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SUBJECT: Forwards response to 840604 request for addl info re NUREG-0737,Item II.F.2 concerning inadequate core cooling instrumentation.

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August 7, 1984

Director of Nuclear Reactor Regulation
Attention: Mr. Walter A. Paulson, Acting Chief
Operating Reactors Branch No. 5
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Inadequate Core Cooling Instrumentation,
NUREG-0737, Item II.F.2
R. E. Ginna Nuclear Power Plant
Docket No. 50-244

Dear Mr. Paulson:

An NRC letter from Dennis M. Crutchfield dated June 4, 1984 requested that RG&E provide additional information regarding Inadequate Core Cooling Instrumentation. Attachment A to this letter responds to the information requests of enclosures 1 and 2 of that letter.

Very truly yours,

Roger W. Kober

Roger W. Kober

Attachment

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ATTACHMENT A

ENCLOSURE 1
REQUEST FOR ADDITIONAL INFORMATION
ROCHESTER GAS AND ELECTRIC CORPORATION PROPOSED
INADEQUATE CORE COOLING INSTRUMENTATION FOR THE
R. E. GINNA NUCLEAR POWER PLANT

1. Describe the scope of the CET upgrading during the 1984-85 refueling outages and note any deviations from the requirements of II.F.2.

RG&E Response

The existing core exit thermocouple (CET) system at Ginna Station utilizes commercial grade connectors, a heated reference junction inside containment and a single display in the control room. None of the system components have qualification documentation and no isolation is provided between the display and plant computer (P250).

During the 1984-85 refueling outages, the CET system will be upgraded from the reactor head connectors to the control room displays. Qualified thermocouple extension wire will be run from the CET's through a new penetration to the control room eliminating the need for the heated reference junction boxes inside containment. The 39 CET's will be split into 2 trains outside of containment and run to separate digital scanning displays in the control room. The displays will provide isolated CET outputs to the plant computer for normal plant operations and safety assessment. The CET displays, cable, containment penetrations, and connectors at the reactor head will be seismically and environmentally qualified. Operating range of the new CET system, including the displays, will be 0-2300°F.

2. Document the redundant (installed) SMM and note any deviations from the requirements of II.F.2.

RG&E Response

A redundant subcooling margin monitor (SMM) system was installed during the 1980 and 1981 refueling outages at Ginna Station. RCS wide range pressure (0-3000 psig) is input to a function generator which computes the saturation temperature (Tsat) for that pressure. RCS hot leg temperature (Thot, 300-700°F) is subtracted from Tsat to obtain the margin to saturation (Tsat-Thot). The saturation margin is displayed in the control room on a vertical scale indicator (0-100°F subcooling) and input to a bistable which alarms when Tsat-Thot is less than 40°F. The SMM system hot leg RTD's, wide range pressure transmitters, signal processing cards, and instrument cable are seismically and environmentally qualified.

3. Describe the display system for the ICC related parameters.

RG&E Response

Class IE displays for the inadequate core cooling (ICC) related parameters will consist of vertical scale indicators for saturation margin monitoring and reactor vessel inventory trending, and digital scanning displays for the core exit thermocouples. The SMM and CET outputs will be directly input to the plant computer for normal operations and safety assessment. All inputs used to compute reactor vessel inventory will also be input to the plant computer for an independent level calculation.

4. Provide a detailed description of the proposed dp system and clarify the schedule planned for the system installation, calibration, and testing. Include the system accuracy for the level measurement and the component uncertainty which contribute to the overall system accuracy.

RG&E Response

The proposed dp system will trend coolant inventory within the reactor vessel during all phases of plant operation including post accident conditions with quasi-steady-state conditions, and during relatively slow developing transients. The system will consist of two redundant Class IE differential pressure trending channels, each consisting of one dp transmitter per channel. Each channel will drive a separate indicator in the main control room showing reactor vessel level (0-100%) and refueling level (0-24 ft.) Signals will be processed to compensate for reference leg temperature differences, primary coolant flow and temperature, and safety injection and residual heat removal system operation. Instrument tubing required will be redundant in the area of the transmitter manifolds only. There will be only one upper and lower reactor vessel tap with a single line to the transmitter manifolds. The areas available for reactor vessel taps are small and preclude separation of redundant taps. Single taps at the reactor top and bottom are considered acceptable because redundant taps would be susceptible to the same events and would introduce additional potential leakage locations. Likewise, the CETs are in close proximity to each other at the reactor head and are not split into separate trains until after they have exited containment. Routing of the CETs is such that they are not susceptible to other single events, such as high energy line breaks inside containment.

Although the dp inventory trend instrument will be capable of generating process signals over a greater span, trend information will be used in accident decision making during quasi-steady state conditions only between the upper tap and the vessel piping penetrations. Emergency Operating Procedures will be revised, based upon Westinghouse Owner's Group Emergency Response Guidelines, to include instrument responses

in this range even though one consultant who studied inadequate core cooling situations (see RG&E letter dated November 29, 1983) concluded that "existing plant instrumentation and procedures are adequate to advise operators of how to respond to voids in the reactor vessel head or distributed through the reactor coolant system." Installation and use of the system in this manner will meet the requirement for a reactor coolant inventory tracking system to monitor coolant inventory over the range from the vessel upper head to the bottom of the hot leg as the requirement was imposed by Mr. Eisenhut's December 10, 1982 letter for operation of pressurized water reactors.

Rochester Gas and Electric has previously stated its position in letters dated July 2, 1980, December 15, 1980, December 30, 1980 and January 19, 1982, that an instrument to accurately measure reactor vessel water level could serve a useful purpose, but that such a device is not necessary for proper response to emergency situations. RG&E also is not convinced that reactor vessel water level (inventory trend) instruments provide a clear, unambiguous indication of inadequate core cooling, although they may indicate coolant void formation in the limited span above the vessel piping penetrations. For these reasons, indications from the differential pressure system may be used during normal plant operations to measure coolant inventory over the full range of the instrument, but during accident conditions only the limited span required by the NRC will be used. In this span, coolant level or inventory trend will be calculated assuming a fluid specific gravity determined using the average of three core exit thermocouples.

For use during non-accident conditions, equations and a functional block diagram have been developed for at least two modes of operation; forced or natural circulation with and without safety injection (SI) or residual heat removal (RHR) system operation. The vessel is assumed to be partitioned into three temperature zones; below the core, within the core and above the core. The fluid temperature (and hence the fluid density) within each of these zones is derived from a combination of cold leg RTDs and core exit thermocouple readings and is dependent upon the operation of the SI and RHR systems. However, because of limitations in determining representative temperatures in the lower regions during SI and RHR system operation, inventory indications will not be relied upon for operator action.

The dp system accuracy in the span above the vessel piping is dependent upon environmental conditions. All signal processing modules are assumed to have the manufacturer's specified accuracy of ±0.5% under all conditions. The dp and wide range pressure transmitters under normal conditions have uncertainties of ±0.5%. For accident conditions, the transmitter uncertainty is specified as ±7.0% worst case for the first 24 hours of a LOCA, and ±2.5% worst case 24 hours

after a LOCA. The overall system accuracies for the above described operating and environmental conditions have been calculated in accordance with guidelines provided in NRC letter from D.M. Crutchfield to J.E. Maier dated 2/23/83 and are tabulated below.

	Normal	LOCA < 24 hrs.	LOCA > 24 hrs.
RCP's Running or Natural Circulation	±2.8%	±5.13%	±3.18%

The above system uncertainties were determined using manufacturer's component specification data. An acceptable uncertainty for the inventory trending system is considered to be at least ±8.0%, which is based on the distance between the top of the core and the centerline of the hot leg. An 8% uncertainty will assure that a coolant trend indication at the vessel outlet will not represent an actual coolant inventory trend which has dropped to the top of the core.

ENCLOSURE 2

MILESTONES FOR IMPLEMENTATION OF
INADEQUATE CORE COOLING INSTRUMENTATION

1. Submit final design description (by licensee) (complete the documentation requirements of NUREG-0737, Item II.F.2, including all plant-specific information items identified in applicable NRC evaluation reports for generic approved systems).

RG&E Response
This description is provided in response to Enclosure 1, item 4 included in this letter.

2. Approval of emergency operating procedure (EOP) technical guidelines - (by NRC).

Note: This EOP technical guideline which incorporates the selected system must be based on the intended uses of that system as described in approved generic EOP technical guidelines relevant to the selected system.

RG&E Response
System procedures will be based upon Westinghouse Owners Group Emergency Response Guidelines. NRC has the above guidelines available for review.

3. Inventory Tracking Systems (ITS) installation complete (by licensee).

RG&E Response
Installation completion is scheduled for the end of the 1986 refueling outage.

4. ITS functional testing and calibration complete (by licensee).

RG&E Response
Completion of functional testing and calibration is scheduled for three months after installation of ITS.

5. Prepare revisions to plant operating procedures and emergency procedures based on approved EOP guidelines (by licensee).

RG&E Response
Revisions to plant procedures are scheduled for 3 months after completion of system testing and calibration.

6. Implementation letter report to NRC (by licensee).

RG&E Response
An implementation report will be sent 6 months after completion of functional testing and calibration.

7. Perform procedure walk-through to complete task analysis portion of ICC system design (by licensee).

RG&E Response
Procedure walk-through will be performed 3 months after revision of plant operating and emergency procedures.

8. Turn on system for operator training and familiarization.

RG&E Response
The system will be available for operator training and familiarization following completion of testing and calibration.

9. Approval of plant-specific installation (by NRC).

RG&E Response
NRC to supply date.

10. Implement modified operating procedures and emergency procedures (by licensee).

- System Fully Operational

RG&E Response
Implement modified procedures 3 months after procedure walk-through.