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June 11, 1984

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Director of Nuclear Reactor Regulation
ATTN: Mr. J. F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Request for Additional Information
Concerning ANO-1 Core Exit
Thermocouple (CET) System

Gentlemen:

Your letter of May 7, 1984, conveyed the acceptance of the existing ANO-1 CET instrumentation for interim operation, and made two requests for information:

a. to review the ANO-1 emergency procedures regarding ICC monitoring after a seismic event, and

b. to review the thermocouple cold junction to assure an accurate reference temperature during adverse environmental conditions.

Supplementary information included with this letter as Attachments A and B, respectively, provide our response to the above requests.

Very truly yours,

John R. Marshall
Manager, Licensing

JRM/JPM/ac

Attachments

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ATTACHMENT A

The staff requests that ANO-1 emergency operating procedures (EOP) be reviewed and revised to provide an alternate method of inadequate core cooling (ICC) monitoring. This is based on the fact that cabling for the 32 core exit thermocouples (CET) is safety-grade, but not routed on seismically qualified raceways.

A seismically-induced collapse of either of two cable raceways in containment, over which the 32 CET cables travel sequentially, is, for analytical purposes, a hypothetical event causing the loss of all CET indication. However, ANO-1 has been analyzed and designed for a seismic event. Should a DBE occur, the instrumentation normally used by the operators (including all process and control instrumentation for Seismic Category I systems and components) is designed redundantly such that a safe shutdown can be achieved. The CET's are not required for safe shutdown; and complete loss of these indications by raceway collapse is within the analyzed bounds of single failure criteria for ANO-1. The staff implies, through the concerns expressed, the hypothetical condition of a seismic event concurrent with an event which poses the potential for ICC (e.g., SBLOCA). Such a condition is beyond the design basis for ANO-1.

The ICC guidelines are the alternate method for protecting the core in case of certain multiple equipment failures during a transient. These events have an extremely low probability of occurrence. The instructions are based on CET indications from either the plant computer or the safety parameter display system. Incorrect operator action (i.e., premature HPI termination) could lead to an ICC condition; however, the EOP's provide explicit instruction to preclude such incorrect action. The procedures are symptom-oriented and clearly instruct the operators to maintain full HPI flow when the subcooling margin is less than 50°F. Other parts of the EOP's provide instruction to prevent ICC as well (e.g., stop RCP's if subcooling margin is lost).

Further, the formation of a steam bubble in the reactor head region, as a precursor event to ICC, is considered in the operating procedures and training of the operators so that this condition will be detected and mitigated in a timely manner (see AP&L letters ØCAN1183103 dated November 13, 1981, response to Generic Letter No. 81-21, and 1CANØ783Ø4 dated July 13, 1983, Natural Circulation Cooldown).

If loss of CET indication is due only to failure of both display systems, ANO technicians can read the outputs directly from the cabling outside of containment. A similar means of obtaining instrument readings may also be applied to other process instruments of the RCS. As this is not an operator function, instructions for such methods are not included in the EOP's.

Notwithstanding the above, a failure of all 32 sensors, though unlikely, is being considered. An alternate procedure, utilizing readings from the wide-range, hot-leg temperature indications of the reactor protection

system, will be incorporated into the ICC guidelines. Should these indications be overranged, the operators are then instructed to assume a worst case condition (fuel clad temperature > 1800°F) and take actions accordingly.

Based upon the above discussion, we are confident that the existing EOP's give the operators adequate instruction to monitor for ICC. The revision being incorporated is an additional method of ICC monitoring for the interim system and is not a part of the planned ICC modification for 1R7. We believe this information will satisfy your concerns for the interim ICC moritoring system.

ATTACHMENT B

Uniform Temperature Reference junctions for the Core Exit Thermocouples (CETs) are located inside containment in a 30"x30"x10" NEMA 12 terminal box. Two RTDs are installed in this terminal box to monitor the temperature inside the terminal box and provide reference compensation for the CET signals.

The junction box and RTDs were installed in 1979 when the thermocouple readouts were made operational. Seismic and environmental qualification requirements were not placed on procurement of the terminal box or RTDs as they were procured non-safety grade. Thus their degree of actual qualification has not been established. This equipment has performed satisfactorily since installation in the containment environment in 1979. Furthermore, this equipment was exposed to and survived the adverse environment described in our March 7, 1984 letter 1CAN038401. As mentioned in the above referenced letter the CETs continued to perform satisfactorily during and following this incident.

The RTDs which provide reference temperature to the computers for compensation have an input range to the computer of 0-132°F. Further investigation is underway to provide an increased input range to the computer of 0-300°F to allow for more accurate compensation during the environmental conditions which might prevail during an ICC event.