March 12, 2001

MEMORANDUM TO: John A. Grobe, Director
Division of Reactor Safety
Region III

FROM: Suzanne C. Black, Deputy Director ***/RA/***
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: DONALD C. COOK (D. C. COOK), UNITS 1 AND 2 - TIA 2000-07 EVALUATION OF EMERGENCY OPERATING PROCEDURE SHUTDOWN CRITERIA AT THE DONALD C. COOK PLANT (TAC NOS. MA9676 AND MA9677)

By memorandum dated July 24, 2000, Region III requested technical assistance from the Office of Nuclear Reactor Regulation (NRR) in evaluating a concern associated with using the rod position indication system as one means to determine whether reactors at the D. C. Cook Nuclear Power Plant are shut down.

Specifically, Region III requested NRR to review the following question:

> Is it acceptable for D. C. Cook Units 1 and 2 emergency operating procedures to use a shutdown criteria (for determining whether emergency boration is necessary) which is less conservative than that supported by deterministic analyses, but is supported by probability analyses? If so, what is the basis for acceptability?

The NRR staff does not find that it is appropriate to combine the deterministic analyses and the probability analyses in the way that Indiana Michigan Power Company (the licensee) did in this case. The NRR staff's review of the material provided indicates that a slightly more realistic, but still very conservative, deterministic calculation would support the current emergency operating procedures for determining whether emergency boration is necessary. The NRR staff finds that such a calculation would show that the shutdown criteria is met even with all rods at the 10-step location. Thus, it would not be necessary to rely upon a probability analysis which assumes that if all rods are at the 7-step location at least one rod would be above the 10-step limit.

The calculations performed by the licensee assumed that all rods have the same reactivity worth as those in the most worthy bank. This assumption is extremely conservative since the rod worth depending on the core location and core configuration, can vary by as much as a factor of two. This assumption allowed the licensee to address the issue with a bounding hand calculation. However, the excessive conservatism in the licensee's assumptions resulted in the bounding deterministic calculation being so conservative that the outcome indicated that the

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reactivity worth of the maximum worth rod is not greater than the reactivity worth of all the rods withdrawn 8 steps (5 inches). With these assumptions, the licensee could not show that shutdown margin was maintained with all rods withdrawn only 5 inches. It appears that the licensee's intent was to account for the uncertainty in the rod position due to the inherent inaccuracy associated with the analog individual rod position indicators (IRPIs). It is well known that the IRPIs frequently indicate rods a few steps different from the demand position. Thus, for a reactor trip, it is common for the IRPI to indicate a few steps withdrawn when in fact the rod is fully inserted. The licensee is correct in stating that the inherent inaccuracy in the IRPI system must be taken into account in the boration instructions provided to the operators.

In summary, the analog IRPI system has an inherent inaccuracy which allows IRPIs to indicate a few steps withdrawn when the rod is fully inserted. It is not appropriate to combine the deterministic and probability analyses as the licensee performed to support the current D. C. Cook emergency operating procedures. The NRR staff believes that it is possible to perform a more realistic, but still conservative analyses to support the emergency operating procedures guidance on emergency boration. This will require a more sophisticated analyses than the hand calculation performed by the licensee.

This completes NRR's review and evaluation efforts under TIA 2000-07 and TAC Nos. MA9676 and MA9677. If you have any questions regarding this issue, please contact John Stang of my staff at (301) 415-1345.

Docket Nos. 50-315 and 50-316

cc: W. Lanning, Region I
C. Casto, Region II
A. Howell, Region IV

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