



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 101 TO FACILITY OPERATING LICENSE NO. DPR-63  
NIAGARA MOHAWK POWER CORPORATION  
NINE MILE POINT NUCLEAR POWER STATION, UNIT NO. 1  
DOCKET NO. 50-220

INTRODUCTION

In a letter dated March 7, 1988, the licensee requested Technical Specifications Sections 3.1.2 and 4.1.2 be revised for the liquid poison system to incorporate changes required by 10 CFR Part 50.62, "Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants." Specifically, the proposed changes would (1) delete Figure 3.1.2a; (2) identify the liquid poison system minimum volume requirements; (3) incorporate the equivalency equation for determining the concentration of sodium pentaborate solution enriched in the boron-10 isotope; (4) revise Figure 3.1.2b to allow a lower concentration of sodium pentaborate as a result of using the enriched isotope; and (5) revise Technical Specification 4.1.2b to incorporate additional surveillance requirements for monitoring the enriched boron-10 isotope concentration. The Bases for Technical Specification Sections 3.1.2 and 4.1.2 would also be revised to incorporate the equivalency equation and to remove the reference to the maximum injection time and revise the minimum injection time. The deviations from 10 CFR Part 50.62(c)(4) associated with the Technical Specification changes are identified in an exemption request dated September 14, 1988. The discussion of the exemption request is included as part of this Safety Evaluation.

EVALUATION

The exemption proposed by the licensee has been reviewed by the staff against the requirements of the Anticipated Transient Without Scram (ATWS) rule (10 CFR Part 50.62) and Generic Letter No. 85-03 "Clarification of Equivalent Control Capacity for Standby Liquid Control Systems," dated January 28, 1985. The licensee's proposed consideration of the 213-inch diameter vessel size in determining an equivalent control capacity will provide a boron content equivalent in control capacity to 86 gpm of 13 weight percent sodium pentaborate for a 251-inch inside diameter vessel. This meets the intent of 10 CFR Part 50.62 and is, therefore, acceptable. Granting of this Exemption provides justification for certain of the TS changes identified in the amendment request.

The liquid poison system is a backup to the Control Rod Drive System. When a scram signal occurs, the control rods are automatically inserted to bring the reactor to a subcritical condition. In the event the control rods would fail to insert, the liquid poison system is designed to inject a sufficient quantity of soluble boron to bring the reactor to a hot subcritical condition. The liquid poison system at Nine Mile Point Unit 1 (NMP-1) performs the function of the standby liquid control system (SLCS) required by Paragraph (c)(4) of 10 CFR 50.62 which states, in part:

"Each boiling water reactor must have a standby liquid control system (SLCS) with a minimum flow capacity and boron content equivalent in control capacity to 86 gallons per minute of 13 weight percent sodium pentaborate solution."

Generic Letter 85-03, dated January 28, 1985, stated that the equivalent boron content could be achieved by increasing the flow rate, or the boron concentration, or through boron enrichment. These methods of meeting the requirements of 10 CFR 50.62 were also evaluated in the staff's review of NEDE-31096-P "Anticipated Transients Without Scram: Response to ATWS Rule 10 CFR 50.62," (G. Laines to T. Pickens, October 21, 1986). The staff's evaluation of NEDE-31096-P also discussed an equivalency equation which could be used to ensure that the SLCS has a control capacity equivalent to 86 GPM of 13 weight percent natural sodium pentaborate solution.

In its application dated March 7, 1988, the licensee requested that the Technical Specifications for NMP-1 be revised to incorporate the following equivalency equation which was discussed in the staff's evaluation.

$$\frac{Q}{86} \times \frac{M251}{M} \times \frac{C}{13} \times \frac{E}{19.8} \geq 1$$

where: Q = expected Liquid Poison System flow rate (30 GPM)  
M = mass of water in the reactor vessel and recirculation system at hot rated conditions (501,500 lbs.)  
C = sodium pentaborate solution concentration, weight percent  
E = boron-10 isotope enrichment (19.8% for natural boron), atom percent  
M251 = mass of water for 251-inch reference plant (628,300 lbs.)

The licensee has proposed to meet the equivalency equation by using appropriate combinations of solution concentration and boron-10 enrichment.

The licensee has indicated that the enriched boron would be supplied premixed by its vendor. On April 13, 1988 the licensee supplemented its amendment application with a letter committing to revise the applicable site procedures to require an isotopic analysis of the enriched sodium pentaborate to be performed by an independent laboratory. In addition, the licensee's amendment application of March 7, 1988 included surveillance requirements to verify conformance with the equivalency equation any time boron or water is added or if the solution temperature drops below the limits specified by Figure 3.1.2b,

and to verify enrichment by analysis once per operating cycle. The staff finds the proposed surveillance requirements and the licensee's commitment to have an independent verification to be adequate assurance that the liquid poison system will meet the requirements of the SLCS required by 10 CFR 50.62.

With the use of the equivalency equation, the effective rate of boron injection into the core will be the product of pumping capacity (flow rate), solution concentration, boron ( $B^{10}$ ) enrichment, and mixing capacity. Previously conducted mixing tests were accepted by the NRC staff and, as a result, boron mixing is not a factor in determining equivalency to the ATWS rule. By meeting the equivalency equation, the licensee will ensure that sodium pentaborate is injected at a rate equivalent to 13 weight percent at 86 GPM. As the rate of injection will be governed by the equivalency equation and boron mixing is not a factor, the minimum and maximum injection times need not be reviewed by the staff. Therefore, the deletion of the maximum mixing time and the revision to the minimum mixing time in the Bases is acceptable.

Figure 3.1.2a of the Technical Specifications specified the volume-concentration limits of the liquid poison system. This curve is applicable for natural (unenriched) boron. These limits will now be determined by the use of the equivalency equation and therefore, deletion of Figure 3.1.2a of the Technical Specifications is acceptable.

Figure 3.1.2b of the Technical Specifications specified the minimum allowable solution temperature for a specified weight percent of sodium pentaborate in solution. This curve was being revised to include the lower weight percent of sodium pentaborate allowed by the equivalency equation. However, the licensee did not address the potential for freezing at the lower temperatures (30°F) represented on the new curve. In addition, during a discussion with Mr. Peter Francisco of the licensee's staff on June 23, 1988, Mr. Francisco indicated that the curve was erroneously shifted in the non-conservative direction. Mr. Francisco further indicated that operation with the equivalency equation with the existing Figure 3.1.2b would be acceptable. The use of the existing figure for the minimum allowable solution temperature would not be affected by the use of the equivalency equation. Therefore, the staff finds the proposed revision to Figure 3.1.2b to be unacceptable and the licensee has agreed that change will be deleted from the proposed revision to the Technical Specifications. This change did not alter or affect the action noticed or the staff's initial determination published in the Federal Register on June 1, 1988.

On the basis of the above discussion, the staff finds that the licensee's changes to the Technical Specification and the Bases for the liquid poison system as proposed in its application of March 7, 1988 with the exception as modified, are acceptable and are consistent with the purpose of 10 CFR Part 50.62 for the SLCS.

#### ENVIRONMENTAL CONSIDERATION

This amendment involves a change in the installation or use of the facility components located within the restricted areas as defined in 10 CFR Part 20 and changes inspection or surveillance requirements. The staff has determined that this amendment involves 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 previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR Sec 51.22(c)(9). Pursuant to 10 CFR Sec. 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

CONCLUSION

On the basis of the above evaluation the staff finds that the licensee's proposed exemption from 10 CFR Part 50.62(c)(4) as requested in the submittal dated September 14, 1988 is acceptable. Thereafter, the licensee shall comply with the provisions of such rule or renew its request for exemption.

We have 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, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Dated: October 31, 1988

PRINCIPAL CONTRIBUTOR:

M. Haughey