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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 168 AND 172 TO

FACILITY OPERATING LICENSE NOS. DPR-24 AND DPR-27

WISCONSIN ELECTRIC POWER COMPANY

POINT BEACH NUCLEAR PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-266 AND 50-301

1.0 INTRODUCTION

By letter dated May 26, 1994, as supplemented January 5, April 25 and October 12, 1995, and February 2 and March 1, 1996, the Wisconsin Electric Power Company (the licensee) submitted a request for revision to the Point Beach Nuclear Plant, Units 1 and 2, Technical Specifications (TSs). The requested amendments would extend the applicability of the pressure-temperature (P-T) limits curves in the TSs from 18.1 effective full power years (EFPY) to 23.6 EFPY. The licensee also proposed that the curves not be changed, stating that the curves have enough margins for reactor operation up to 23.6 EFPY based on neutron fluence reduction. The supplemental submittals provided additional information that did not change the initial proposed no significant hazards consideration determination.

2.0 EVALUATION

2.1 Background

To protect reactor vessels from brittle fracture, the NRC requires licensees to use P-T limits for the operation of the reactor coolant system to limit loads applied to the reactor vessel and the rate of vessel material embrittlement. The P-T limits are constructed using an adjusted reference temperature (ART) of the vessel material and applied loads to limit pressures and temperatures during normal operation (in accordance with Appendix G to 10 CFR Part 50).

The ART is a measure of the embrittlement of reactor vessel materials caused by neutron irradiation. Regulatory Guide 1.99, Revision 2, defines the ART as the sum of the 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 calculation. The increase in RT_{ndt} is calculated from the product of a chemistry factor and a neutron fluence factor. The chemistry factor is dependent upon the amount of copper and nickel in the vessel material. Therefore, the rate of material embrittlement increases as the neutron fluence, copper content, and nickel content increase.

2.2 Fluence Determinations

The Point Beach units are each equipped with a thermal shield. The dosimetry surveillance capsules which were previously analyzed were located behind the thermal shield with respect to the direction of neutron propagation. A cavity dosimetry program was implemented for both units using fast neutron flux which has traversed the thermal shield and the pressure vessel. Measurements obtained from these dosimetry programs were subject to the underestimation of the (Evaluated Nuclear Data File) ENDF/B-IV cross sections. ENDF/B-IV based cross sections had an error in the inelastic scattering of iron which resulted in an underestimation of the fast neutron flux, whenever such flux traversed a significant thickness of iron such as the thermal shield or the pressure vessel. This discrepancy has been corrected in the sets of cross sections based on ENDF/B-VI.

WCAP-12795, Revision 3, documents a reestimation of the capsule dosimetry and the cavity dosimetry data for Unit 2 using cross sections based on ENDF/B-VI. In addition, the calculations in WCAP-12795 use a benchmarked version of the DOT code, use the P_3 scattering approximation and the S_8 quadrature approximation. The neutron sources were estimated on a pin-wise basis and accounted for the plutonium buildup, including the spectral effects. The assumptions and methods are consistent with accepted industry practice and state of the art, and are therefore acceptable.

The pressure vessel critical element with respect to pressurized thermal shock is the peripheral weld SA-1484. The licensee now estimates that the E>1.0 MeV fluence to the SA-1484 weld will not reach the 2.05×10^{19} n/cm^2 level until after 23.6 EFPYs. Estimates based on the results of the surveillance capsules and the reactor cavity measurements support this conclusion. Therefore, the staff finds it acceptable.

The licensee did not submit a revision to WCAP-12794, Revision 2, which deals with the Unit 1 dosimetry data. However, the P-T curves are the same for both units. In addition, the same measures have been implemented in both units regarding fluence reduction. Therefore, it is reasonable to conclude that the P-T curves are applicable for Unit 1 as well. In addition, the licensee stated that in the last refueling outage neutron dosimetry was removed from Unit 1, and the measurements were analyzed using ENDF/B-VI cross sections. The licensee noted in the March 1, 1996, submittal that the dosimetry analysis confirmed that the fast neutron fluence level of 2.05×10^{19} neutrons/cm^2 (n/cm^2) for the Unit 1 SA-1101 weld will not be reached until after 23.6 EFPYs (about January 2001). The staff finds this acceptable. The dosimetry data should be kept available for staff audit.

2.3 Adjusted Reference Temperature

In 1989, the licensee implemented a low-low leakage pattern core with hafnium inserts in the guide tubes of peripheral assemblies to reduce neutron fluence in each unit. With the low leakage cores and hafnium inserts, the neutron flux has been reduced compared to previous core loading patterns. Consequently, the rate of irradiation embrittlement of reactor vessel materials has been reduced over what was projected in the current P-T limits,

which the NRC approved on January 10, 1990. For the current limits, the licensee calculated a limiting (maximum) ART of 258.4°F based on a fluence of 2.05E19 n/cm^2 at the 1/4 location of the vessel beltline thickness (the 1/4T location). The ART was calculated using the material data of weld SA-1484 in the Unit 2 reactor vessel.

In a discussion with the licensee on October 31, 1994, the licensee indicated that for the proposed amendment, the fluence of 2.05E19 n/cm^2 was at the inside surface instead of at the 1/4T location of the vessel wall. This is a conservative assumption because the fluence at the inside surface is greater than the fluence at the 1/4T location. The fluence at the 1/4T location is the value used in the P-T curve calculation since the calculation assumes a 1/4T deep flaw.

For the proposed amendment, the staff recalculated the ART for each beltline material in the Unit 1 and Unit 2 reactor vessels. The ARTs were compared to the limiting ART in the current P-T limits to verify whether the current P-T curves have sufficient margins. The staff used the material data that the licensee submitted under Generic Letter (GL) 92-01, which the NRC issued on March 6, 1992. GL 92-01 requested licensees to submit information on reactor vessel materials. In response to GL 92-01, Wisconsin Electric submitted reactor vessel material data for both Point Beach units on June 25, 1992, with supplements on July 30, 1992, May 21, 1993, May 2, 1994, and June 27, 1994.

Using the material data in Wisconsin Electric's response to GL 92-01 and the fluence of 2.05E19 n/cm^2, the staff calculated a limiting ART of 240.3°F at the 1/4T location based on material data of weld SA-1101 in the Unit 1 reactor vessel. (It should be noted that the material used in the current P-T curves, weld SA-1484 in the Unit 2 reactor vessel, is no longer limiting because Wisconsin Electric has updated the material data since the current P-T curves were approved in 1990.) For the proposed amendment, the staff calculated the highest ART based on the material data of Unit 1 weld SA-1101. Therefore, weld SA-1101 is the limiting material. The staff's calculated ART of 240.3°F is less than the ART of 258.4°F in the current P-T limits. This shows that the current P-T limits have a sufficient margin (18.1°F) and the curves do not need to be revised for the proposed amendment.

2.4 Summary

The staff concludes that the current P-T limit curves for heatup, cooldown, criticality, and inservice pressure test are valid up to 23.6 EFPY. The P-T limits were calculated in accordance with Appendix G to 10 CFR Part 50 and Regulatory Guide 1.99, Revision 2. Hence, the proposed changes to the P-T limits may be incorporated into the Point Beach, Units 1 and 2, Technical Specifications.

2.5 Technical Specification and Bases Changes

The length of time and date of applicability for Figures 15.3.1-1 and 15.3.1-2 are being changed to 23.6 EFPY and January 2001. These changes are consistent with the licensee's submittal and with the staff's evaluation, and are therefore acceptable. The bases for TS 15.3.1 are also being modified. The

computed maximum integrated fast neutron exposure of the vessel is being changed to 2.5E19 n/cm^2 for 40 years of operation. In addition, editorial changes are proposed. The staff agrees with the licensee that these changes are consistent with the TS changes.

3.0 STATE CONSULTATION

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

4.0 ENVIRONMENTAL CONSIDERATION

These amendments change a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 or change a surveillance requirement. The staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluent that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously published a proposed finding that these amendments involve no significant hazards consideration and there has been no public comment on such finding (59 FR 37093). Accordingly, these 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 these amendments.

5.0 CONCLUSION

The staff 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 this 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: March 20, 1995