28, 2010, letter and for the February 14, 2011, letter.

Request for Additional Information Dated February 14, 2011

Question 1:

The UHS is required to be OPERABLE in MODES 1 through 4. Eight cooling tower fans running in fast speed are necessary to ensure basin temperature does not reach 100°F following a LOCA/loss of offsite power at one unit concurrent with the safe shutdown from maximum power of the other unit under bounding conditions. When 8 fans are not OPERABLE and in fast speed while the plant is in MODES 1 through 4 under bounding conditions, LCO 3.7.9 is not met. As an alternative to shutting down the reactor, the TS allow entry into LCO 3.7.9 Condition A and performance of REQUIRED ACTIONS A.1 and A.2.

The Facility Operating License (FOL) for Byron contains a set of rules for the use and application of Byron TS's. The BACKGROUND section on Page 1.3-1 of Byron TS states "The ACTIONS associated with an LCO state Conditions that typically describe the ways in which the requirements of the LCO can fail to be met. Specified with each stated Condition are Required Action(s) and Completion Time(s)."

The proposed TS 3.7.9 changes do not appear to conform to the use and application section of Byron TS. That is, the proposed Conditions do not describe the ways in which cooling tower fan requirements can fail to be met.

Explain why this unusual format is required, or provide revised proposed TS that conform to the TS use and application section of the Byron FOL.

Response to Question 1:

EGC has considered the NRC position on the proposed TS 3.7.9 formatting and agrees the "Limiting Condition for Operations (LCO) referencing to Tables" concept may not be consistent with TS formatting guidelines. However, EGC concludes that having a fixed LCO for the UHS at the most extreme conditions would result in, under less extreme conditions, the UHS being in a Condition Statement when it was capable of meeting its design basis. Condition Statement Development for specific separate conditions of not satisfying SX pump discharge water temperature regions is not an optimal solution either, since it adds at least five Condition statements, most with Notes, to a TS which already has six Conditions. EGC proposes an alternative that is consistent with TS use, application, and formatting conventions.

ATTACHMENT 1
Response to Request for Additional Information

The alternative approach is to have the LCO state "The UHS shall be OPERABLE," and place the specific requirements of the SX pump discharge water temperature, number of operable cooling tower fans, and their operational mode in a Surveillance Requirement (SR) (i.e., SR.3.7.9-2). This is consistent with TS section 1.0, "Use and Application," page 1.4-1, "Description," which states "...the Surveillance must be met in order to meet the associated Limiting Condition for Operation (LCO)."

In addition, SR 3.0.1 states, "SRs shall be met during the MODES or other specified conditions in the Applicability for individual LCOs, unless otherwise stated in the SR. Failure to meet a Surveillance, whether such failure is experienced during the performance of the Surveillance or between performances of the Surveillance, shall be failure to meet the LCO."

If the SR is not met, then appropriate Condition statements have been developed such that the UHS design basis can still be met considering the temporary relaxation of the single failure criterion. Otherwise, LCO 3.0.3 would need to be entered.

The SR will keep the "required" number of SX cooling tower fans approach as with the current TS 3.7.9, since the required number is dependent on SX pump discharge water temperature. The SX pump discharge water temperature is, in part, limited by environmental conditions that vary throughout the year. Depending on the SX pump discharge water temperature, either six, seven, or eight SX cooling tower fans are required to satisfy the UHS design basis including single failure assumptions. In this TS format, only one action condition is needed to address the Condition of one less than required cooling tower fans depending on the region the SX pump discharge temperature is in versus having multiple separate Condition statements, one for each SX pump discharge region.

The proposed approach is similar to how the current TS 3.7.9 is formatted. EGC originally proposed to use a tabular format; however, the presentation of the specific requirements of the UHS in the proposed Tables has been streamlined and placed in proposed SR 3.7.9-2.

The revised markup of TS 3.7.9 is provided in Attachment 2.

Request for Additional Information Dated December 28, 2010

Question 1.a:

The EGC request dated June 30, 2009, provided revised TS 3.7.9, "Ultimate Heat Sink," and the revised TS B3.7.9 Bases for a cross tied SX system. The letter dated November 8, 2010, includes new proposed TS 3.7.9 for split SX system, but did not include the new TS Bases.

a) Please provide the complete TS B3.7.9 Bases for clarity.

Response to Question 1.a:

The revised markup of TS Bases 3.7.9 is provided in Attachment 3. These changes will be made in accordance with the Byron TS Bases Control Program.

ATTACHMENT 2
Markup of Technical Specifications Pages for Byron Station, Units 1 and 2

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66

REVISED TECHNICAL SPECIFICATIONS PAGES

3.7.9-1
3.7.9-2
3.7.9-3
3.7.9-4
3.7.9-5

INSERTS

3.7 PLANT SYSTEMS

3.7.9 Ultimate Heat Sink (UHS)

LCO 3.7.9 The UHS shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required cooling tower fan inoperable.	A.1 Verify remaining required OPERABLE cooling tower fans are capable of being powered by an OPERABLE emergency power source.	1 hour
	AND	
	A.2 Restore required cooling tower fan to OPERABLE status.	72 hours
B. One or more basin level(s) < 60%.	B.1 Restore both basin levels to ≥ 60%.	6 hours

(continued)

E

E.1

Replace with
INSERT A

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>F → Є. One Essential Service Water (SX) makeup pump inoperable.</p>	<p>Є.1 Verify basin level for each tower is ≥ 90%.</p> <p>F.1 →</p> <p><u>AND</u></p> <p>Є.2 Verify OPERABILITY of associated makeup source.</p> <p>F.2 →</p> <p><u>AND</u></p> <p>Є.3 Restore SX makeup pump to OPERABLE status.</p> <p>F.3 →</p>	<p>72 hours</p> <p><u>AND</u></p> <p>Once per → 2 hours thereafter</p> <p>72 hours</p> <p>7 days if both units are in MODE 1, 2, 3, or 4</p> <p><u>AND</u></p> <p>14 days if one unit is in MODE 5, 6 or defueled</p>

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>G → D. Two SX makeup pumps inoperable.</p>	<p>D.1 Verify basin level for each tower is ≥ 90%. G.1 → Once per →</p> <p><u>AND</u></p> <p>D.2 Verify OPERABILITY of at least one makeup source. G.2 →</p> <p><u>AND</u></p> <p>D.3 Verify OPERABILITY of second makeup source. G.3 →</p>	<p>1 hour <u>AND</u> 2 hours thereafter</p> <p>1 hour</p> <p>72 hours</p>
<p>H → E. Rock River water level ≤ 670.6 ft Mean Sea Level (MSL). H.1 →</p>	<p>E.1 Verify Rock River water level is > 664.7 ft MSL and flow ≥ 700 cubic feet per second (cfs). H.1 →</p>	<p>1 hour <u>AND</u> 12 hours thereafter</p>

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>F. Required Action E not met.</p> <p><u>OR</u></p> <p>Rock River water level forecast to exceed 702.0 ft MSL by the National Weather Service (NWS).</p> <p><u>OR</u></p> <p>Tornado Watch issued by the NWS that includes the Byron site.</p>	<p>F.1 Verify basin level for each tower is $\geq 90\%$.</p> <p><u>AND</u></p> <p>F.2 Verify OPERABILITY of at least one deep well pump.</p> <p><u>AND</u></p> <p>F.3 Verify OPERABILITY of both deep well pumps.</p>	<p>1 hour</p> <p><u>AND</u></p> <p>2 hours thereafter</p> <p>1 hour</p> <p>72 hours</p>
<p>G. Required Action and associated Completion Time of Condition A, B, C, D, or F not met.</p> <p><u>OR</u></p> <p>UHS inoperable for reasons other than Condition A, B, C, D, E, or F.</p>	<p>G.1 Be in MODE 3.</p> <p><u>AND</u></p> <p>G.2 Be in MODE 5.</p>	<p>6 hours</p> <p>36 hours</p>

A, B, C, D, E, F, G, H, or I.

A, B, C, E, F, G, or I.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.9.1	Verify water level in each cooling tower basin is $\geq 60\%$.	24 hours
SR 3.7.9.2	Verify essential service water pump discharge water temperature is: a. $\leq 80^{\circ}\text{F}$; b. $\leq 90^{\circ}\text{F}$, with all required cooling tower fans running on high speed; or c. $\leq 96^{\circ}\text{F}$, with ≥ 7 cooling tower fans running on high speed.	24 hours
SR 3.7.9.3	Verify river water level is > 670.6 ft MSL and ≤ 702.0 ft MSL.	24 hours
SR 3.7.9.4	Operate each required cooling tower fan on high speed for ≥ 15 minutes.	31 days
SR 3.7.9.5	Verify each SX makeup manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in the open position, is in the correct position.	31 days
SR 3.7.9.6	Verify that each SX makeup pump starts on a simulated or actual low basin level signal and operates for ≥ 30 minutes.	31 days

Replace with
INSERT B



(continued)

ATTACHMENT 2
Markup of Technical Specifications Pages for Byron Station, Units 1 and 2

INSERT A

<p>A. One or more OPERABLE cooling tower fan(s) not running in required high speed.</p>	<p>A.1 Initiate actions to operate OPERABLE cooling tower fan(s) in high speed.</p>	<p>Immediately</p>
<p>B. One required cooling tower fan inoperable.</p>	<p>B.1 Verify OPERABLE cooling tower fans are capable of being powered by an OPERABLE emergency power source.</p>	<p>1 hour</p>
	<p><u>AND</u></p> <p>B.2 Restore cooling tower fan to OPERABLE status.</p>	<p>72 hours</p>
<p>C. Outside air wet bulb temperature > 76°F.</p> <p><u>AND</u></p> <p>Each electrical division not capable of providing power to at least one OPERABLE SXCT fan.</p>	<p>C.1 Restore SXCT fan configuration such that each electrical division is capable of providing power to at least one OPERABLE SXCT fan.</p>	<p>72 hours</p>
<p>D. SX pump discharge water temperature > 96°F.</p>	<p>D.1 Be in MODE 3.</p>	<p>6 hours</p>
	<p><u>AND</u></p> <p>D.2 Be in MODE 5.</p>	<p>36 hours</p>

ATTACHMENT 2

Markup of Technical Specifications Pages for Byron Station, Units 1 and 2

INSERT B

<p>SR 3.7.9.2 -----NOTE----- When outside air wet bulb temperature is > 76°F, then each electrical division must be capable of providing power to at least one OPERABLE SXCT fan. -----</p> <p>Verify essential service water (SX) pump discharge water temperature, SX cooling tower (SXCT) fans OPERABILITY, and their required operational mode are:</p> <p>a. When SX trains are cross tied on both Units;</p> <ol style="list-style-type: none">1. SX pump discharge water temperature ≤ 77°F and 6 OPERABLE SXCT fans;2. SX pump discharge water temperature > 77°F and ≤ 82°F and 7 OPERABLE SXCT fans;3. SX pump discharge water temperature > 77°F and ≤ 84°F and 6 OPERABLE SXCT fans running in high speed;4. SX pump discharge water temperature > 84°F and ≤ 91°F and 7 OPERABLE SXCT fans running in high speed; or5. SX pump discharge water temperature > 91°F and ≤ 96°F and 8 OPERABLE SXCT fans running in high speed. <p>b. When SX trains are split on either Unit;</p> <ol style="list-style-type: none">1. SX pump discharge water temperature ≤ 82°F and 8 OPERABLE SXCT fans; or2. SX pump discharge water temperature > 82°F and ≤ 96°F and 8 OPERABLE SXCT fans running in high speed.	<p>24 hours</p>
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ATTACHMENT 3
Markup of Technical Specifications Bases Pages for Byron Station, Units 1 and 2

Byron Station, Units 1 and 2

Facility Operating License Nos. NPF-37 and NPF-66

REVISED TECHNICAL SPECIFICATIONS BASES PAGES

(NOTE: TS Bases pages are provided for information only.)

B 3.7.9-2
B 3.7.9-3
B 3.7.9-4
B 3.7.9-5
B 3.7.9-6
B 3.7.9-7
B 3.7.9-8
B 3.7.9-9
B 3.7.9-10
B 3.7.9-11
B 3.7.9-12
B 3.7.9-13

INSERTS

BASES

BACKGROUND (continued)

Additional information on the design and operation of the system, along with a list of components served, can be found in UFSAR, Section 9.2.5 (Ref. 1).

APPLICABLE
SAFETY ANALYSES

The UHS is the sink for heat removed from the reactor core following all accidents and anticipated operational occurrences in which the unit is cooled down and placed on Residual Heat Removal (RHR) operation as well as the sink for heat removed from containment via the reactor containment fan coolers. The UHS performance requirements are that the design basis temperatures of safety related equipment served by SX, either directly or indirectly are not exceeded. The UHS maximum post accident heat load occurs near the time the unit switches from injection to recirculation and the containment cooling systems and residual heat removal systems are required to remove core decay heat. The status of both units must be considered in the UHS analyses, because the UHS is a common system. The design basis accident analyses for the UHS is based on design basis LOCA/loss of offsite power conditions on one unit concurrent with the safe shutdown from maximum power of the other unit. References 2, 3, and 6 provide details of the UHS design basis analyses. The analyses include worst expected meteorological conditions, conservative uncertainties when calculating decay heat, and worst case single ~~active~~ failures.

BASES

APPLICABLE SAFETY ANALYSES (continued)

Replace with
INSERT C



~~The design basis analyses assume two cooling tower cells (i.e., two fans or water distribution to two tower cells) are out of service. In addition, the analyses assume that at least six fans are running on high speed if the average temperature as measured at the SX pump discharge is $\geq 80^{\circ}\text{F}$; that with the fans running the SX pump discharge temperature is $\leq 96^{\circ}\text{F}$; and must not exceed 90°F with 6 OPERABLE fans running on high speed. The UHS maximum design temperature is 100°F . The UHS design basis analyses assume an initial temperature of $< 96^{\circ}\text{F}$ with at least 6 fans running or $< 80^{\circ}\text{F}$ with no fans running. For the 96°F cases, heat transfer is credited immediately following the event because the fans will auto reenergize with the respective diesel generator output breaker auto closure. The calculated peak basin temperature is $< 100^{\circ}\text{F}$. For the 80°F cases heat transfer is not credited until operator action opens riser valves and starts the fans. These calculations also show that the 100°F design temperature is not exceeded.~~

The analyses assume an initial basin level of $\geq 60\%$ in both cooling tower basins, which corresponds to approximately 306,000 gallons in each basin. The analyses consider the AF System requirements, whose safety related source of water is the SX System.

The UHS is designed in accordance with Regulatory Guide 1.27 (Ref. 4), which requires a 30 day supply of cooling water in the UHS. The UHS requires makeup to the basins to meet this requirement. The safety related source of makeup is the two diesel driven SX makeup pumps which take suction from the Rock River. The diesel driven SX makeup pumps auto start on low level in their associated tower basin. The SX makeup system is designed to withstand all design basis natural phenomena events and combination of events except for seismic events during low Rock River flow or level (loss of SX makeup pump suction), tornado, and river flood. Therefore, constraints on river level and flow are imposed, and if the weather is conducive to tornadoes or high river levels, plant procedures dictate proactive actions.

BASES

APPLICABLE SAFETY ANALYSES (continued)

A backup makeup source is provided by deep well pumps. The deep well system is designed for seismic, tornado, and river flood events. Each deep well pump is powered from the engineered safety feature bus for the associated tower. The deep well pumps do not include automatic start capability. To compensate for the possible time delay in providing makeup associated with a manual start of the deep well pumps, the minimum acceptable volume of water maintained in each basin is raised (90% level) and the level is verified every 2 hours.

The UHS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The UHS is required to be OPERABLE and is considered OPERABLE if it has available a sufficient volume of water at or below the maximum temperature that would allow the SX System to operate for at least 30 days following the design basis event without the loss of Net Positive Suction Head (NPSH), and without exceeding the maximum design temperature of the equipment served by the SX System.

~~To meet this condition the UHS temperature as measured at the discharge of the SX pump: 1) must not exceed 96°F, with > 6 OPERABLE fans running in high speed; 2) must not exceed 90°F with 6 OPERABLE fans running on high speed; or 3) must not exceed 80°F otherwise. Therefore, at least 6 fans (high speed) and associated tower cells must be OPERABLE. In addition, each basin level must be ≥ 60%. The fan operation, basin level and SX pump discharge temperature constraints assure that adequate thermal capacity is available in the SX water inventory to absorb the initial heat input from the design basis event.~~

Replace with
INSERT D



Two diesel powered SX makeup pumps must also be OPERABLE. SX makeup pump OPERABILITY includes, auto start capability on low basin level, and sufficient river level (> 664.7 ft Mean Sea Level (MSL)) and flow combinations.

BASES

APPLICABILITY In MODES 1, 2, 3, and 4, the UHS is required to support the OPERABILITY of the equipment serviced by the UHS and required to be OPERABLE in these MODES.

In MODE 5 or 6, the OPERABILITY requirements of the UHS are determined by the systems it supports.

ACTIONS ~~A.1 and A.2~~ ← **B.1 and B.2**

INSERT E →

If one required fan is inoperable (i.e., ~~only 5 fans OPERABLE~~), action must be taken to restore the inoperable cooling tower fan to OPERABLE status within 72 hours. Required Action ~~A.1~~ requires the remaining required OPERABLE cooling tower fans be capable of being powered by an OPERABLE emergency power source. This action assures availability of electric power to the remaining required fans in the unlikely event of a loss of offsite power. The 1 hour Completion Time is reasonable based on the fact this is an administrative check of the OPERABILITY of the emergency power sources. **B.1**

The 72 hour Completion Time is reasonable based on the low probability of an accident occurring during the 72 hours that one cooling tower fan is inoperable, the number of available systems, and the time required to reasonably complete the Required Action.

INSERT F →

BASES

ACTIONS (continued)

B.1 ← **E.1**

If one or more cooling tower basin level is < 60%, the assumptions of the design basis analyses are not met, and action must be taken to restore both basin levels within 6 hours. The 6 hour Completion Time is reasonable based on the low probability of an accident occurring during the 6 hours that the basin level is < 60%, the number of systems available to replenish basin level, and the time required to reasonably complete the Required Actions.

~~C.1, C.2, and C.3~~ ← **F.1, F.2, and F.3**

When one SX makeup pump is inoperable, action must be taken to verify a ≥ 90% cooling tower basin level in both basins within 72 hours, and verify OPERABILITY of an associated makeup source within 72 hours. The increased basin level must be verified every 2 hours thereafter, and the inoperable SX makeup pump must be restored to OPERABLE status within 7 days or 14 days depending on plant conditions.

In this Condition, the remaining OPERABLE makeup sources are adequate to perform the UHS makeup function. However, the overall reliability is reduced because failure of the OPERABLE makeup source(s) could result in a loss of the makeup function.

BASES

F.1

F.2

ACTIONS (continued)

Required Action ~~C.1~~ requires verification that both basin levels are $\geq 90\%$, and Required Action ~~C.2~~ verifies the OPERABILITY of an associated makeup source (pump and flow path). The increased basin level and its verification every 2 hours provide assurance of enough inventory in the basins to allow sufficient time to manually start makeup sources, consistent with the assumptions of the design basis analyses. An associated makeup source is a source (i.e., ESF powered deep well pump of the same train or the SX makeup pump capable of manual start) which provides makeup to the same basin served by the inoperable SX makeup pump. An SX makeup pump that is inoperable due solely to the inability to auto start on low basin level may be considered an OPERABLE associated makeup source. OPERABILITY of the same train deep well pump includes capability to start and provide sufficient flow to the associated basin.

The 72 hours to verify $\geq 90\%$ basin level and OPERABILITY of an associated makeup source is reasonable based on the low probability of a design basis accident occurring during this time period and the ability of the remaining SX makeup pump to perform the required makeup function. The 2 hour periodic verification of $\geq 90\%$ basin level is consistent with the assumptions of the design basis analyses.

BASES

F.3

ACTIONS (continued)

Required Action ~~C.3~~ requires the SX makeup pump to be restored to OPERABLE status within 7 days or 14 days respectively. The 7 day limit is applicable if both Unit 1 and Unit 2 are in MODE 1, 2, 3, or 4. The 14 day limit is only applicable if either Unit 1 or Unit 2 is in MODE 5, MODE 6, or defueled. This Required Action serves to provide up to 7 days to restore a SX makeup pump when both units are operating, and up to 14 days when one unit is operating and the other is shutdown. The 14 day allowance provides adequate time to perform pump inspection and extended maintenance when one unit is in an outage. Without this allowance, a dual-unit outage would be required to perform maintenance that requires more than 7 days to complete. The extended Completion Time when one unit is in shutdown is also based on the reduction in the quantity of heat that would have to be removed by the UHS when one unit is in a shutdown condition, a reduction in the amount of water that may be required to satisfy AF demands, and the availability of the other makeup water sources. Although the 14 day Completion Time was justified based on the need to perform extended maintenance, its use and application is not restricted to these activities because the effects of SX makeup pump inoperability are unrelated to the cause of the inoperability.

BASES

ACTIONS (continued)

~~D.1, D.2, and D.3~~

G.1, G.2, and G.3

When both SX makeup pumps are inoperable, action must be taken to verify a $\geq 90\%$ cooling tower basin level in both basins within 1 hour, verify OPERABILITY of at least one makeup source (pump and flow path) within 1 hour, and verify OPERABILITY of a second makeup source serving the other tower basin within 72 hours. The increased basin level must be verified every 2 hours thereafter.

G.1 and G.2

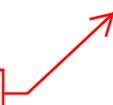
In this Condition, the UHS makeup function may not be met. Required Actions ~~D.1 and D.2~~ require verification of the OPERABILITY of at least one makeup source and verification that both basin levels are $\geq 90\%$. The increased basin level and its verification every 2 hours allows sufficient time to manually start makeup sources, consistent with the assumptions of the design basis analyses. An SX makeup pump which is inoperable solely due to the inability to auto start on low basin level may be considered an OPERABLE makeup source. The 1 hour Completion Time is reasonable based on the low probability of an accident occurring during the 1 hour and the time required to reasonably complete the Required Actions.

G.3

Required Action ~~D.3~~ requires verification of the OPERABILITY of a second makeup source within 72 hour. With the plant only having one OPERABLE makeup source, the UHS makeup function can be performed; however the overall reliability is reduced. The 72 hour Completion Time is reasonable based on the low probability of an accident occurring during this time period and the available makeup capability.

BASES

ACTIONS (continued)

H.1  E.1

With the Rock River water level \leq 670.6 ft Mean Sea Level (MSL), action must be taken to assure that adequate level and flow remain available from the Rock River intake to the SX makeup pumps to permit their operation. When the water level in the river falls below this limit, within one hour, and every 12 hours thereafter, the water level in the river must be verified to be greater than 664.7 ft MSL and the flow rate in the river must be verified to be greater than or equal to 700 cubic feet per second (CFS). 700 cfs assures adequate inventory is available for the pumps to maintain the level in the UHS basins. 664.7 ft is the minimum design operating level of the SX makeup pumps. Assuring adequate inventory and a level greater than the minimum operating level provides assurance that the pumps can perform their function if required. The 1 hour Completion Time for initial performance of this Required Action is reasonable based on the low probability of an accident occurring during the 1 hour and the time required to reasonably complete the Required Actions. The continued performance of this verification every 12 hours is reasonable based on the availability of other makeup sources and the low likelihood of an accident and a rapid unexpected decrease in the river level.

BASES

ACTIONS (continued)

~~F.1, F.2, and F.3~~

I.1, I.2, and I.3

I

The SX makeup pumps provide the safety-related makeup capability to the UHS, however when Condition F applies, the pumps may not be capable of performing the required function. With water level or flow in the Rock River outside of the limits specified, the pumps may not have adequate NPSH or inventory to supply the required makeup to the UHS if an accident occurs. If water level is forecast to exceed 702 ft MSL on the Rock River, the SX makeup pumps may be subjected to flooding that would render them inoperable. Similarly, if a Tornado Watch exists that includes the Byron site, the pumps may not be capable of performing their required function because the river screen house that contains the pumps is not designed to protect them from a tornado.

In these conditions, alternative makeup capability to the UHS must be available and the inventory in the UHS basin must be large enough to permit manual initiation of the alternative source. The deep well pumps supply the alternative makeup capability to the UHS. To assure adequate inventory in the UHS to permit a delay in makeup for manual initiation of the deep well pumps, the level in each tower basin must be verified to be greater than or equal to 90% within 1 hour, and every 2 hours thereafter. The 1 hour Completion Time for initial performance of this Required Action is reasonable based on the low probability of an accident occurring during the 1 hour and the time required to reasonably complete the Required Actions. The continued performance of this verification every 2 hours is reasonable based on the low likelihood of an accident and the maximum expected decrease in level in the UHS basin.

In addition, at least one deep well pump must be verified OPERABLE within 1 hour. This assures that if an accident occurs, adequate makeup capability to the UHS is available. The 1 hour Completion Time for initial performance of this Required Action is reasonable based on the low probability of an accident occurring during the 1 hour and the time required to reasonably complete the Required Actions.

BASES

ACTIONS (continued)

Within 72 hours, both deep well pumps must be verified to be OPERABLE if Condition ~~F~~ continues to apply. This Required Action is consistent with the need to assure reliable and redundant supplies are available to provide makeup to the UHS. The 72 hour Completion Time is reasonable based on the low probability of an accident occurring during the 72 hours coincident with a failure of the OPERABLE deep well pump.

J.1 and J.2

~~G.1 and G.2~~

A, B, C, E, F, G, or I

If the UHS cannot be restored to OPERABLE status within the associated Completion Times or the associated Required Actions are not met of Condition ~~A, B, C, D, or F~~, or if the UHS is inoperable for reasons other than Condition ~~A, B, C, D, E, or F~~, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours.

A, B, C, D, E, F, G, H, or I

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE
REQUIREMENTS

SR 3.7.9.1

This SR verifies adequate basin level to provide time to manually establish makeup while providing auxiliary feedwater if required. The specified level also ensures that sufficient NPSH is available to operate the SX pumps. The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES. This SR verifies that the UHS cooling tower basin water level is $\geq 60\%$.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.9.2

This SR verifies that the UHS is capable of supporting the SX System. In turn, availability of the UHS ensures the ability of the SX System to cool the CC System to at least its maximum design temperature with the maximum accident or normal design heat loads for 30 days following a Design Basis Accident and cool the other components served directly by the SX System. The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES. ~~This SR verifies that the essential service water pump discharge water temperature is $\leq 80^{\circ}\text{F}$; $\leq 90^{\circ}\text{F}$ if all required cooling tower fans are running on high speed; or $\leq 96^{\circ}\text{F}$ if ≥ 7 OPERABLE cooling tower fans are running on high speed.~~

This SR verifies that the SX pump discharge water temperature, fan OPERABILITY and operational mode is in accordance with the LCO.

SR 3.7.9.3

This SR verifies the SX makeup pumps are OPERABLE by ensuring river water level and flow are sufficient for proper operation of the SX makeup pumps in case of the Design Basis Accident (DBA). If the river water level is > 670.6 ft MSL and ≤ 702.0 ft MSL, proper operation is assured. If the water level is > 702.0 ft MSL, the pumps may become flooded and not be available. If the river level is ≤ 670.6 ft MSL, proper operation of the pumps during a DBA is possible. However, the river level must be > 664.7 ft MSL and river flow must be ≥ 700 cfs. The frequency of SR 3.7.9.3 is based on the potential for changes in river level on a daily basis.

SR 3.7.9.4

Starting from the control room and operating each required cooling tower fan on high speed for ≥ 15 minutes (if not already operating in high speed) ensures that all fans are OPERABLE and that all associated controls are functioning properly. It also ensures that fan or motor failure, or excessive vibration, can be detected for corrective action. The 31 day Frequency is based on operating experience, the known reliability of the fan units, the redundancy available, and the low probability of significant degradation of the UHS cooling tower fans occurring between surveillances.

ATTACHMENT 3

Markup of Technical Specifications Bases Pages for Byron Station, Units 1 and 2

INSERT C

The UHS maximum basin design temperature is 100°F. To ensure this limit is not exceeded, the cooling tower fan requirements vary with increasing SX pump discharge water temperature. These requirements involve an increasing number of required cooling tower fans to be OPERABLE and whether those fans need to be running in high speed. The design analysis for determining these requirements was based on the worst-case three-hour wet bulb temperature of 82°F. For example, with SX trains cross tied on both units, if SX pump discharge water temperature is < 77°F, then only six of the eight cooling tower fans need to be OPERABLE and none are required to be running in high speed. If the SX pump discharge water temperature is > 91°F and ≤ 96°F, then all eight cooling tower fans need to be OPERABLE and all running in high speed. Detailed limits are included in the LCO section.

When fans are required to be running in high speed the heat transfer is credited immediately following the event because fans will automatically reenergize with the respective diesel generator output breaker auto-closure. When fans are not required to be running in high speed heat transfer is not credited until operator action opens riser valves and starts the fans.

The SX pump discharge water temperature limits are based on a design assumption that in the event of a LOCA, under the most severe design basis weather conditions, and a single breaker failure results in the loss of two cooling tower fans, the Operators will shed heat load by securing up to two of the four reactor containment fan coolers (RCFCs) on the LOCA unit within 21.6 minutes. Only one of the two trains of RCFCs is required to operate for post accident containment heat removal. Also, operators on the non-accident unit will have to monitor and manage the cooldown rate such that SX discharge temperature limits are not exceeded.

The safety analysis evaluates conditions when two SXCT fans are out of service. In the case when both out of service SXCT fans are powered by the same electrical division, a postulated breaker failure associated with the power to the other two SXCT fans in the same tower could result in a configuration with no SXCT fans available on one tower and four OPERABLE SXCT fans on the second tower. In this configuration, the overall cooling tower performance is less than when fans are available on both towers. To support design basis accident heat removal in this configuration the outside air wet bulb temperature needs to be ≤ 76°F.

ATTACHMENT 3

Markup of Technical Specifications Bases Pages for Byron Station, Units 1 and 2

INSERT D

To meet the SX supply design temperature under postulated accident conditions a minimum number of SX cooling tower fans need to be OPERABLE to remove the postulated accident heat load. The number of cooling tower fans required is dependent on whether SX is operated with SX trains on both units cross tied or SX trains on either unit split. Split train operation is defined as both the supply and the return sides of an SX train are separated from the other SX train. Cross tied train operation is defined as either or both the supply and the return sides of an SX train are not separated from the other SX train.

The specific SX pump discharge water temperature, SX cooling tower (SXCT) fans OPERABILITY, and their required operational mode are:

- a. When SX trains are cross tied on both Units;
 1. SX pump discharge water temperature $\leq 77^{\circ}\text{F}$ and 6 OPERABLE SXCT fans;
 2. SX pump discharge water temperature $> 77^{\circ}\text{F}$ and $\leq 82^{\circ}\text{F}$ and 7 OPERABLE SXCT fans;
 3. SX pump discharge water temperature $> 77^{\circ}\text{F}$ and $\leq 84^{\circ}\text{F}$ and 6 OPERABLE SXCT fans running in high speed;
 4. SX pump discharge water temperature $> 84^{\circ}\text{F}$ and $\leq 91^{\circ}\text{F}$ and 7 OPERABLE SXCT fans running in high speed; or
 5. SX pump discharge water temperature $> 91^{\circ}\text{F}$ and $\leq 96^{\circ}\text{F}$ and 8 OPERABLE SXCT fans running in high speed.
- b. When SX trains are split on either Unit;
 1. SX pump discharge water temperature $\leq 82^{\circ}\text{F}$ and 8 OPERABLE SXCT fans; or
 2. SX pump discharge water temperature $> 82^{\circ}\text{F}$ and $\leq 96^{\circ}\text{F}$ and 8 OPERABLE SXCT fans running in high speed.

A cooling tower fan is considered OPERABLE when it has a structurally sound cooling cell, a water distribution system, and the capability of running in high speed for 30 days. The number and configuration of cooling tower fan requirements vary with increasing SX pump discharge temperature.

This SR is modified by a Note. By requiring at least one OPERABLE SXCT fan to be capable of being powered by each electrical division when outside air wet bulb temperature is above 76°F , a postulated worst case single failure could not result in a configuration of no OPERABLE SXCT fans on one of the towers when tower performance is limited by high wet bulb temperature conditions.

ATTACHMENT 3

Markup of Technical Specifications Bases Pages for Byron Station, Units 1 and 2

INSERT E

A.1

If there is less than the number of cooling tower fans running in high speed as required by the operational mode, then actions must be initiated to operate all the required OPERABLE cooling cell fans in high speed. This action ensures the 100°F design temperature limit will not be exceeded during a design basis accident. The immediate Completion Time is reasonable since an OPERABLE cooling tower fan must be capable of running in high speed and the fan can be placed in this condition from the Main Control Room.

INSERT F

C.1

This Condition is applicable when SX is operating in a cross tied configuration on both Units. When outside air wet bulb temperature is > 76 F and at least one SXCT fan is not powered by each electrical division then a postulated worst case single failure could result in no OPERABLE SXCT fans on one tower and four SXCT on the second tower. In this potential configuration design basis SX temperatures could be exceeded. The Required Action is to reconfigure the SXCT fans to eliminate this vulnerability.

The 72 hour Completion Time is reasonable based on the low probability of an accident occurring during the 72 hour timeframe in addition to a single failure disabling two cooling tower fans on the same tower that initially had two inoperable fans.

D.1 and D.2

If the SX pump discharge temperature exceeds 96°F, then the UHS cooling tower fans cannot prevent the design SX system temperature limit of 100°F from being exceeded during a design basis accident. Consequently, in this condition, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in MODE 3 within 6 hours and in MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power in an orderly manner and without challenging plant systems.