



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 210 TO FACILITY OPERATING LICENSE NO. DPR-77  
AND AMENDMENT NO. 200 TO FACILITY OPERATING LICENSE NO. DPR-79  
TENNESSEE VALLEY AUTHORITY  
SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2  
DOCKET NOS. 50-327 AND 50-328

1.0 INTRODUCTION

By application dated August 21, 1995, the Tennessee Valley Authority (the licensee) proposed amendments to the Technical Specifications (TS) for Sequoyah Nuclear Plant (SQN) Units 1 and 2. The requested changes would amend TS 3.7.5.c to allow an increase in the average essential raw cooling water (ERCW) supply header temperature from 84.5°F to 87°F until September 30, 1995. The proposed change would be implemented by adding an asterisk following "84.5°F" in TS 3.7.5.c that would reference a new footnote. The footnote would read: "87°F is allowed until September 30, 1995."

2.0 EVALUATION

The ERCW system, the Ultimate Heat Sink (UHS) at SQN, consists of eight pumps, traveling screens and strainers that supply water from the Tennessee River (Chickamauga Reservoir) to various essential plant components. These components include the component cooling heat exchangers, containment spray system heat exchangers, emergency diesel generators, containment ventilation coolers, plant air compressors, reactor coolant pump motor coolers, and control rod drive ventilation coolers.

According to the SQN Updated Final Safety Analysis Report, operation of two pumps on one unit train is sufficient to supply all cooling water requirements for the 2-unit plant for unit cooldown, refueling, or post-accident operation. Additional pumps may be started for unit cooldown or refueling. Two pumps per unit operate during the hypothetical, combined accident and loss of normal power if each diesel generator is in operation. In an accident, the safety injection signal automatically starts two pumps on each train. This assures adequate cooling water under both normal and emergency conditions.

Due to significant increases in the average water temperature of the Tennessee River, the ERCW temperature, as measured at SQN's ERCW header, has increased and on August 18, 1995, reached 83°F. This high temperature is the result of

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daytime temperatures that remain above 90°F, which is expected to cause the average ERCW temperature to increase at a rate of 0.5°F per day. In the event the temperature increases to 84.5°F with the river water level above elevation 680 feet mean sea level, TS 3.7.5.c would require that both units be placed in hot standby within 6 hours and in cold shutdown within the following 30 hours.

In order to prevent the need for such a shutdown, the licensee performed an analysis to identify additional margins in the UHS safety analysis in order to justify a temporary increase the ERCW temperature limit from 84.5°F to 87°F. The containment pressure analysis was reviewed to determine the effects on the overall containment peak pressure relative to the ERCW temperature. The analysis is based on a double-ended reactor coolant pump suction pipe guillotine-type break that causes a loss of coolant accident (LOCA), coincidental with a minimum ice condenser ice weight of 1.93 million pounds of ice, a minimum safety injection capability (maximum peak containment pressure of 10.9 pounds per square inch (psi)), and an assumed 11 percent tube plugging penalty for the containment spray heat exchangers. The analysis showed that the peak pressure increased by 0.14 psi to 11.04 psi.

In addition, since the containment spray system (CSS) heat exchanger is served by the ERCW system, the effects of increased ERCW temperature will ultimately affect the amount of energy transferred between containment spray and the heat sink (i.e., heat out of the containment) after the plant switches over to containment sump recirculation (i.e., after the contents of the refueling water storage tank are emptied via the containment spray and emergency core cooling system (ECCS)).

The licensee performed computer model sensitivity studies at varying ERCW temperatures above the limit and found that with an increase of 1°F, the corresponding increase in peak containment pressure is less than 0.2 psi, which had no adverse affect on the margin to ice melt-out time relative to containment sump inventory swapover. In addition, the pressure increase is approximately linear in this temperature range. Therefore, based on present calculated maximum peak containment pressure of 11.04 psi (due to a large break LOCA), the licensee has determined that the maximum peak containment pressure that can be expected for an ERCW temperature of 87°F is 11.44 psi. Note that the present licensed analysis is actually performed with an ERCW temperature of 85°F and not the TS limit of 84.5°F. The 11.44 psi peak containment pressure is below the TS integrated leak rate test pressure and containment design pressure of 12.0 psi.

By letter dated May 30, 1995, the Commission issued TS Amendment No. 200 for Sequoyah Nuclear Plant Unit 1. This amendment modified License Condition 2.C.5(25) to extend the ice mass determination surveillance period for approximately 7 days. This extension was necessary because the required surveillance could not be performed within the interval specified in the TS when the Unit 1 operating cycle was extended. A sensitivity analysis for this amendment showed that, assuming a double-ended guillotine break and 102 percent reactor power, containment pressure would not exceed 11.9 psig. Unit 1 is presently operating at approximately 80 percent power and coasting down for a refueling outage scheduled to start on September 9, 1995. Because

of the lower mass and energy release associated with an accident at the lower power level, and because the ice bed is expected to be only slightly below the 1.93 million pound analytical limit, the actual impact of the extension of the surveillance interval on the design basis analyzed containment peak pressure of 11.04 psig is negligible.

The containment subcompartment pressure analysis is not affected by the increase in UHS temperature since the analysis is for the immediate (first few seconds) response to the double-ended break, when the UHS is not used as a heat removal source. Likewise, the peak containment temperature analysis is unaffected by this temperature increase. The peak containment temperature results from a main steam line break and occurs very early in the transient during blowdown from the faulted steam generator (SG). The temperature decreases in the containment with the long-term ice melt rate and at the time that swapper to the containment sump is initiated, the containment temperature is well below the calculated maximum.

By letter dated August 15, 1988, the Commission issued Amendment Nos. 79 and 70 for the SQN Unit 1 and 2 TS, respectively. One change included in these amendments was to increase the UHS temperature from 83°F to the present limit of 84.5°F. In the long-term analysis for the amendments, it was shown that any increase in UHS temperature will decrease the cooldown rate. It was also shown that the correlation between UHS temperature and the long-term containment temperature was basically one-to-one. Therefore, the long-term cooling effect of the lower compartment coolers (which are cooled by ERCW) would be expected to increase the long-term containment temperature by 2°F for the 2°F UHS temperature increase that is the subject of this amendment request. The licensee has determined that this extension of the long-term cooldown rate does not affect the environmental qualification limits of equipment. In addition, the long-term definition assumes 100 days at the elevated temperature. It is not reasonable to assume that the UHS will be at an elevated temperature for 100 days, since the river temperature is expected to decrease in the fall. As a result, the licensee has determined that the long-term containment temperature analysis, the long-term cooling analysis for pipe breaks outside the containment, and the environmental qualification analysis, would not be affected by the short-term change to the limit.

The increase in UHS temperature may also result in excess heatup of the containment sump water following a postulated LOCA. This may challenge the net positive suction head requirements of the residual heat removal (RHR) pumps and the containment sump pumps. The current analysis for both pumps assumes a containment sump water temperature of 190°F and a minimum sump elevation. The peak post-LOCA long-term sump water temperature is presently analyzed at 160°F. Sensitivity analyses have shown that the long-term temperature will increase less than 5°F for every corresponding 1°F increase in river water temperature. Therefore, based on the assumed maximum UHS temperature of 87°F, there will be adequate net positive suction head for the RHR and containment sump pumps.

The consequences of an SG tube rupture has been analyzed by the licensee and found to be unaffected by the proposed TS change. However, the last

mitigative action for the operator in the Final Safety Analysis Report analysis for this event is initiation of the RHR system. Since the RHR heat exchangers transfer heat load to the UHS via the component cooling system, cooldown of the reactor coolant system may be slightly extended. The licensee has determined that this does not represent any unacceptable consequences.

The emergency core cooling system analysis is unaffected since the 10 CFR 50.46 limits and Appendix K requirements are met in the short-term accident mitigation period.

An evaluation of the latest ERCW flow balance data taken in June 1994 was performed by the licensee to determine impacts on safety related equipment and components served by ERCW. The analysis showed satisfactory results. Operational and accident performance capabilities of safety-related components will not be decreased.

The licensee also evaluated piping, pipe supports, and components and found that piping stresses will not be affected by the proposed TS change. Alternately analyzed ERCW piping and rigorously analyzed ERCW supply piping inside the containment and annulus are not affected because the thermal analysis performed on this piping bounds the 87°F condition.

The balance of the ERCW piping, primarily rigorously analyzed ERCW piping in the Auxiliary Building, will have a slight increase in thermal stress of approximately 17 percent due to the increase in UHS temperature. The licensee determined that the piping would continue to remain operable under this condition and that a thermal fatigue problem would not be created. Sufficient margin exists between SQN's design basis limits and interim operability limits to accommodate the temporary load increase predicted by the analysis.

The staff has reviewed the licensee's analysis that was used to support the temporary increase of the average ERCW supply header water temperature from 84.5°F to 87°F until September 30, 1995. Based on the analysis, the staff finds the proposed amendments acceptable. The date of September 30, 1995 is also acceptable since river water temperature is expected to decrease to normal by that time.

### 3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Tennessee State official was notified of the proposed issuance of the amendments. The State official had no comments.

### 4.0 EXIGENT CIRCUMSTANCES

The staff has reviewed the licensee's proposed amendments and finds (1) that exigent circumstances exist, as provided for in 10 CFR 50.91(a)(6), in that the licensee and the Commission must act quickly and that time does not permit the Commission to publish a Federal Register notice allowing 30 days for prior public comment, and (2) that the licensee has not failed to use its best efforts to make a timely application and avoid creating the



exigent circumstance. The Commission noticed the licensee's August 21, 1995, application for amendments in the Federal Register on August 28, 1995 (60 FR 44517), at which time the Commission made a proposed finding that the amendments involved no significant hazards condition and there has been no public comment in response to the notice.

#### 5.0 FINAL NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

The Commission's regulations in 10 CFR 50.92 provide that the Commission may make a final determination that a license amendment involves no significant hazards considerations if operation of the facility in accordance with the amendment would not:

- a. Involve a significant increase in the probability or consequences of an accident previously evaluated.

The probability of occurrence or the consequences of an accident are not increased as presently analyzed in the safety analysis since the objective of the event mitigation is not changed. No changes in event classification as discussed in Final Safety Analysis Report Chapter 15 will occur due to the increased river water temperature (with respect to both containment integrity and safety-system heat removal). Therefore, the probability of an accident or malfunction of equipment presently evaluated in the safety analyses will not be increased. The containment design pressure is not challenged by allowing an increase in the river water temperature above that allowed by the TSs, thereby ensuring that the potential for increasing offsite dose limits above those presently analyzed at the containment design pressure of 12 pounds per square inch is not a concern.

- b. Create the possibility of a new or different kind of accident from any previously analyzed.

The possibility of a new or different accident situation occurring as a result of this condition is not created. The ERCW system is not an initiator of any accident and only serves as a heat sink for normal and upset plant conditions. By allowing this change in operating temperatures, only the assumptions in the containment pressure analysis are changed. The proposed change to the ERCW temperature results in an increase in peak containment accident pressure that continues to remain below the pressure limit. Also, the net positive suction head requirements of the essential core cooling system and containment spray system will not challenge the present design requirements.

- c. Involve a significant reduction in a margin of safety.

The margin of safety as reported in the basis for the TSs is also not reduced. The design pressure for the containment and all supporting equipment and components for worse-case accident condition is 12.0 pounds per square inch gauge (psig). The proposed change to the river water temperature will not challenge the design condition of containment.

Further, the 12.0 psig design limit is not the failure point of containment that would lead to the loss of containment integrity.

Based on the above, the Commission has made a final determination that the proposed amendments involve no significant hazards consideration.

#### 6.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has made a final determination that the amendments involve no significant hazards consideration. Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

#### 7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

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Date: September 13, 1995

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