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DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards status rept on inadequate core cooling instrumentation sys,per 831219 request.Rept addresses reactor vessel instrumentation sys,core exit thermocouples, subcooling margin monitor & NUREG-0737,Item II.F.2.

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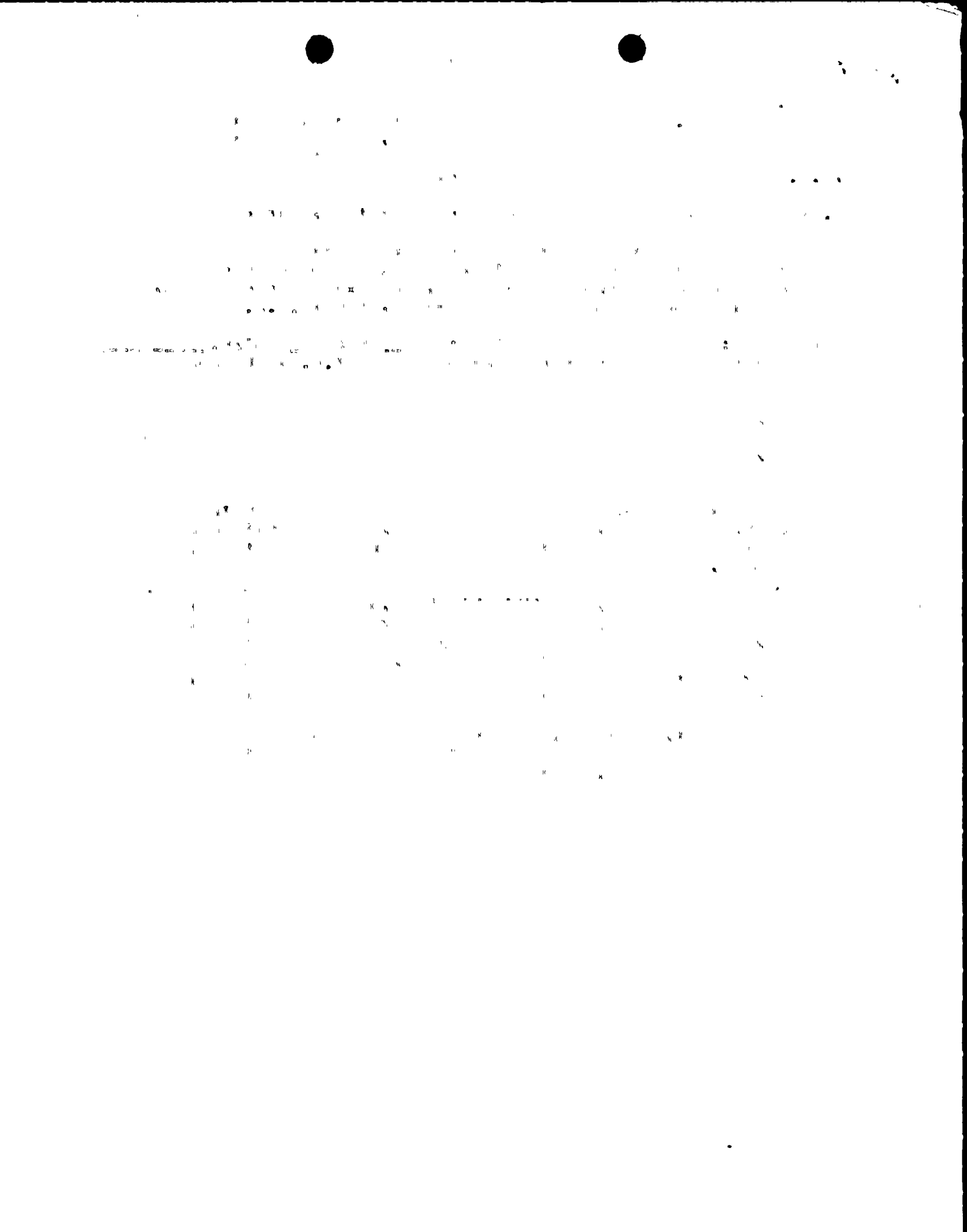

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August 20, 1984
AEP:NRC:0761C

Donald C. Cook Nuclear Plant Unit Nos. 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
INADEQUATE CORE COOLING INSTRUMENTATION SYSTEM STATUS REPORT

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Denton:

This letter responds to Mr. S. A. Varga's letter dated December 19, 1983, which transmitted to Mr. John E. Dolan of the Indiana & Michigan Electric Company (IMECo) the NRC's preliminary Safety Evaluation of the Inadequate Core Cooling Instrumentation (ICCI) system for the Donald C. Cook Nuclear Plant.

More specifically, the Attachment to this letter provides a status report on the Donald C. Cook Nuclear Plant ICCI system, which consists of a Reactor Vessel Level Instrumentation System (RVLIS), Core Exit Thermocouples (CETs), and a Subcooling Margin Monitor (SMM). This status report fulfills the commitments we made in our letter AEP:NRC:0761B (dated February 3, 1984) regarding Enclosure 1 to Mr. Denton's December 19, 1983 letter. Information regarding Enclosure 2 of the December 19, 1983 letter will be transmitted following completion of the Upgrade Emergency Operating Procedures Generation Package scheduled for submittal in September, 1984.

This document has been prepared following Corporate procedures which incorporate a reasonable set of controls to ensure its accuracy and completeness prior to signature by the undersigned.

Very truly yours,

M. P. Alexich
Vice President

MPA/dam

cc: John E. Dolan
W. G. Smith, Jr. - Bridgman
R. C. Callen
G. Charnoff
E. R. Swanson - NRC Resident Inspector, Bridgman

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ATTACHMENT TO AEP:NRC:0761C
INADEQUATE CORE COOLING INSTRUMENTATION SYSTEM STATUS REPORT
DONALD C. COOK NUCLEAR PLANT UNIT NOS. 1 AND 2

Introduction

This attachment provides a status report on the Donald C. Cook Nuclear Plant Inadequate Core Cooling Instrumentation (ICCI) system, which consists of a Reactor Vessel Level Instrumentation System (RVLIS), Core Exit Thermocouples (CETs), and a Subcooling Margin Monitor (SMM). The contents of this status report address the 4 items of concern identified by the NRC in Enclosure 1 to the preliminary ICCI system Safety Evaluation, transmitted via letter dated December 19, 1983 [S. A. Varga (NRC) to John E. Dolan (IMECo)].

The 4 items of concern and the IMECo responses are provided below:

Item 1:

An unresolved concern regarding post-accident environmental effects on in-containment wide range pressure transmitters and subsequent effects on RVLIS accuracy was identified. Describe the status of the resolution of the wide range pressure transmitter application including any changes to the current installed RVLIS system and provide the schedule for completion of installation and calibration of the RVLIS system.

Response to Item 1:

In IMECo letter No. AEP:NRC:0761A, dated June 22, 1983, it was noted that the Westinghouse Electric Corporation (W) concern with regard to the transmitters was being discussed with W. Since that time, the W recommendation that the wide range pressure transmitters interfacing with RVLIS be located outside containment to achieve the design RVLIS accuracy was reviewed and found to be acceptable. Subject to final engineering and design review, it is proposed that the currently installed RVLIS be modified by relocating the existing wide range pressure transmitters from inside containment to outside containment, where they will be connected to RVLIS through level transmitter access assemblies. This installation, together with the required calibration, is scheduled to be completed by the end of the next refueling outages for both units. These outages are currently expected to begin in March 1985 for Unit No. 1 and in November 1985 for Unit No. 2.

The RVLIS installation is complete in both Units with the exception of the aforementioned relocation of the wide range pressure transmitters scheduled to be completed by the end of 1985. The systems are functional. Remaining calibration tasks reported in the past have been completed. Should the systems be required in an emergency, the level indicators and recorders are available. However, operators are not now permitted to use these systems.

Item 2:

Provide an evaluation of the final CET system with respect to conformance with Item II.F.2 Attachment 1 and Appendix B of NUREG-0737 requirements since the data provided is insufficiently spread over numerous referenced documents and a definitive determination of conformance is not possible.

Response to Item 2:

The CET system in Unit No. 1 is undergoing upgrade work which is expected to be complete during the 1985 refueling outage with the following exception: The relocation of two (2) thermocouples to monitor the upper head region will not be done during the 1985 refueling outage because of technical problems that still remain to be resolved. This work is anticipated to be completed during the next refueling outage after the 1985 refueling outage. Presently, thirty-two (32) new environmentally and seismically qualified connectors and thirty-two (32) temporary transition cables have been installed. Additionally, a recovery method for the inoperable CETs is being tested and appears to be successful at this time.

We believe that the design of the upgraded CET system meets, with the exception of cable separation criteria and core map display capabilities (explained later), all the requirements of NUREG-0737 Item II.F.2, Attachment 1. The following describes the upgraded CET system to be installed in Unit No. 1:

- Upon successful recovery of the inoperable thermocouples, sixty-three (63) of the sixty-five (65) thermocouples will be divided into two (2) electrically independent channels. Each channel will be energized from a Class IE power source, and physically separated, except at the Reactor Vessel Head area, using the appropriate guidance of Regulatory Guide 1.75, up to and including the isolation devices. These thermocouples will be divided as evenly as possible to provide adequate coverage of each core quadrant.

- Two (2) thermocouples, one (1) from each channel, are planned to be relocated to monitor temperatures in the upper head region to assist in monitoring local vessel temperature conditions during natural circulation modes of operation. It should be noted that these two thermocouples are not required to meet the requirements of NUREG-0737.

- Environmentally and seismically qualified connectors and mineral insulated cabling will be installed from the CET nozzles up to a location past the missile shield wall, where a transition to qualified organic cabling will take place via qualified splices. From this point the qualified organic thermocouple cabling will be run through penetrations and will terminate at new signal processing equipment.

- Signal processing equipment will consist of two (2) racks of hardware capable of converting the low level thermocouple signals into high level (4-20 or 10-50 ma) signals. The two (2) racks will be Class IE and qualified to the appropriate environmental and seismic requirements of IEEE Std 323-1974. Isolation between IE and non-IE signals will be provided.

- Cold junction compensation will be done automatically by the equipment. The two (2) racks will be physically separated using the guidance of Regulatory Guide 1.75 including the IE signals and non-IE signals. Thirty-three (33) signals will be processed on one (1) rack and thirty-two (32) on the other. (This may vary slightly when final determinations of CET configuration is made.) These racks will each be powered by a IE power source. The outputs of these racks will be transmitted to the normal plant process and Technical Support Center computers, two (2) back-up displays, and the SMM's incore thermocouple inputs (two (2) per quadrant for a total of eight (8)). Isolation between IE and non-IE equipment is provided in the electronics of the various pieces of equipment.

- The primary display will be the plant process computer which has direct readout and hard copy capabilities for all thermocouples. The range will be 200°F to 2300°F. Trending capabilities also exist which can show the time history of CET temperatures on demand.

- Alarm capabilities presently exist and will be made to be consistent with Emergency Operating Procedures. The operator display devices are presently under review, as is the entire control room for human factors. Results of this review, when complete, will be taken into account.

- A spatially oriented core map, available on demand, showing the temperature at each CET location will be available from the Technical Support Center CRT located in the control room. The Technical Support Center computer is not designated as the primary operator display. Therefore, this method of providing a core map is in variance with NUREG-0737. However, it is our opinion that the Technical Support Center computer man-machine interface, together with operator training in use of the upgraded Emergency Operating Procedures, provides adequate compensatory methods for this deviation. It is therefore concluded that this deviation from NUREG-0737 is not significant and should be an acceptable method of providing a core map.

- A Class IE back-up display will be provided for each channel with the capability for the selective reading of a minimum of sixteen (16) operable thermocouples (four (4) per quadrant).

- The present design specifies manual switching between each thermocouple. It is expected that the switching can be completed between all CETs within a time interval of six (6) minutes. The displayed temperature range will be 200°F to 2300°F.

Approximately fifty-seven (57) of the sixty-five (65) CETs are operable in Unit No. 2. Provided the Unit No. 1 upgrade is successful, the anticipated schedule for Unit No. 2 is as follows:

- Completion of Unit No. 1 upgrading in 1985, except for the thermocouples in the upper head area.
- One (1) year operational study.
- Complete detail design November 1987.
- Complete installation during first refueling outage which occurs after December 1987.

A definite schedule and a detailed description for review of compliance with NUREG-0737 cannot be available until the Unit No. 2 detailed design is complete. Should the Unit No. 1 upgrade be successful it is likely that the Unit No. 2 upgrade will be designed in a similar, if not identical, manner as Unit No. 1, providing that the hardware is still available for purchase.

Item 3:

Provide justification for the schedule for completion of the ICCI system and for the adequacy of the CET system during the interim period until upgrading can be completed.

Response to Item 3:

The ICCI system completion schedule is contingent upon the successful upgrade of the CET system. The RVLIS is installed and calibrated and after some modifications can be made operable prior to the completion of the CET system in either Unit. The SMM is installed and operational and operators have been trained in its use. Since the SMM's primary inputs are wide range Reactor Coolant System temperatures, the remaining work on upgrading the CETs does not impact the SMM normal operation.

The scheduling for Unit No. 2 is based on the ongoing Unit No. 1 CET upgrade program. The design and procurement of materials for the Unit No. 2 CETs cannot proceed until the results of the Unit No. 1 upgrade program are known. The adequacy of the present Unit No. 2 CET system can be shown by the fact that after seven (7) years, fifty-seven (57) of the thermocouples are still operational. These could be used to provide the operators with adequate secondary information under accident conditions.

During the interim period until CET upgrading can be completed, the SMM can be used to detect Inadequate Core Cooling conditions. Wide range pressure and temperature (i.e., Resistance Temperature Detectors) Class IE signals are used as inputs, and the operators have been trained in the SMM's use and emergency procedures are in place.

We believe that the RVLIS can now be used in an emergency, although it has not been declared operational. Additionally, the survivability of incore thermocouples was demonstrated during the TMI-2 accident. From the results of that accident, it is believed that a sufficient portion of the present CET system should survive a postulated incident and could provide the operators with adequate information to establish qualitative trending indications.

Item 4:

The Subcooling Margin Monitor receives input signals from a mix of Class 1E and non-Class 1E instrumentation sources. Furthermore it is not clear that the subcooling margin computer and display are seismically and environmentally qualified. Clarify that in all instances Class 1E equipment is protected by qualified isolation devices to preclude the possibility of adverse interaction between Class 1E and non-Class 1E devices or signals.

Response to Item 4:

Inputs to the saturation meter consist of Class IE signals (i.e., Reactor Coolant System wide range pressure detectors) and non-Class IE signals (i.e., CETs). Each of these input signals is isolated by a qualified Signal Converter Transformer. All cabling and connections for these isolation devices to the saturation meter are confined to the control room, eliminating the need for environmental qualification.

The saturation margin meter and display were installed to meet the requirements of NUREG-0578. These devices were designed, purchased, and installed during the period of October 1979 to October 1980 in a good faith effort to meet the then existing requirements. Therefore, they were not required to be and as such have not been seismically and environmentally qualified.