

Docket Nos.: 50-327
50-328

NOV 22 1985

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Mr. H. G. Parris
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Dear Mr. Parris:

SUBJECT: EVALUATION OF INADEQUATE CORE COOLING INSTRUMENTATION SYSTEM
FOR SEQUOYAH, UNITS 1 AND 2

The staff has reviewed your submittal on inadequate core cooling instrumentation (ICCI) (NUREG-0737, Item II.F.2) dated August 14, 1985, in response to the staff's March 26, 1985, request for additional information. The evaluation is enclosed.

The staff has concluded that the following are acceptable concerning the Sequoyah ICCI system: (1) the interim use of the current installed redundant reactor vessel level instrumentation system (RVLIS) for operator familiarization pending completion of the hardware and software modification and the functional tests, (2) the commitment to complete the upgrade of the existing core exit thermocouple (CET) and subcooling margin monitor (SMM) prior to startup following Cycle 4 for Units 1 and 2 and to complete the modification of RVLIS prior to the Cycle 3 refueling outage for each unit, (3) the commitment to implement the upgraded emergency operating procedures (EOPs) to address RVLIS based on the Westinghouse Owner's Group Emergency Response Guidelines, Revision 1, prior to startup from the Unit 2 Cycle 3 refueling outage, (4) the proposed change to add the RVLIS to Technical Specifications, and (5) the justification for interim operation using the current CET, SMM, and EOPs without RVLIS in operation until the startup following the Cycle 3 operation. Therefore, the staff concludes that the proposed ICCI meets the NUREG-0737, Item II.F.2, requirements. The regional inspectors will verify completion of the upgrade of the CET, SMM, and RVLIS, implementation of the upgraded procedures for ICC, and the functional tests after RVLIS modifications.

Original signed by:
Thomas M. Novak

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Thomas M. Novak, Assistant Director
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cc: See next page

Enclosure: As stated

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DESIGNATED ORIGINAL

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

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A handwritten signature in dark ink, appearing to read "Tom Novak".

Thomas M. Novak, Assistant Director
for Licensing
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Enclosure: As stated

Mr. H. G. Parris
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Sequoyah Nuclear Plant

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SAFETY EVALUATION REPORT
TENNESSEE VALLEY AUTHORITY
IMPLEMENTATION OF THE INADEQUATE CORE COOLING (ICC) INSTRUMENTATION SYSTEM
FOR SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2

The ICC instrumentation system at Sequoyah consists of subcooling margin monitor (SMM), Core Exit Thermocouples (CET), and reactor vessel level instrumentation system (RVLIS). All of the equipment is installed and operational.

The staff evaluation¹ of the Tennessee Valley Authority (TVA) response² to NRC Generic Letter No. 82-28 (GL 82-28) concluded that additional information with respect to the backup core exit thermocouple display system, Subcooling Margin Monitoring System, and the implementation letter report were needed in order for the staff to conclude that the design of the ICC instrumentation system conforms to NUREG-0737 design requirements.

In response to the staff's request¹ for additional information and for the implementation letter report, the licensee has transmitted a letter³ from J. A. Domer to H. R. Denton to address those concerns as follows:

- A. Response to CET, SMM, and RVLIS system design
 - 1. Qualified connectors, thermocouple extension cable, and reference junction boxes will be provided for the inside containment upgrade associated with the CET system. In lieu of inside containment reference junction boxes, additional containment penetration may be added and the reference junction boxes provided outside containment or within the microprocessor. For outside containment, a dual-train microprocessor-based main control room display system will be provided. Each main control room display will provide four continuous CET temperatures, selectively display on demand any CET temperature

to the respective microprocessor, and selectively display on demand the saturation margin based on the existing RCS wide-range pressure input and the hotter of the two hot leg temperatures, average CET, or the hottest CET temperature. This upgraded system will be installed and operational to meet the Category 1 design requirements before startup following Cycle 4 refueling outages for both Units 1 and 2.

2. RVLIS Systems were installed during the second refueling outages for both Units 1 and 2. TVA has begun the process to relocate two RTDs and to replace or modify the affected function-generator cards in accordance with Westinghouse recommendations for environmental design upgrade. These modifications will take place before startup from the Cycle 3 refueling outage for each unit provided the Westinghouse-recommended fix is timely and acceptable. Otherwise, RVLIS will be placed in service with the operators informed to use the system with caution after a seismic event. The post modification test (PMT) to verify accuracy of the system will be performed during the heatup from the respective Cycle 3 refueling outages for each unit and with verification provided by this test, the RVLIS will be a fully operable system. In the interim, the operators are encouraged during any unanticipated plant shutdown and, in particular, the scheduled shutdown, cooldown, vessel drain, and refill operations associated with the next refueling operations to observe the indications of the RVLIS and become familiar with its operation.
3. TVA has implemented those portions of upgraded procedures for plants without RVLIS based on the Westinghouse Emergency Response Guidelines (ERGs) in August 1985. However, the version of the EOPs utilizing RVLIS indication will be implemented simultaneously for Units 1 and 2 prior to startup from the Unit 2 Cycle 3 refueling outage.

4. TVA has provided justification for operators to safely operate the plant during the interim period prior to Cycle 3 refueling outage. The operator will use the criteria obtained from RCS T-hot subcooling, RCS pressure, auxiliary feedwater to intact steam generators, adequate pressurizer level and the upgraded EOPs for guidance in Safety Injection (SI) termination.

B. Implementation Letter Report

1. The RVLIS system is installed and calibrated. The functional testing of the RVLIS will be performed during heatup from each unit's Cycle 3 refueling outage. Upon completion of those tests, their results will be onsite and available for inspection.
2. Recalibration of the instrumentation has been performed and Westinghouse is evaluating the need to rescale compensation inputs to correct the indications. Westinghouse assures that, upon implementation of the recommended fix, system accuracy will be improved to less than ± 6 percent of the full range at core midplane evaluation and ± 8.1 percent of the full range when the vessel is full.
3. The current as-built system deviates from previous design descriptions in several areas of the modification such as field modification to Foxboro NCSS racks to provide outputs for RVLIS, addition and revision of density compensation, changes of RVLIS indicating scales, deletion of transmitter equalizer valves, and modification to function generator cards for seismic qualification, etc.
4. The core exit thermocouple system and subcooling margin monitor are currently included in Sequoyah's Technical Specifications. The RVLIS is in the process of being added to technical specifications

in accordance with Generic Letter 83-37. The request to add the RVLIS to technical specifications was made via letter from L. M. Mills to E. G. Adensam, January 25, 1984.

5. Sequoyah's EOPs are in the final stages of development and verification. These procedures are being developed based on the Westinghouse ERGs, Revision 1. In addition, Sequoyah's operators will be notified and encouraged to observe RVLIS indication during plant operations. Shutdowns, startups, and particularly during refueling operations in the upcoming refueling outages for both units.

Evaluation

The staff has reviewed the TVA responses^{2,3} with respect to conformance with the requirements of NUREG-0737, Item II.F.2. Based on this review in conjunction with our implementation review of the ICCI installation conducted at the Sequoyah Nuclear Plant site on March 28, 1985, the staff's conclusions follow:

1. The current redundant RVLIS, which has been installed and calibrated for Units 1 and 2, is acceptable upon completion of the hardware and software modification and the functional tests to achieve the expected system accuracy. In the interim, the proposal to encourage the Sequoyah's operators to observe the indications of the RVLIS and become familiar with its operation is acceptable.
2. The commitments to upgrade CET system, SMM, and RVLIS to meet NUREG-0737 Item II.F.2 requirements prior to startup from Cycle 4 for CET and SMM and prior to startup from the Cycle 3 refueling outage for RVLIS are acceptable.

3. The upgraded EOPs to address RVLIS based on WOG EPG Revision 1 to be implemented simultaneously for Units 1 and 2 prior to startup from the Unit 2 Cycle 3 refueling outage is acceptable.
4. The justification for interim operation using the current CET, SMM, and the EOPs without RVLIS is acceptable.
5. The proposed change to add the RVLIS to technical specifications is acceptable. However, this proposed change should be implemented upon the completion of the Cycle 3 refueling outage of each unit.

Regarding the Sequoyah procedures and displays, review of the Procedures Generation Package (PGP) and review for acceptance of the licensee's Detailed Control Room Design Review (DCRDR) (required by USNRC Generic Letter No. 82-33), which will include procedures and displays for inadequate core cooling, is in progress and may require further changes to Sequoyah Nuclear Plant, Units 1 and 2 EOPs and displays. Any additional changes to Sequoyah EOPs and displays resulting from the staff review of PGP and DCRDR should be addressed by TVA in a separate submittal corresponding to the schedule committed to in response to GL 82-33.

Based on this review and the implementation review of the ICCI installation conducted at the Sequoyah Nuclear Plant on March 28, 1985, the staff has concluded that upon completion of the upgrade of the CET, SMM, and RVLIS, implementation of the upgraded procedures for ICC and Technical Specification changes for RVLIS, and the fully functional tests after RVLIS modifications, the ICC instrumentation for Sequoyah Nuclear Plant Units 1 and 2 will be in compliance with the NUREG-0737, Item II.F.2 requirements and is acceptable.

References

- (1) NRC letter, T. M. Novak, to H. G. Parris, Evaluation and Request for Additional Information on NUREG-0737, Item II.F.2, Inadequate Core Cooling Instrumentation (ICCI) for the Sequoyah Nuclear Plant (SQN), March 26, 1985.
- (2) TVA letter, L. M. Mills to H. R. Denton, Response to the December 10, 1982 letter (NRC Generic Letter 82-28), March 8, 1983.
- (3) TVA letter, J. A. Domer to H. R. Denton, Response to Request for Additional Information, August 14, 1985.