Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

March 31, 1992

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555
Attn: Document Control Desk

Subject: Byron Station Units 1 and 2
Application for Amendment to Facility
Operating Licenses NPF-37 and NPF-66
Appendix A, Technical Specifications
NRC Docket Nos. 50-454 and 50-455

Dear Dr. Murley:

Pursuant to 10 CFR 50.90, Commonwealth Edison proposes to amend Appendix A, Technical Specifications of Facility Operating Licenses NPF-37 and NPF-66. The proposed amendment requests changes to Specification 3/4.7.5 and the Bases Section 3/4.7.5 for the Ultimate Heat Sink.

The description, impact, and bases of the proposed changes are contained in Attachment A. The revised Technical Specification pages are contained in Attachment B. The proposed changes have been reviewed and approved by both on-site and off-site review in accordance with Commonwealth Edison procedures. Attachment C describes Edison's evaluation performed in accordance with 10 CFR 50.92(c), which has determined that no significant hazards consideration exists. An Environmental Assessment has been performed and is included as Attachment D. Attachment E contains figures referenced by the text of the submittal. Attachment F provides a list of Byron/Braidwood UFSAR sections which are being revised as a result of the Design Basis Reconstitution process for the Byron Station Ultimate Heat Sink.

Due to the complex nature of submittal, we offer to meet with your staff, at your convenience, to present the basis of the submittal and to answer any questions.

Commonwealth Edison is notifying the State of Illinois of our application for this amendment by transmitting a copy of this letter and its attachments to the designated State Official.

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To the best of my knowledge and belief the statements contained here are true and correct. In some respects, these statements are not based on my personal knowledge but upon information received from other Commonwealth Edison and contractor employees. Such information has been reviewed in accordance with Company practice and I believe it to be reliable.

Please direct any questions you may have concerning this matter to this office.

Respectfully,

Terence K. Schuster

Terence K. Schuster
Nuclear Licensing Administrator

Subscribed and Sworn to before me
this 31st day of March, 1992.

Notary Public

" OFFICIAL SEAL "
SANDRA C. LARA
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 6/25/94

Attachments:
(A): Description and Impact of the Proposed Changes
(B): Proposed Technical Specification Changes
(C): Evaluation of Significant Hazards Consideration
(D): Environmental Assessment Statement
(E): Figures
(F): List of Affected UFSAR Sections

cc:
W. Kropp - Senior Resident Inspector, Byron
A. Hsia - Project Manager (Byron), NRR
B. Clayton - Branch Chief, Region III
Office of Nuclear Facility Safety - IDNS

ATTACHMENT A

DESCRIPTION AND IMPACT OF PROPOSED CHANGES

Background

The ultimate heat sink (UHS) consists of two essential service water (SX) cooling towers and the normal makeup, safety related makeup and backup makeup systems. A simplified general arrangement drawing is provided as Figure 1 in Attachment E. The drawing depicts the tower design and its interconnections with the rest of the SX system. Each of the two safety related mechanical draft cooling towers consists of a water storage basin, four fans, four riser valves and two bypass valves. Normal makeup to the cooling towers is provided from the non safety-related circulating water system with the safety-related emergency supply of makeup water provided by the diesel-driven SX makeup pumps located in the River Screen House. The diesel-driven SX makeup pumps auto-start on low level in their respective basin. Loss of both the normal and safety-related makeup supplies due to natural phenomena such as a tornado, flooding or loss of SX makeup pump suction (due to a seismic event concurrent with low river flow) can be circumvented by use of the backup deep-well makeup pumps.

In early 1991, it became apparent that several UHS design assumptions were indeterminate or different from those previously assumed in the UFSAR and UHS design analysis. Consequently, a design basis reconstitution effort for the UHS was undertaken and completed in 1992. This design review and re-analysis was required to determine the cumulative effect on SX cooling tower performance. The review considered the following items:

a. The regulatory requirements were reviewed to determine the limiting design basis accident (DBA) and the number and type of postulated equipment failures. For design purposes, the worst case accident scenario considered for the Byron Station UHS is a large break Loss of Coolant Accident (LOCA) coincident with a Loss of Offsite Power (LOOP) on one unit, and the concurrent orderly shutdown and cooldown from maximum power to Mode 5 of the other unit using normal operating procedures. This event also includes consideration of the most limiting single active failure. This particular series of initiating event, coincident event, and single active failure is consistent with regulatory requirements and with the design basis event presented to the NRC in Reference 2. The individual scenarios detailed the various initial flow alignments, fans out of service, and single active failures. For each scenario, an analysis case which described the initial conditions, flow distribution, the energy transport, and the available equipment was developed. The scenarios are as follows:

    1) <u>Containment Spray Pump Failure</u>

    The single failure of a containment spray pump was chosen to maximize the peak heat load on the UHS. This failure maximized the peak heat removal rate by the four operating reactor containment fan coolers (RCFCs). The UHS towers were not functionally affected by this failure.

2) Cooling Tower Fan Failure

The single failure of a tower fan affects the heat removal capability of a tower cell. This failure was considered in addition to the two cells that were assumed to be out of service (OOS) initially. Technical Specifications allow two fans OOS without being in an action statement. The accident unit containment heat load on the UHS for this failure corresponds to that generated from 4 RCFCs and 2 containment spray system (CS) pumps operating.

3) Diesel Generator Failure

The single failure of an emergency diesel generator affects UHS heat load, system flows and tower performance. The accident unit containment heat load on the UHS for this failure corresponds to that generated from 2 RCFCs and 1 containment spray pump operating. The SX system flows correspond to one SX pump operating on each unit. In addition to the 2 out of service cells, 2 additional cells were affected by the diesel generator failure.

4) Essential Service Water Pump Failure

The single failure of an accident unit essential service water pump reduces overall system and tower flow rates. The towers were not functionally affected by this failure. The accident unit containment heat load on the UHS for this failure corresponds to that generated from 4 RCFCs and 2 containment spray pumps operating.

The analyses performed for all the above scenarios verified that the peak basin temperature remained below the design temperature of 100° F. Other failures considered resulted in either lower heat input to the tower, no effect on the tower's heat removal capability, or were enveloped by the above limiting failures. These scenarios provided the basis for SX system flow and tower cell flow calculations, containment mass/energy release calculations, tower performance calculations and the overall basin temperature calculations.

b. Previous UHS performance calculations assumed a steady state heat load of 67 MBtu/hr (24 MBtu/hr from the non-LOCA unit plus 43 MBtu/hr from the LOCA unit)[1]. The new steady state heat load from the two units is 103 MBtu/Hr (72 MBtu/hr from the non-LOCA Unit plus 31 MBtu/hr from the LOCA Unit). This results in a greater demand on the SX cooling towers.

c. Several changes were made in the analysis assumptions which resulted in an increased rate of energy transport into the SX system from the LOCA unit containment. The reconstitution study maximized the accident unit containment heat load to the UHS by:

- Postulating scenarios with 4 RCFCs and either 1 or 2 CS pump(s) operating (the maximum number of RCFCs running, assumed previously was 3)

[1] MBtu/hr = million Btu per hour

- Assuming higher SX water flowrates to the RCFCs
- Assuming higher air flowrates to the RCFCs and
- Assuming earlier switchover to containment recirculation phase and correspondingly earlier RHR heat loads for cases where 2 CS pumps are operating.

The analysis resulted in greater LOCA unit containment integrated heat loads of approximately 25% for the first two hours after accident initiation and an increase in LOCA unit containment peak heat load to 830.8 MBtu/hr. These increased heat loads were used for conservatively evaluating UHS tower performance and do not affect previous UFSAR Chapter 6 containment analyses.

d. The worst case meteorological wet bulb temperature for the Byron Station area is 82°F for a 3 hour period, as determined in the UFSAR 30 year climatological record search. It is at the worst meteorological condition for which Regulatory Guide 1.27 states that the UHS must be capable of performing its cooling function for the critical time period (i.e. during the design basis event LOCA/LOOP on one unit and the Non-LOCA unit shutting down). The effect on the cooling tower's ability to reject the design heat loads was considered for the reconstitution analyses utilizing the higher wet bulb temperature of 82°F rather than the previously assumed tower design value of 78°F. The effect of raising the wet bulb temperature was a resultant decrease in the cooling tower performance.

e. The previous analysis utilized a single bounding scenario which assumed 48,000 gpm flowing from two SX pumps to a single tower with 4 cells operating and each cell receiving an equivalent share of the total flow. The assumption of 48,000 gpm for the case where the two pumps are operated in parallel, on a given unit, was in error and provided too high an estimate of system flowrate. The design basis reconstitution effort utilized a calibrated computer model of the SX system to determine SX pump and individual tower cell flow rates for various postulated accident scenarios.

Numerous calculations were performed to evaluate the time dependent basin temperature responses. These calculations included sensitivity runs to evaluate the effect of varying the fractions of flow and energy to the towers by ± 10%. The results of the calculations verified the basin temperature does not exceed 100°F under the worst case accident scenario.

Description of the Proposed Changes

Reference 1 documents the Design Basis Reconstitution effort for the Byron Ultimate Heat Sink (UHS). As a result of this effort, Technical Specification 3/4.7.5 and the Bases for the specification are being revised to clarify the current UHS design and to preserve the assumptions used in the current UHS analyses. The Updated Final Safety Analysis Report (UFSAR) is being revised for the same reasons. A list of affected UFSAR sections is provided in Attachment F. In addition, other changes to the Specification are proposed that did not result directly from the design basis reconstitution.

The marked up Technical Specification pages indicating the proposed changes are provided in Attachment B. A discussion of each change follows. The changes have been classified into 6 groups: 1) SX fan operation and SX pump discharge temperature Limiting Conditions for Operation (LCO), 2) SX fan operation Action Requirements, 3) UHS cooling tower basin level switch operability, 4) addition of the provision that Specification 3.0.4 is not applicable to the SX makeup pump Action Requirements, 5) editorial changes, and 6) Technical Specification Bases rewrite.

1. **Essential Service Water Fan and Temperature Limiting Condition for Operations (LCO)**

Description and Bases of the Current Requirement

The current Technical Specification 3.7.5.b requires four Essential Service Water System (SX) fans operable with only one unit operating. With both units operating, 3 fans with power supplied from each unit are required to be operable for a total of six fans. LCO 3.7.5.d requires the SX pump discharge temperature to be less than 80°F with less than 4 fans running in high speed or less than 98°F with all fans running in high speed.

The current Technical Specification fan operability requirements are based on the original cooling tower analyses which determined the SX pump discharge water temperature remained less than 98°F. Therefore, the analyses verified that the temperature of the water inventory within the UHS basin remains less than the design maximum value of 100° F. This 100° F temperature limit is specified to assure: 1) the maximum Reactor Containment Fan Cooler Inlet temperature assumed for the containment heat removal safety function is maintained; and 2) the inlet temperature assumed for equipment coolers serviced by the SX System is not exceeded. The original analyses considered a time-dependent LOCA heat load that peaked at about 100 seconds at a value of 556 MBtu/hr, utilized the thermal capacity of the essential service water and assumed the following: 1) an initial SX pump discharge temperature of 90°F, 2) 78°F ambient wet bulb temperature, and 3) four cooling tower cells available to accommodate the design basis accident heat load (References 2 & 3). Six of the eight cooling tower cells were required to be operable during two unit operation. A single active failure of the emergency diesel generator was postulated to cause the loss of two cooling tower fans, leaving four cooling tower cells available to remove the design basis heat load.

Description and Bases of the Requested Revision

Technical Specification LCO 3.7.5.b is being revised to require 6 fans operable in the high speed mode with either one or both units in Mode 1-4. The revision also removes all unit specific fan requirements. The essential service water pump discharge temperature limit in LCO 3.7.5.d is being reduced from 98°F to 96°F. Unchanged is the statement that when the SX pump discharge temperature is between 80°F and its upper limit (96° F in this proposal), then the required operable fans must be running in high speed. The 96°F SX pump discharge temperature limit with all operable six fans running, assures that the initial cold water basin temperature assumption used in the basin temperature calculations for this mode of tower operation remains valid. The proposed number of fans and temperature limit requirements are based on the results of calculations performed for the reconstitution effort. The calculations performed are explained in detail below.

Time dependent basin temperature calculations were performed to determine the temperature response for the essential service water system. The results of the calculations verified that the basin temperature does not exceed 100°F under the postulated accident scenarios. The basin temperature calculations used the following assumptions/inputs:

a. The rationale for initial cold water basin temperature was as follows:

   1. Both the current and proposed Specifications do not require any fans running in high speed when the basin temperature is less than 80°F. Therefore, a group of single failure scenarios were analyzed assuming an initial basin temperature of 80°F and assuming no fans were initially running. These scenarios did not take credit for UHS heat transfer to the atmosphere until post-LOCA operator actions were initiated to open riser valves and start fans. During the initial phase of these calculations the thermal capacity of the water present in the SX System and cooling tower basin was solely relied upon to accept heat. Figure 2 depicts the basin temperature response for the worst case scenario starting at an initial basin temperature of 80°F, that of a single cooling tower fan failure.

   2. Scenarios were analyzed assuming an initial basin temperature of 88°F. Existing administrative controls for the UHS require unit shutdown if the tower basin temperature is over 88°F. In these scenarios, UHS heat removal was credited immediately following the event because present administrative controls require six tower fans running in high speed when the basin temperature is greater than or equal to 80°F. Dependent upon the scenario, the fans not subject to a single active failure, would either remain running or auto-reenergize with the respective diesel generator output breaker auto-closure.

3. Scenarios were analyzed using the proposed SX pump discharge temperature Technical Specification limit of 96°F. In these scenarios, UHS heat removal was credited immediately following the event because the proposed specification and administrative controls will require six tower fans running in high speed when the basin temperature is greater than or equal to 80°F. Dependent upon the scenario, the fans not subject to a single failure, would auto-reenergize with the respective diesel generator output breaker auto closure. The peak basin temperature was determined to occur for the case of a failed cooling tower fan, in combination with two previously OOS fans. This case resulted in only 5 fans running in high speed. The heat load for this case (Figure 4), corresponds to that generated with 4 RCFCs and 2 CS pumps. Figure 3 depicts the basin temperature response for this case. The calculations demonstrate that the peak basin temperature does not exceed 100°F.

4. Scenarios were analyzed using the existing SX pump discharge temperature Technical Specification limit of 98°F. In these scenarios, UHS heat removal was credited immediately following the event because administrative controls require six tower fans running in high speed when the basin temperature is greater than or equal to 80°F. Dependent upon the scenario, the fans not subject to a single active failure, would auto-reenergize with the respective diesel generator output breaker auto-closure. A series of engineering calculations demonstrates that with an initial basin temperature as high as 98°F the design basis accident scenario would result in a peak SX temperature of 100.5°F. It would remain above the design limit 100°F for less than 10 minutes.

b. Cooling tower cold water basin level was assumed to be at the Technical Specification minimum of 50%. This conservatively provides the minimum available volume of water inventory in the UHS basin and for the SX system to serve as a heat sink. Basin levels above 50% provide additional volume that would increase the thermal capacity of the water inventory and result in a lower peak basin temperature.

c. Initially, the essential service water system was assumed to be aligned in the normal operating configuration of one pump operating per unit, the pump discharge train-crosstie valves open, the pump discharge unit-crosstie valves closed and the return header crosstie valves open. The normally operating heat exchangers and coolers were assumed to receive flow.

d. It was assumed that two cooling tower cells were initially out of service and the corresponding riser valves were closed since current requirements of Technical Specifications allow this. The scenarios considered either one cell out of service on each tower or two cells out of service on one tower, depending on whichever was the most limiting.

e. Tower bypass valves were assumed to be closed.

f. When operator actions were required in the main control room, it was assumed these actions occurred 10 minutes following safeguard signals. This caused a ten minute delay before heat removal via the fans began. The 10 minute delay allowed the main control room operator to reach the applicable step in the Byron Emergency Procedures and complete alignment of fans and riser valves on the cooling tower. This was a reasonable assumption because all actions are achievable from within the control room, the actions appear early in the emergency procedures, and no local operator action is required.

g. The two essential service water pumps on the accident unit were assumed to operate following the LOCA based on auto-start signals, unless the single active failure prevented one pump from starting. The non-accident unit pump that was running initially was assumed to remain running. It was assumed that only one non-accident unit SX pump was running in the post accident mode since the non-running pump would not receive an auto-start signal.

h. All safety related essential service water system heat exchangers and coolers were assumed to be aligned for service based on ESF signals created by post-LOCA conditions.

i. The flows to the individual tower cells were determined based on the system alignments under different accident scenarios. The data was used to determine the amount of flow and energy going to each of the cooling towers.

j. The steady state heat loads of 31 MBtu/hr from the accident unit and 72 MBtu/hr for the other unit were used. These steady state heat loads were added to the LOCA Unit containment heat loads to obtain the total heat load on the UHS for the basin temperature calculation. The LOCA energy profiles for various single failure modes were obtained from a calculation performed by CECo. As an example, Figure 4 graphically represents the transient UHS total heat load generated from 4 operating RCFCs and 2 operating CS pumps. This calculation provides the highest integrated head load over an 8 hour period. The corresponding response of basin temperature is shown in Figures 2 and 3.

k. An ambient wet bulb temperature of 82°F was utilized for the analyzed cases.

l. Tower performance was modeled using a computer program developed by Environmental Services Corporation (ESC), modified to specifically represent the Byron cooling towers. In all of the cases, the cooling tower performance curves were generated using a flow slightly higher than the average tower cell flow. This method gave a conservative estimate of the cooling tower performance since the tower performance decreases with increasing flow, assuming a constant number of cells in service.

Several of the assumptions utilized in the calculations were inherently conservative. These conservatisms, while not being quantitatively analyzed, provide additional margin to the 100°F SX system basin design temperature. Some of the major conservatisms are:

1) Basin level was assumed to be at the Technical Specification minimum of 50%. The basin is normally maintained at 82% level, which would provide additional water inventory heat capacity.

2) No credit was taken for ambient heat dissipation in passive cooling tower cells (i.e. those cells with riser valves open but the fans off). Any cooling that occurs from these passive cells or from fans running in low speed would further limit basin temperature hence providing more margin to the maximum allowed basin temperature.

3) The 80°F basin temperature calculations which bound operations of the tower at ≤ 80°F basin temperature assumed 10 minutes for operator action to align riser valves and start the fans in high speed. The fans will be running in high speed earlier than the analysis assumed when started in accordance with emergency operating procedures.

4) No credit was taken for the cooling contribution from the makeup flow of any of the makeup systems. The makeup system for the UHS takes a suction from the Rock River or from the deep well system.

5) More fans than assumed in the analysis are usually maintained functional.

The time dependent basin temperature calculations were performed using the fan operability requirements proposed in LCO 3.7.5.b. Initial basin temperatures ranging from 80°F to 98°F were used to analyze the post accident basin temperature response following a variety of postulated failures. The scenario that provided the highest peak basin temperature was when there were 4 operating RCFCs, 2 operating CS pumps and a single failure of an SX cooling tower fan (worst case scenario). The peak basin temperature remained under 100°F with an initial basin temperature of less than or equal to 96°F for all scenarios evaluated.

The SX pump discharge temperature limit of 80°F, with less than 6 fans running, assures that adequate thermal capacity is available in the SX water inventory to absorb the initial heat input prior to operator action to open risers and start the cooling tower fans. Operator action in the Control Room is assumed to occur at ten minutes after the event initiation. In that time, SX basin temperature is assumed to increase until the operators have re-aligned the cooling tower.

Two assumed failures that directly affect tower functionality are a single SX fan failure or a single emergency diesel generator (EDG) failure. Failure of any SX fan (starting with 6) will result in 5 fans remaining to dissipate the heat from the postulated accident. For these scenarios, the remaining fans are sufficient to remove the full LOCA heat. Failure of an EDG could result in a total of only 4 fans being available (assuming 2 initially OOS and loss of 2 more fans). If an EDG were to fail on the LOCA/LOOP unit, only one SX pump would be running to cool the essential loads. In addition, one RCFC train would not operate as a result of the EDG failure. The fans of the affected RCFC train would remain deenergized and the RCFC discharge check dampers would close. The resultant heat removal from the LOCA containment would be approximately one half of the value calculated for cases where all 4 RCFCs function. For these scenarios any 4 SX fans are sufficient to remove the LOCA heat.

For cases where basin temperature is >80°F but <96°F, calculations assumed that the required operable fans were initially running in high speed. The same number of fans as discussed for each of the cases above are required. The difference is that with the temperature above 80°F, the fans need to be running.

Impact of the Proposed Change

The proposed changes for the LCO in conjunction with the original LCO requirements reflect the conditions and assumptions of the design calculations. With this newly defined specification, the UHS will always be in a condition to perform its specified function assuming a worst case single active failure and under worst case environmental conditions. With the basin temperature less than 80°F, no fans need to be running initially because the calculations have shown there is sufficient time for the operators to manually start the fans during a design basis limiting accident scenario and still keep SX cooling water temperatures under the 100°F limit. With basin temperatures above 80°F and less than or equal to 96°F, fans running in high speed are needed immediately at the onset of the design basis limiting accident scenario. Consequently, the LCO requires fans to be running in high speed when basin temperatures are in this range.

2. **Essential Service Water Fan Action Requirements**

Description and Bases of Current Requirement

Technical Specification 3.7.5 Action b requires that if one of the fans required in the LCO combination is inoperable then it must be restored within 72 hours or the unit must be shutdown. The UHS could perform its specified function under the design basis limiting accident scenario if a single active failure is not assumed. Only 72 hours of continued operation are allowed in this degraded condition.

Technical Specification 3.7.5 Action (d) requires the appropriate unit(s) to be in Hot Standby in 6 hours and in Cold Shutdown in 30 hours if an essential service water pump discharge temperature exceeds the LCO limits of Specification 3.7.5.d. At Byron Station, pump discharge temperature is the only installed indication that conservatively reflects the UHS basin temperature. Since both units' SX pumps take suction from each of the UHS basins, this action requirement, in effect, would require both units to shutdown if both units were in Modes 1-4. Exceeding the basin temperature limits would put the units in a condition outside its design basis analyses; consequently, an immediate shutdown is required.

Description and Bases of the Requested Revision

Technical Specification 3.7.5 Action b is being revised to require that if only 5 fans are operable in the high speed mode (LCO 3.7.5.b), then within one hour verify that the remaining fans are capable of being powered from their respective diesel generator. Restore at least 6 fans to operable status in 72 hours or shutdown the units.

During operations with a unit in Modes 1-4, emergency diesel generator (EDG) inoperability on the unit susceptible to the DBA LOCA/LOOP, is constrained by Technical Specification LCO 3.8.1.1 which provides maximum allowed outage times (AOTs) for either a single EDG (72 hours) or two EDGs (2 hours) inoperable. After this AOT is used, the subsequent action specified is for the affected unit to achieve Hot Standby conditions in 6 hours and Cold Shutdown in the following 30 hours. The existing action requirements of Specification 3.8.1.1 assure a limited time of unit operation is allowed for conditions involving inoperable EDGs.

During a DBA LOCA/LOOP on one unit, or only a LOCA on one unit, calculations show that 5 SX fans are necessary to dissipate the energy assuming all ESF equipment functions. Four SX Fans are necessary to dissipate the energy when unavailability of an EDG, in conjunction with an offsite power loss to the LOCA unit, results in approximately one-half containment heat input.

The "EDG requirement" of Action 3.7.5b assures that possible concurrent reliance on the actions of LCO 3.8.1.1 does not result in an unanalyzed condition, while continuing to operate under the provisions of this action. It is important that at least 4 fans are powered from their respective emergency diesel generators since the analyses for one-half containment heat input assumed 4 fans are running in high speed either at the onset of the accident (for scenarios analyzed at 96°F) or at 10 minutes into the event (for the scenarios analyzed at 80°F). Present emergency procedures start fans with supplied ESF power either from Station Auxiliary Transformers (SATs) or emergency diesel generators. No credit is taken for cross-tying the ESF buses to provide an emergency power supply for any fans, although this could be done if it were necessary. In conclusion, the additional requirement of an EDG being operable for each fan relied upon assures the minimum number of fans are available to safely shutdown the plant assuming a DBA LOCA/LOOP on one unit and a concurrent safe shutdown of the opposite unit.

No change to Technical Specification 3.7.5 Action (d) has been requested.

Impact of the Proposed Change

The proposed Action Requirement b is consistent with LCO Action Requirement development methodology. When observing the conditions of this action requirement the UHS can still perform its specified function for the design limiting accident scenario; however, it cannot meet the single active failure requirement. The 72 hours allowed outage time has not changed. Since AOTs and limitations on the degree of equipment inoperability are specified, the operation allowed by this action statement is consistent with accepted methods. If equipment is degraded beyond the limitations of Action 3.7.5.b, then Specification 3.0.3 applies.

3. **UHS Cooling Tower Basin Level Switch LCO, Action Requirements, and Surveillance Requirements**

Description and Bases of the Current Requirement

There are currently no explicit operability requirements for UHS cooling tower basin level switches. Byron Station conservatively interprets the current Action 3.7.5.c to mean that when a basin level switch fails, the automatic start signal to the essential service water makeup pump is not operable, and therefore the makeup pump is considered inoperable. This is very conservative because the makeup pump is still functional and can be started manually either from the main control room or locally. The control room basin level indication is not related to the level switches that auto-start the makeup pumps. Therefore, operators have level indication if a level switch were to fail.

Description and Bases of the Requested Revision

A new requirement is proposed in specification 3.7.5.e to require two operable UHS cooling tower basin level switches. The corresponding action statement would require within 72 hours that, with one switch inoperable, the switch be restored or both basin levels be verified ≥ 82% within the next hour and every 2 hours thereafter. Otherwise, the reactor must be in at least Hot Standby within the next 6 hours and in Cold Shutdown within the following 30 hours. If both switches are inoperable, the action statement requires, within one hour, either restore one switch and follow the first action requirement, or verify both basin levels are ≥ 82% every 2 hours. The shutdown requirements would be the same as above. Also included is the requirement to provide a special report to the Commission if any of the switches are inoperable for greater than 30 days. A surveillance requirement is also proposed in 4.7.5.g explicitly requiring that the UHS cooling tower basin level switches be demonstrated operable by the performance of a channel calibration at least once per 18 months.

The new basin level switch operability requirements provide an alternate method to maintain the required UHS cooling tower basin level when a basin level switch is inoperable, preventing essential service water makeup pump automatic start on low basin level. With an inoperable basin level switch, basin level is increased to a point that a surveillance can adequately ensure that the basin low level limit of 50% is maintained. During this period the makeup pumps would be manually started if required to maintain basin level.

The proposed Action e., which raises level to 82%, is similar to the actions for one essential service water makeup pump inoperable (Action c.2), high Rock River water level (Action f.1 & f.2), low Rock River level (Action g.2.a & g.2.b), and a tornado watch (Actions h.1 & h.2).

The basis for this action was provided in an application for amendment to Facility Operating Licenses NPF-37 and NPF-66 transmitted in a letter from R.A. Chrzanowski to Dr. T.E. Murley dated May 24, 1989. Technical Specification Amendment 32 was approved by the NRC as documented in the Safety Evaluation transmitted by a letter from L.N. Olshan to T.J. Kovach dated August 15, 1989. These amendments modified Technical Specification 3.7.5 to utilize the seismically qualified deep well pumps in several instances instead of the essential service water make-up pumps to satisfy the design bases of the ultimate heat sink. Since the deep well pumps do not have an automatic start feature on low essential service water basin level, a calculation was performed to determine an initial increased operating level, such that basin level would not fall below the Technical Specification limit within a specified surveillance time interval.

The calculation took into consideration basin inventory losses from evaporation, blowdown and drift for "worst 30 day" and "worst day" weather condition periods, and a heat load on the tower that corresponds to power operation on one unit and normal shutdown on the other unit. Normal makeup was assumed to be lost. This calculation determined that if the basin level were raised to 80% and verified every two hours, a sufficient inventory of water would be available in the basin at the start of an accident which relies on cooling tower basin inventory for mitigation.

During the period when the basin level switches are inoperable, there may be evolutions that affect level beyond the evaporation, drift, blowdown and heat load requirements resulting from starting or stopping an essential service water pump, changing riser valve positions, or backwashing strainers. Of these evolutions, backwashing the strainers has the greatest impact on the UHS cooling tower basin level. An additional margin of 2% was added to the Technical Specification basin level when the level switches are inoperable to account for basin level changes during strainer backwashing. Therefore, basin level will be raised to > 82%. At 82%, water level is above the basin overflow and the basins are interconnected. The essential service water makeup pumps can be started as required. Increasing the basin level to > 82% and verifying level every 2 hours will ensure that the water level remains above the Technical Specification minimum of 50%.

As part of the design reconstitution effort, an updated analysis was performed to determine the effect of increased accident heat loads on the evaporation rate and the adequacy of the makeup system to replenish basin inventory. These calculations evaluated the basin volume change as a function of time. The first calculation evaluated makeup from the Rock River using the SX makeup pumps starting with 50% initial basin level. A single active failure caused one SX makeup pump to fail. The calculation took into consideration basin inventory losses from blowdown, auxiliary feedwater supply, evaporation rate based on meteorological conditions for a worst 24 hour period and heat load on the tower that corresponds to the highest integrated heat load for the first eight hour period. This calculation determined that adequate makeup capacity exists to replenish basin inventory.

A second calculation evaluated makeup from the deep well pumps. The accident scenario assumed the makeup from the Rock River is unavailable due to low flow or level, basin level is initially at 82%, and a single active failure caused one deep well pump to fail. A two hour delay was assumed for the operator to start the deep well pump(s) locally and to align the system to deliver water to the basins. The calculation used the same basin inventory losses as described above. This calculation also determined that adequate makeup capacity exists to replenish basin inventory and that adequate inventory exists in the basin throughout the event to assure SX system operability.

Actions e.1.a and e.2.a state that the provisions of Specification 3.0.4 are not applicable. This allows mode changes while in the Action statement for the inoperable basin level switches. The basin level is maintained at a conservatively high level since automatic makeup is not available. Previous calculations demonstrated there was sufficient time to manually initiate deep well makeup to the UHS. The same reasoning applies to the essential service water makeup pumps. Considering that the essential service water makeup pumps have a greater capacity than the deep well pumps, level would recover more rapidly. Since there is still redundant manual makeup capability to the basins and sufficient time before manual action is required, it is acceptable that the provision of Specification 3.0.4 is not applicable.

Impact of the Proposed Change

The proposed change provides an alternate method to maintain UHS cooling tower basin level when basin level switches are inoperable. The alternate method is consistent with existing Technical Specification actions that replace automatic makeup capability with manual makeup capability. Based on design calculations the proposed alternate basin levels and surveillance provide adequate measures to assure that basin inventory is available to support UHS and essential service water operation for normal operation and accident conditions. Therefore the proposed change has no impact on plant safety.

4. Essential Service Water Makeup Pump Action Requirements

Description and Bases of the Current Requirements

The current Action Requirement for SX Makeup trains does not allow a mode change pursuant to Specification 3.0.4.

Description and Bases of the Proposed Requirements

The proposed change to Action c.2 adds that the provisions of Specification 3.0.4 are not applicable. That is, a unit can enter into an operational mode with one essential service water makeup pump inoperable as long as the same train deep-well pump is operable and both UHS cooling tower basin levels are greater than or equal to 82%. This is consistent with the Technical Specification 3.7.5 requirements of Actions f.1, g.2.a., and h.1. Engineering calculations have shown that the UHS can perform its specified function for the limiting accident scenario with both deep well trains available as the only source of makeup water.

The intent of Specification 3.0.4, in general, is to ensure that facility operation is not initiated with inoperable equipment or systems. Exceptions to this provision are allowed if it can be demonstrated that the inoperable equipment does not affect plant safety.

Impact of the Proposed Change

This change has no impact on plant and public safety. The backup deep well train and increased basin level requirement provides sufficient assurance, for the maximum of 14 days that a train of SX makeup may be inoperable, that adequate makeup flow will be available. The deep well makeup trains are seismically qualified and powered from an ESF bus. An allowance for the unit(s) to enter an operational mode, with one train of SX makeup inoperable and the compensatory actions of increasing the basin level and verifying the corresponding deep well train is operable, does not affect plant safety.

5. **Editorial Changes**

The following changes are considered editorial in nature to correct, clarify or otherwise unclutter the Specification. These changes do not, in any way, affect the technical or regulatory requirements of the Specification.

a. The first sentence of Specification 3.7.5 is revised to state that the ultimate heat sink shall be operable. This is more accurate than stating that all of the LCO requirements are applicable to the cooling towers. In addition, there is one common ultimate heat sink, not two independent sinks.

b. Proposed changes to LCO a, Action a, and Surveillance a express the cooling tower basin level limit as a percentage. There is no reading available for "feet Mean Sea Level". This corresponding elevation is being moved to the Bases section. No change to the operating limit is proposed. LCO a is reworded for consistency with the LCO format.

c. The footnote is being deleted from LCO 3.7.5.d because it is no longer required. This applied during UHS cooling tower performance testing, which is now complete. The corresponding asterisk is also deleted.

d. Specification 3.7.5 Action c revisions include correcting a punctuation error in the first line, and using the proper capitalization of "status" and "MODE". Mode should be capitalized because it is defined in the Technical Specifications; status is not. The proposed action verifies that both basin levels are greater than or equal to the limit for consistency with the other action statements. In addition, the last sentence will appear as part 3 to maintain a consistent format. An extraneous hyphen is being deleted from "30-hours".

e. The word "continued" is being deleted from the Surveillance Requirements page because it is the first page. The revision to Surveillance Requirement 4.7.5.d clarifies that fan operability must be verified in the high speed mode. Verifying high speed mode operation is also consistent with the LCO requirement to maintain the required fans capable of running in the high speed mode.

f. Changes to Surveillance Requirements 4.7.5.e.2 and 4.7.5.e.4 to add the words "at least" before "30 minutes" and "15 minutes" is a clarification. The diesel powered SX makeup pump shall be operated for at least 30 minutes and the deep well pumps shall be operated for at least 15 minutes; not operated for exactly 30 minutes or 15 minutes, respectively.

g. An additional change to Surveillance Requirement 4.7.5.e.2 deletes the requirement that the test signal be simulated. The low basin level test signal may be actual or simulated, allowing more flexibility in performing the surveillance.

h. A surveillance that requires a visual inspection to verify that there is no abnormal breakage or degradation of the fill materials in the UHS cooling tower is being added as Technical Specification 4.7.5.j. The identical surveillance requirement currently exists in Technical Specification 4.7.4.c and it will be removed in a future Technical Specification amendment being developed in response to Generic Letter 91-13, "Essential Service Water System Failures at Multi Unit Sites". This change is proposed because the cooling tower is part of the Ultimate Heat Sink, and surveillance of the tower fill materials is more appropriate in Technical Specification 4.7.5.

6. Technical Specification Bases

Description and Bases of the Current Requirement

The current Bases for Technical Specification 3/4.7.5 is reviewed in the previous sections of this proposal. The fan operability and basin temperature limits were selected to ensure that adequate cooling is available for critical safety related equipment and to ensure adequate heat dissapation capability for a DBA containment heat load.

Description and Bases of the Requested Revision

The Bases were re-written to reflect the results of the design basis reconstitution effort initiated for Byron's Ultimate Heat Sink. This study identified items that were indeterminate or different from those previously assumed for the UHS in the UFSAR and UHS design analysis. These items affected the calculated performance of the cooling towers during a postulated design basis accident.

The current Bases were re-evaluated and revised based on calculations incorporating the limiting design basis event with certain postulated equipment failures. Discussion of basin temperature following a design basis tornado event has been removed from the Bases.

Impact of the Proposed Change

An ultimate heat sink design bases reconstitution effort and operability assessment process re-defined the design basis accident and identified new limits. The new limits assure that the UHS is capable of performing its two principle safety functions of dissipating decay heat energy after a reactor shutdown and dissipating decay heat energy and containment stored heat energy following an accident. The bases were re-written to incorporate only those items applicable to Technical Specification Limits.

References

1. January 9, 1992 letter from T.K. Schuster to Dr. T.E. Murley, UHS Design Basis Reconstitution Final Report.

2. May 29, 1987 letter from K.A. Ainger to USNRC, Document Control Desk, Essential Service Water Cooling Towers.

3. May 26, 1987 letter from K.A. Ainger to USNRC, Document Control Desk, Essential Service Water Cooling Towers.