SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 216 TO FACILITY OPERATING LICENSE NO. DPR-58

AND AMENDMENT NO. 200 TO FACILITY OPERATING LICENSE NO. DPR-74

INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-315 AND 50-316

1.0 INTRODUCTION

By letter dated February 29, 1996, the Indiana Michigan Power Company (the licensee) requested amendments to the Technical Specifications (TS) appended to Facility Operating License Nos. DPR-58 and DPR-74 for the Donald C. Cook Nuclear Plant, Units 1 and 2. The proposed amendments would change TS 3.1.2.7 and 3.1.2.8 for both units. These changes will increase the minimum borated water volume in the boric acid storage system and decrease the maximum boron concentration.

The licensee is also requesting amendments to increase the minimum required flow rate in action statements for TS 3.1.1.1, 3.1.1.2, 3.9.1, and 3.10.1 and an additional surveillance requirement for this flow rate in TS 4.1.2.2.d. In addition, the licensee is proposing to decrease the minimum temperature requirement in TS 4.1.2.1.a, 4.1.2.2.a, 3.1.2.7.a.3, and 3.1.2.8.a.3 to 63°F. The bases Section 3/4.1.2 would be updated to reflect these changes.

The November 15, 1996, and February 4, 1997, supplements only provided the anticipated schedule for the plant modifications and procedure changes associated with this request and did not change the staff's proposed determination of no significant hazards consideration.

2.0 BACKGROUND

These revisions will support the licensee's plans to reduce the boron concentration requirements in the boric acid storage tank (BAST) for Units 1 and 2. The present boric acid concentration requirement is between 20,000 ppm and 22,500 ppm (parts per million) of boron (approximately 12 percent by weight). The BAST borated volume for Unit 1 is 5,641 gallons and the borated volume for Unit 2 is 4,905 gallons. This is based on the ability to borate the reactor coolant system (RCS) to a concentration required to bring the reactor to a cold shutdown mode through the feed and bleed process. Prior to the commencement of the cooldown, the RCS is borated to a concentration required to provide a shutdown margin of 1,000 pcm [percent mille] (1 pcm = 10^{-5} $\Delta k/k$) at 68°F. The RCS boron is maintained at a constant (uniform) concentration during the cooldown process.

Reducing the concentration in the BAST to between 6,550 ppm and 6,990 ppm (between 3.4 and 4.0 weight percent) will eliminate the need to heat trace the BASTs, valves, and piping. The normally anticipated ambient temperature in the auxiliary building where this equipment is located would be sufficiently high to prevent boric acid precipitation and deposits.

The reduction in the BAST boron concentration is achieved by relying on both the BAST and the refueling water storage tank (RWST) for cooldown. Specifically, at Donald C. Cook, Units 1 and 2, the BAST is borated water used for increasing the RCS boron concentration at hot conditions and the RWST borated water is for overcoming coolant contraction. Using the RWST to supplement the BAST for makeup, the minimum required boric acid concentration in the BAST is reduced from approximately 12 percent to 3.5 and 4.0 percent by weight. Following reactor shutdown, boration feed and bleed operation is carried out to satisfy the hot zero power shutdown margin requirement. This operation will introduce negative reactivity into the system to compensate for the decrease in power and xenon decay.

To compensate for the reduction in the boron concentration, the licensee performed calculations to determine the maximum volume of borated water required in the BAST and to determine the minimum delivery volume flow rate from the BAST. The licensee also performed calculations to determine the amount of RWST borated water to compensate for the above-mentioned reactivity effects. The results of the calculations are discussed below.

3.0 TECHNICAL EVALUATION

3.1 Transient and Accident Analysis

Accident and transients addressed in Chapter 15 of the Updated Final Safety Analysis Report (UFSAR) do not take credit for borated water delivery to the RCS and BAST. The charging pumps are typically aligned to the RWST during safety injection, so reduction of the boric acid concentration in the BASTs has no effect on the accident analysis covered in the UFSAR.

3.2 Reactivity Calculations

The licensee analyzed several cooldown scenarios for both units. First of all, the purpose of these investigations was to determine the amount of boric acid required in the BAST to counteract the positive reactivity addition due to reactor shutdown (moderator temperature changes) and xenon decay during the cooldown process. Secondly, the licensee performed a set of calculations to determine the boron addition required to counteract xenon decay after shutdown, as well as the boron requirements to compensate for cooldown below 200°F.

To demonstrate the acceptability of the proposed reduction in BAST boron concentration, the licensee performed calculations for specific cooldown scenarios. These calculations determine the minimum RCS boron concentration necessary to maintain the required shutdown margin during cooldown, and the expected boron delivery from the BAST and RWST to the RCS at any time during cooldown. Maintaining the required shutdown margin throughout the cooldown process is ensured by providing sufficient boron (above minimum value required) to the RCS. The core physics analysis used conservative assumptions to bound the reactivity effects of any cooldown scenario that may occur at any point in the fuel cycle and to maximize boron demand. The bounding scenario assumed the reactor is shut down from full power and at equilibrium xenon. The control and the shutdown rods, except the most reactive rod, are assumed to be inserted. The shutdown boron values for no xenon conditions were obtained from the PC-NDR computer program. The licensee pointed out that the results of the calculation showed that all the Tss corresponding to the shutdown margin requirements were met. Other calculations were performed to show that requirements for hot zero power critical boron concentration (6,550 ppm) conditions were met. To show that enough RWST water was available for further cooldown, calculations were performed using the RWST water at a lower boron concentration (2,400 ppm) to compensate for shrinkage. Results of analyses for both Units 1 and 2 showed that, for equilibrium and peak xenon conditions, there is sufficient RWST water available in the event that cooldown is required. Additional analyses showed that for all expected normal shutdown scenarios, there is enough BAST borated water volume available to increase the RCS boron concentration by feed and bleed operation to cold shutdown boron concentration.

Flow rate verification analyses were conducted for both xenon decay and xenon burnout. In the case of xenon decay, it was found that to counteract xenon decay, the core had to be borated at approximately 24 ppm/hr. The flow rate necessary to increase RCS boron at this rate is approximately 6 gpm of BAST boric acid at 6,550 ppm. For xenon burnout, the maximum boration rate is approximately 137 ppm/hr. This translates to approximately 33 gpm of boric acid addition from the BAST. A conservative value of 34 gpm flow requirement was chosen.

Analyses for shutdown boration requirements (Modes 5 and 6), showed that BAST and RWST water requirements to compensate for temperature reduction (cooldown from 200°F to 68°F) were met. In Mode 6, a boron concentration requirement sufficient to ensure the more restrictive of the following reactivity conditions must be maintained: a K_{eff} of 0.95 or less, or 2,400 ppm. With the higher boric acid concentration in the RCS, the reactivity addition due to any postulated dilution accident is slow enough to allow the operator to determine the cause of the dilution and take corrective actions before shutdown margin is lost.

3.3 Operational Analysis

The licensee analyzed the impact on plant operations from a reduction in the boron concentration in the BAST. Following a small line break accident (SLBA) or steam generator tube rupture (SGTR), the operators are directed (through plant procedures and instructions) to borate the RCS to maintain shutdown margin. Emergency procedures directing the blending operations via control settings will be modified to reflect the reduction in the BAST boron

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concentration. Normal operating procedures will also be changed to reflect the reduction in the BAST boron concentration.

To support the planned reduction in the BAST boron concentration, changes to the current TS have been proposed by the licensee. TS 3.1.2.8 on borated water sources is changed to require 8,500 gallons of boric acid at a boron concentration between 6,550 ppm and 6,990 ppm. The amount of 8,500 gallons of BAST water is required for Modes 1 and 2 in anticipation of a reactor shutdown and subsequent increase in reactivity due to xenon decay and cooldown. TS for Modes 1, 2, 3, and 4 were changed to include a note for the BAST volume requirement stating in effect that the volume of borated water is not required once the reactor is stripped and the borated water is injected into the RCS for boron concentration increase. For Modes 5 and 6, a lower amount (900 gallons) was found to be sufficient to counteract volume shrinkage. However, this value was conservatively increased to 5,000 gallons. Consequently, TS 3.1.2.7 was changed to reflect the change in volume and concentration. For consistency, portions of TS 3.1.1.1, 3.1.1.2, 3.9.1, and 3.10.1 were also changed to reflect the revised boron concentration of 6,550 ppm. These changes are consistent with the licensee's analysis supporting the reduced boron concentration and are acceptable.

TS 3.1.1.1, 3.1.1.2, 3.9.1, and 3.10.1 are changed to increase the rate at which borated water is injected into the RCS from 10 gpm to 34 gpm. The licensee provided supporting technical justification which showed that this rate was sufficient to counteract xenon burnout. The 34 gpm flow rate is conservative and acceptable. The change in flow rate necessitated a new flow rate surveillance requirement in TS 3.1.2.2. Once per 18 months, the flow rate is to be verified to be greater than 34 gpm. Relevant control valves were modified to accommodate the increased flow rate.

Associated with the elimination of the heat tracing networks for the BAST flowpaths is a change in the requirement to monitor the heat traced portion of the flowpath to monitor the ambient air temperature of the rooms containing the flowpath components from the boric acid tank to the blending tee. TS surveillance 4.1.2.1.a. is changed from verifying the temperature of the heat tracing to be greater than or equal to 145°, to verifying the area temperature to be greater than 63°F. This change is consistent with the licensee's analysis of the minimum required temperature at the reduced boron concentration and is acceptable.

The licensee also proposed changes to the bases which are consistent with, and support, the TS changes.

The licensee has assessed the impact of the proposed changes and found that these changes do not affect the plant's ability to reach hot standby and cold shutdown.

4.0 SUMMARY

The NRC staff has reviewed the reports submitted by the licensee for the operation of Donald C. Cook Units 1 and 2 and finds the proposed reduction in BAST boron concentration, the associated elimination of boric acid flowpath heat tracing, the resulting revisions to the relevant TS, associated bases and surveillance, as described in the licensee's submittal of February 29, 1996, as supplemented November 15, 1996, and February 4, 1997, to be acceptable.

5.0 STATE CONSULTATION

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

6.0 ENVIRONMENTAL CONSIDERATION

The amendments change the requirements with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and change surveillance requirements. The 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 previously issued a proposed finding that the amendments involve no significant hazards consideration and there has been no public comment on such finding (61 FR 18172). 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 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 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: August 7, 1997