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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 164 TO FACILITY OPERATING LICENSE NO. DPR-63

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION, UNIT NO. 1

DOCKET NO. 50-220

1.0 INTRODUCTION

By letter dated June 19, 1998, as supplemented November 6, 1998, Niagara Mohawk Power Corporation (NMPC and the licensee) proposed a license amendment to change the Technical Specifications (TSs) for Nine Mile Point Nuclear Station, Unit No. 1 (NMP1). The proposed amendment would change TS 3.2.2, "Minimum Reactor Vessel Temperature for Pressurization," and associated TS Bases 3/4.2.2 to update TS 3.2.2 tables and figures ("pressure-temperature (P-T) curves") that limit the minimum reactor vessel temperature for a given pressure. Because the limits are based upon the number of effective full-power years (EFPYs) of core operation and the existing tables and figures are valid for up to 18 EFPYs, the proposed amendment would substitute new tables and figures that are valid for 20, 24, and 28 EFPYs. The word "leakage" would be added to clarify that this TS applies to both leakage and hydrostatic tests.

By letter dated November 6, 1998, NMPC provided additional information in support of the application for amendment. The additional information does not affect the Commission's finding of no significant hazards consideration that was issued in a Federal Register notice (63 FR 40557, July 29, 1998).

2.0 EVALUATION

The NRC staff evaluated the P-T limits based upon the following NRC regulations and guidance: Appendix G to 10 CFR Part 50, "Fracture Toughness Requirements"; Generic Letter (GL) 88-11, "NRC Position on Radiation Embrittlement of Reactor Vessel Materials and Its Impact on Plant Operations," dated July 12, 1998; GL 92-01, "Reactor Vessel Structural Integrity, 10 CFR 50.54(f)," Revision 1, dated March 6, 1992; Regulatory Guide (RG) 1.99, "Radiation Embrittlement of Reactor Vessel Materials," Revision 2, dated May 1988; and Standard Review Plan (SRP or NUREG-0800) Section 5.3.2, "Pressure-Temperature Limits." Appendix G to 10 CFR Part 50 requires that P-T limits for the reactor vessel shall be at least as conservative as those obtained by Appendix G to Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code). GL 88-11 specifies that licensees should use the methods in RG 1.99, Revision 2, to predict the effect of neutron irradiation upon the adjusted reference temperature (ART) of reactor vessel materials. The ART is defined as the sum of initial nil-ductility transition reference temperature (RT_{NDT}) of the material, the increase in RT_{NDT} caused by neutron irradiation, and a margin to account for uncertainties in the prediction method. The increase in RT_{NDT} is calculated from the product of a chemistry factor and a fluence factor.

The chemistry factor may be calculated using credible surveillance data, obtained by a licensee's surveillance program, as specified by Position 2 of RG 1.99, Revision 2. If credible surveillance data are not available, the calculated chemistry factor depends upon the amount of copper and nickel in the vessel material as specified in Table 1 of RG 1.99, Revision 2. GL 92-01 provides for the submittal of reactor vessel materials data by licensees, which the NRC staff uses in the review of the P-T limits submittals.

SRP 5.3.2 provides guidance on calculation of P-T limits using the linear elastic fracture mechanics methodology specified in Appendix G to Section III of the ASME Code. The linear elastic fracture mechanics methodology postulates sharp surface defects that are normal to the direction of maximum stress. The postulated defects have a depth of one-fourth of the reactor vessel beltline thickness (1/4T) and a length of 1-1/2 times the beltline thickness. The critical locations in the vessel for this methodology are the 1/4T and 3/4T locations, which correspond to the maximum depth of the postulated inside surface and outside surface defects, respectively.

For the NMP-1 reactor vessel, NMPC determined that the most limiting material at the 1/4T and 3/4T locations is plate G-307-4. This plate was fabricated using plate heat P2076. NMPC calculated an ART of 167.7 °F at the 1/4T location and 136.9 °F at the 3/4T location at 28 EFPY. The neutron fluence used in the ART calculation was 1.76×10^{18} n/cm^2 at the 1/4T location and 7.48×10^{17} n/cm^2 at the 3/4T location. The initial RT_{NDT} for the limiting plate was 40 °F. The margin term used in calculating the ART for the limiting plate was 34 °F.

The NRC staff performed an independent calculation of the ART values for the limiting material using the methodology in RG 1.99, Revision 2. Based on these calculations, the NRC staff verified that NMPC's limiting material for the NMP-1 reactor vessel is plate G-307-4. The NRC staff's calculated ART value for the limiting material agreed with NMPC's calculated ART value.

Substituting the ART values for the NMP-1 vessel in SRP 5.3.2 equations, the NRC staff verified that the proposed P-T limits satisfy the requirements in paragraph IV.A.2 of Appendix G of 10 CFR Part 50.

In addition to beltline materials, Appendix G of 10 CFR Part 50 also imposes a minimum temperature at the closure head flange based upon the reference temperature for the flange material. Table 1 of Section IV.A.2 of Appendix G shows that when the pressure exceeds 20% of the preservice system hydrostatic test pressure, the temperature of the closure flange regions highly stressed by the bolt preload shall exceed the reference temperature of the material in those regions by at least 120 °F for normal operation and by 90 °F for hydrostatic pressure tests and leak tests. Based on the flange RT_{NDT} of 40 °F for NMP-1, the NRC staff has determined that the proposed P-T limits have satisfied the requirement for the closure flange region during normal operation and inservice leak and hydrostatic testing.

Accordingly, on the basis of its review of NMPC's submittal and its own independent analysis which verified NMPC's proposed P-T limits, the NRC staff concludes that the proposed P-T limits for heatup and cooldown for non-critical operations; heatup and cooldown for critical operations;

and non-critical leakage/hydrotest, are acceptable for use up to 28 EFPY because the limits conform to the requirements of Appendix G of 10 CFR Part 50 and GL 88-11. Therefore, the proposed changes to the NMP1 TS based upon these P-T limits are acceptable.

3.0 STATE CONSULTATION

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

4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes 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 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 the amendment involves no significant hazards consideration, and there has been no public comment on such finding (63 FR 40557). Accordingly, the amendment meets 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 amendment.

5.0 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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Date: November 25, 1998