



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 158 TO FACILITY OPERATING LICENSE NO. DPR-58

AND AMENDMENT NO. 142 TO FACILITY OPERATING LICENSE NO. DPR-74

INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-315 AND 50-316

1.0 INTRODUCTION

By letter dated March 26, 1991 (AEP:NRC:1140), the Indiana Michigan Power Company (the licensee) requested amendments in the form of changes to Technical Specifications (TS) in Appendix A of Operating License Nos. DPR-58 and DPR-74 for the Donald C. Cook nuclear facility. The proposed changes would eliminate the requirements for a Boron Injection Tank (BIT). Specifically, the licensee intends to delete reference to the BIT, including the limiting condition for operation and surveillance requirements from Section 3/4.5 of the TS for each unit.

Deletion of the BIT from the plant design requires an increase in engineered safety feature (ESF) actuation system response times to reflect the safety analyses supporting the request. These proposed changes are identified in revised TS Table 3.3-5. Changes to the Bases sections associated with the proposed changes are also identified in the amendment request.

2.0 EVALUATION

BITs were originally incorporated into Westinghouse-designed plants as a means of mitigating the consequences of the worst-case cooldown accident, the limiting cooldown accident being the main steam line break event. The sole purpose of the BIT, as a component of the safety injection system (SIS), is to insert concentrated boric acid (i.e., 20,000 ppm) into the reactor vessel and thus add negative reactivity during accidents. The injection of this concentrated boric acid was relied on in the steam line break analysis to limit the peak power during the post cooldown return to power.

Problems and safety concerns associated with the BIT were identified in NRC Generic Letter 85-16 "High Boron Concentrations" dated August 25, 1985. The high concentration of boric acid imposes operational and maintenance problems that adversely affect plant availability such as (1) minimum volumes and concentrations in boric acid system tanks, (2) heat tracing malfunctions, (3) BIT valve testing, and (4) recovery from an inadvertent safety injection. The high boric acid concentrations also cause a safety concern involving boric acid solidification that could render emergency core cooling inoperable. Therefore, many plants such as Beaver Valley, Byron/Braidwood, Turkey Point, McGuire, and

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Catawba have removed the BIT. The licensee has proposed to deactivate the BIT and the associated heat-tracing systems from D. C. Cook Units 1 and 2 during the next refueling outage for each unit.

In the current Donald C. Cook design, the BIT provides boric acid solution at 20,000 ppm to the reactor coolant system upon initiation of the Emergency Core Cooling System (ECCS). Without the addition of boric acid from the BIT, the ECCS can only inject borated water to the reactor core from the refueling water storage tank (RWST) at a reduced boron concentration, which results in a reduced rate of decrease of reactivity. Consequently, elimination of the BIT will affect the containment pressure response for a postulated Main Steam Line Break (MSLB) through changes in the mass and energy release rates.

The licensee has reanalyzed the core response and mass and energy releases for a spectrum of postulated MSLB's inside and outside containment in connection with the rerated power and revised temperature and pressure operation for the D. C. Cook facility (Westinghouse Licensing Report WCAP-11902, Supplement 1, dated September 1989). The MSLB analyses were performed assuming a BIT boron concentration of zero ppm which is a conservative assumption for the postulated event. The analyses for the inside containment break were approved in the NRC Safety Evaluation dated August 27, 1990 for Amendment Nos. 148 and 134 to Facility Operating License Nos. DPR-58 and DPR-74. The results of the analyses are applicable to the current amendment application for removal of the BIT.

Although limited clad perforation following a MSLB is permitted by the Standard Review Plan, the licensee has demonstrated that no clad perforation is likely to occur. The staff's acceptance criteria for a MSLB includes a consideration that the radiological release should not exceed the limits set forth in 10 CFR Part 100. With no predicted clad perforation, the proposal thus satisfies the acceptance criteria of Standard Review Plan Section 15.1.5, Appendix A, "Radiological Consequences of Main Steam Line Failures Outside Containment of a PWR."

#### Proposed Design Changes

The physical changes to the boron injection system proposed by the licensee were identified in the March 26, 1991 amendment request. The BIT will remain in place connected to the ECCS injection piping system, but filled with water containing only a nominal boron concentration instead of 12 percent boron by weight. The BIT recirculation piping to and from the boric acid storage tank (BAST) and attendant equipment will remain in place, but will be cut and capped. All flow instruments and control room annunciators to be deactivated will have their alarm wiring disconnected. Recirculation valves will remain in place in the closed position. The staff believes that the isolation of the BAST will preclude inadvertent concentration of boric acid greater than that of the RWST and concurs with the proposed design changes.

#### Safety Injection Response Times

During a safety injection, the suction of the charging pumps is diverted from the normal suction at the volume control tank (VCT) to the RWST and discharged through the BIT to the reactor coolant system (RCS). In loss-of-coolant accident (LOCA) analyses, safety injection is assumed to begin while the charging pumps



are aligned to the RWST, whereas in the non-LOCA analyses, boron injection is assumed to begin when the realignment is complete including isolation of charging pump suction from the VCT. Isolation of the VCT occurs after alignment of the charging pumps to the RWST. The response time for charging pump suction switchover from the VCT to the RWST will be included in ESF response times (TS Table 3.3-5).

The Unit 2 reactor trip on safety injection for ESF response times has been increased from 2.0 to 3.0 seconds. The new response times are identified for both off-site power available (27.0 seconds) and off-site power not available (37.0 seconds). The proposed changes in response time are consistent with the analysis assumptions and are acceptable.

#### Technical Specification Changes

The following are the proposed changes to the TS associated with the deactivation of the BIT and the deactivation or removal of its heat tracing.

(a) Index and TS 3/4.5.4

The proposed changes are editorial and reflect the deactivation of the BIT and the deactivation or removal of the boric acid flow path heat tracing.

(b) Table 3.3-2

This table is being changed to reflect the overpower delta-T reactor trip response time supported by the analysis of steam line break mass and energy release outside containment.

(c) Unit 1 Design Features/ECCS

An exception statement is added to make note of the modifications to the chemical and volume control system (CVCS) boron makeup system and the BIT.

(d) Table 3.3-5, Engineered Safety Features Response Times

Engineered Safety Feature (ESF) response times will be increased from 2.0 to 3.0 seconds. New response times for safety injection are identified for both off-site power available and not available. The increases are supported by the safety analyses and are acceptable.

(e) Changes to the Bases Sections are made to reflect the new analyses and page shifts resulting from added paragraphs.

The Bases for TS Section 3/4.3 "Instrumentation" is being modified to include the following proposed insert related to the RWST and VCT.

"ESF response times specified in Table 3.3-5 which include sequential operation of the RWST and VCT valves (notes @ and @@) are based on values assumed in the non-LOCA safety analyses. These analyses take credit for injection of borated water from the RWST. Injection of borated water is assumed not to occur until the VCT charging pump suction valves are closed

following opening of the RWST charging pump suction valves. When sequential operation of the RWST and VCT valves is not included in the response times (Note ++), the values specified are based on the LOCA analyses. The LOCA analyses take credit for injection flow regardless of the source. Verification of the response times specified in Table 3.3-5 will assure that the assumptions used for VCT and RWST valves are valid."

This proposed insert correctly reflects the basis for the response times and is, therefore, acceptable.

The revised Technical Specification pages identified in Attachment 2 to AEP:NRC:1140 are acceptable as proposed.

### Containment Analysis

As noted above, earlier safety evaluations addressed the revised Main Steam Line Break analyses. The earlier analyses were prepared in support of potential increases in licensed power ratings of both units and relaxation of certain parameters including zero boron concentration in the BIT. However, deletion of BIT technical specifications was not requested as part of the previous applications due to unevaluated effects of higher peak temperatures on instruments located in steam compartments. The licensee has since completed additional analyses of the temperature effects.

The temperature response of each affected instrument was analyzed by modeling the instruments as heat structures subjected to the revised environmental conditions. All instrument surface temperatures were determined to remain below the component qualified temperature due to the short duration of the temperature transient. The proposed amendments will, therefore, not compromise the environmental qualification of electrical equipment.

Based on a review of the information provided by the licensee and because of the similarity of the licensee's request to other staff actions on boron concentration reduction programs, the staff concludes that the licensee's proposal to eliminate the BIT will not adversely affect the functional performance or environmental qualification of the containment or equipment and will present no significant change in the safety margin. Therefore, the BIT requirement may be deleted from the TS for Donald C. Cook Units 1 and 2.

### 3.0 STATE CONSULTATION

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



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#### 4.0 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 previously issued a proposed finding that these amendments involve no significant hazards consideration, and there has been no public comment on such finding. 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) issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: M. A. McCoy  
W. O. Long

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