UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 11, 2009

Mr. Charles G. Pardee
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BYRON STATION, UNIT NOS. 1 AND 2 - REQUEST FOR ADDITIONAL INFORMATION RELATED TO LICENSE AMENDMENT REGARDING ULTIMATE HEAT SINK (TAC NOS. ME1669 AND ME1670)

Dear Mr. Pardee:

By letter to the Nuclear Regulatory Commission (NRC) dated June 30, 2009 (Agencywide Documents Access and Management System Accession No. ML091831253), Exelon Generation Company, LLC (the licensee), submitted a license amendment request to revise Technical Specification 3.7.9, "Ultimate Heat Sink (UHS)," to add additional essential service water (SX) cooling tower fan requirements as a function of SX pump discharge temperature to reflect the results of a revised analysis for the UHS.

The NRC staff is reviewing your submittals, and has determined that additional information is required to complete its review. The specific information requested is addressed in the enclosed Request for Additional Information (RAI). The RAI was discussed with your staff on December 8, 2009, and they agreed to respond within 45 days after the date of this letter.

The NRC staff considers that timely responses to requests for additional information help ensure sufficient time is available for staff review and contribute toward the NRC's goal of efficient and effective use of staff resources. If circumstances result in the need to revise the requested response date, please contact me at (301) 415-1547.

Sincerely,

Marshall J. David, Senior Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-454 and STN 50-455

Enclosure:
Request for Additional Information

cc w/encls: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION

BYRON STATION, UNIT NOS. 1 AND 2

DOCKET NOS. STN 50-454 AND STN 50-455

The Nuclear Regulatory Commission (NRC) staff is reviewing Exelon Generation Company, LLC's (the licensee's) license amendment request (LAR) dated June 30, 2009 (Agencywide Documents Access and Management System Accession No. ML091831253). The LAR requests to revise Technical Specification (TS) 3.7.9, "Ultimate Heat Sink (UHS)," to add additional essential service water (SX) cooling tower fan requirements as a function of SX pump discharge temperature to reflect the results of a revised analysis for the UHS. The NRC staff has determined that the following additional information is required to complete its review.

1. Operator Actions

   a. Based on the revised design basis analysis for the UHS, it appears that there are two manual actions being credited: 1) manual initiation of cooling tower fans at the 10 minute mark of a loss-of-coolant accident (LOCA - scenarios 8D and 8D1); and 2) shedding of half the heat load at or prior to the 30 minute mark of a LOCA. Are these the only two manual actions being credited in the new UHS analysis? If not, please identify all manual actions being credited in the UHS analysis.

   b. Have any available times for significant operator actions been reduced for other accident scenarios and events, such as anticipated transients without scram, due to the revised UHS analysis? If so, list the operator actions required and the completion times assumed in the analysis.

2. Operating Procedures

   a. Describe any changes to operator actions in the emergency operating procedures, abnormal operating procedures, or other procedures required by the proposed LAR and how these changes will be integrated into the operator training program.

   b. What alarms, annunciators, or other alerting mechanism will be used to cue the operators that actions are required?

   c. Given that the assumed actions for UHS occur during the first 10 minutes and the first 30 minutes of a LOCA, what alternative actions are possible if an operator error of omission or timing occurs? What feedback or cue will alert operators to the fact that a required action has not been completed?

3. Control Room Controls, Displays (Including the Safety Parameter Display System), and Alarms

   a. Describe any changes, additions, or deletions to the main control room interface including setpoint changes and alarms.

   b. What, if any, plant specific simulator modifications will be required?

ENCLOSURE

4. Control Room Plant Reference Simulator

   a. How will the licensee verify the plant simulator's fidelity after the proposed LAR-related modifications are made?

   b. How have credited operator actions been validated as feasible and reliable? Include a discussion of both in-control room and ex-control room actions.

5. Attachment 4, "Analytical Basis for Proposed Changes to TS," and Attachment 7, "Evaluation of Additional Scenarios for Postulated Single Failures," of the June 30, 2009, LAR provide the scenarios for postulated single failures of electrical circuit breakers serving SX system components occurring concurrent with a LOCA and a loss of offsite power on one unit with the opposite unit in normal shutdown. Provide a detailed discussion and supporting calculations why the scenarios analyzed in the LAR are bounding, considering both active and passive failures.

6. Attachment 5, "Validation of Assumption 3.1 of Analytical Basis for Proposed Changes to Technical Specifications (TS)," of the LAR discusses the validation of Assumption 3.1 from the calculation in Attachment 4. Assumption 3.1 states that the fraction of water cooled for SX cooling tower cells with fans not running is assumed to be 0.10 (i.e., 10 percent) of the water delivered to that cell is effectively cooled. Assumption 3.1 also states that the cooling tower manufacturer provided 10 percent as a reasonable estimate for minimum cooling tower performance without fan air flow. Attachment 5 assumes an initial service water temperature of 98°F (Section 2.3), and the resulting maximum basin temperature is 113.7°F, when 10 percent cooling was used. Attachment 5, Section 8.0 concludes that, in comparison, greater than 10 percent cooling was used to calculate the maximum basin temperature of 109.3°F in Ceramic Cooling Tower Company Engineering Report NCT-683-55, "Response to Sargent and Lundy letter of 11-17-81; Complete Loss of Fans," and hence, 10 percent cooling is conservative. However, Report NCT-683-55 (page I15 of Attachment 5) states that the initial SX temperature entering the plant is 91°F and, after the first cycle of cooling, the water leaving the fill area is 92.8°F. Provide a detailed explanation of the assumptions used in Report NCT-683-55 with regard to the SX temperature used. In addition, explain how the calculations are correlated (and can be compared) when different initial conditions are used, and how the comparison of the calculations validate the 10 percent cooling. Furthermore, is the value of 10 percent cooling affected by weather conditions such as outside temperature, wet bulb temperature, or humidity? If so, provide a detailed explanation of how the 10 percent value is conservative under different weather conditions.

7. The fan requirements of the UHS are dependent on the SX pumps' discharge temperature. New TS Table 3.7.9-1 states these fan requirements and defines the associated Limiting Condition for Operation (LCO). Note (a) of this table could be construed to reduce the fan requirement when in Condition B. Since this note is associated with the column of the table that specifies LCO requirements, an interpretation of Note (a) could imply that the fan requirements for the LCO are satisfied if in Condition B and there is one less fan running in

high speed. Then one might conclude the plant is no longer in Condition B. This could present confusion as to the actual condition of the UHS.

Furthermore, Condition A explicitly states that if one or more required cooling tower fans are not running in high speed, then actions must be taken immediately to correct the condition and, if not corrected immediately, then Condition J should be entered and the plant must be shutdown. This would mean that when the plant was running high speed fans to meet the LCO requirements of Table 3.7.9-1 with the other fans out of service, failure of one or more of the running fans would cause entry into Condition J and Mode 3 in 6 hours. The same situation would exist if SX temperature increased such that an additional fan in high speed was required in accordance with Table 3.7.9-1 and an additional fan was not available.

Per discussion with the licensee via telecom on November 18, 2009, the licensee stated that the intent was, if in Condition B, to keep the remaining fans running in high speed during the 72 hours that the UHS was in Condition B. The intent was also to exit Condition A, if also in Condition B, and only one required fan (not more than one fan) was not running in high speed.

The licensee needs to explain how Note (a) of Table 3.7.9-1 and Condition A are not subject to possible misinterpretation or reword/relocate Note (a) of Table 3.7.9-1 and Condition A, as applicable, such that the intent of the LCO, Condition, Required Actions, and Completion Time of Conditions A and Condition B are not subject to possible misinterpretation.

8. Each accident scenario described in Attachment 4 to the June 30, 2009, LAR specifies that half of the reactor containment fan cooler (RCFC) heat load is subtracted at 30 minutes. The "UHS Accident Heat Load Profile L42" for each accident scenario shows the slope of the decreasing heat rate (MBTU/hr) input into the UHS becoming less negative at the time (approximately 1800 sec) when the RCFC heat load is removed from the UHS. Intuitively, it should be more negative because a set of RCFCs is no longer providing heat to the UHS.

   a. Explain why the heat load profile shows a decrease in the slope of the decreasing heat rate profile at 1800 seconds. How does this relate to removing one-half the RCFC heat load to the UHS?

   b. What is the cause of the rapid decrease in the heat input at t = 1400 seconds?

9. Assumption 3.3 in Attachment 4 of the LAR states that, for scenarios 8D and 8D1, no cooling is credited prior to fan initiation at 10 minutes after the LOCA.

   Cold weather scenarios 10 through 13 require fans to be started and riser valves to be opened within 10 minutes of the LOCA and bypass valves to be manually shut within 30 minutes.

   a. Explain the existing or planned processes and procedures that cause the required number of fans, the required fan speed and applicable valves to be open or shut within 10 and 30 minutes after the LOCA such that UHS basin temperature will not exceed 100°F.

b. Specify what operator actions from the control room and outside the control room, and their time completion requirements, are necessary for each scenario.

c. Explain the basis for assuming initial basin temperature is 74°F in scenarios 10 through 13.

10. The LAR specifies a new Surveillance Requirement 3.7.9.10, which will check outside wet bulb temperature every 12 hours. Discuss what instrumentation will be used to obtain these temperature measurements.

11. Attachment 4, Section 6.0, Method of Analysis, refers to the "ESW [essential service water] cooling tower transient model" from Appendix G of calculation NED-M-MSD-009.

    a. Discuss the origin of this model and how it relates to the current licensing basis of the UHS.

    b. For the cooling tower transient model:

        - Define and explain the cooling tower transient model; include discussing the governing equations and process variables; include identifying the input to the model from various calculations. Discuss the accuracy of the model by comparing predicted model performance with actual test or operational data.

        - Discuss how the model accounts for varying SX flow rates, as some accident scenarios have closed riser valves and/or open bypass valves.

        - Discuss how the model accounts for time varying LOCA heat loads from the SX system to the UHS.

        - Include how the model accounts for varying number of fans running in either fast speed or slow speed.

        - Explain how the model accounts for varying dry bulb temperatures at the maximum wet bulb temperature.

        - Discuss how the model predicts bulk UHS basin temperature, which is limited to 100°F.

    c. Page H6 refers to "Eq (3)" which is not defined in the LAR. Describe and define Eq (3), and discuss how it relates to the essential service water cooling tower transient model which predicts UHS performance.

12. Attachment 4, Section 6.0, Methods of Analysis, Item 1 refers to the revised total heat load to the UHS curve and Item 3 refers to the new flow rates and tower performance curves.

a. Discuss the reasons why the total heat load to the UHS had to be revised for this LAR. Discuss the conservatism and design margin of the revised total heat load to the UHS.

b. Discuss why new tower flow rates and tower performance curves had to be generated for this LAR. Discuss the conservatism and design margin of the new flow rates and tower performance curves.

13. The calculations for each scenario in Attachment 4 use the terms M11, B11, M12, and B12. Discuss the meaning of these terms and how they are used to determine model performance.

14. The calculations for each scenario in Attachment 4 use the terms ß1 and ß2 and define them as the fraction of load to Tower 1. Explain why the fraction is defined in terms of flow to the RCFC only.

15. For cooling tower performance, each scenario in Attachment 4 uses temperatures Th1 through Th4 and Tc1 through Tc4. Explain how these values are obtained and how they are used for predicting cooling tower performance.

December 11, 2009

Mr. Charles G. Pardee
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BYRON STATION, UNIT NOS. 1 AND 2 - REQUEST FOR ADDITIONAL INFORMATION RELATED TO LICENSE AMENDMENT REGARDING ULTIMATE HEAT SINK (TAC NOS. ME1669 AND ME1670)

Dear Mr. Pardee:

By letter to the Nuclear Regulatory Commission (NRC) dated June 30, 2009 (Agencywide Documents Access and Management System Accession No. ML091831253), Exelon Generation Company, LLC (the licensee), submitted a license amendment request to revise Technical Specification 3.7.9, "Ultimate Heat Sink (UHS)," to add additional essential service water (SX) cooling tower fan requirements as a function of SX pump discharge temperature to reflect the results of a revised analysis for the UHS.

The NRC staff is reviewing your submittals, and has determined that additional information is required to complete its review. The specific information requested is addressed in the enclosed Request for Additional Information (RAI). The RAI was discussed with your staff on December 7, 2009, and they agreed to respond within 45 days after the date of this letter.

The NRC staff considers that timely responses to requests for additional information help ensure sufficient time is available for staff review and contribute toward the NRC's goal of efficient and effective use of staff resources. If circumstances result in the need to revise the requested response date, please contact me at (301) 415-1547.

Sincerely,
/RA/

Marshall J. David, Senior Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-454 and STN 50-455

Enclosure:
Request for Additional Information

cc w/encls: Distribution via Listserv

DISTRIBUTION:
PUBLIC
LPL3-2 R/F
RidsNrrDorlLpl3-2 Resource
RidsNrrLATHarris Resource
RidsNrrPMByron Resource
RidsNrrDorlDpr Resource
RidsAcrsAcnw_MailCTR Resource
RidsRgn3MailCenter Resource
RidsNrrDssSbpb Resource
RidsNrrDirsIhpb Resource
RidsNrrDirsItsb Resource
RidsNrrDeEeeb Resource
RidsOgcRp Resource
GPurciarello, NRR
GLapinsky, NRR
SRay, NRR
MHamm, NRR

ADAMS Accession No.: ML093200651 * RAI Memo Date NRR-088

OFFICE	LPL3-2/PM	LPL3-2/LA	DIRS/IOLB/BC(A)	DE/EEEB/BC	DSS/SBPB/BC	LPL3-2/BC
NAME	MDavid	THarris	JMunro*	GWilson*	GCasto*	JBoska for SCampbell
DATE	12/11/2009	12/10/2009	8/25/2009	11/18/2009	12/01/2009	12/11/2009

OFFICIAL RECORD COPY