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

SAFETY EVALUATION
VIRGINIA ELECTRIC AND POWER COMPANY
IMPLEMENTATION OF THE INADEQUATE CORE COOLING (ICC) INSTRUMENTATION SYSTEM FOR NORTH ANNA POWER STATION, UNITS 1 AND 2

The ICC instrumentation system at North Anna Power Station, Units 1 and 2, consists of Subcooling Margin Monitor (SMM), Reactor Vessel Level Instrumentation System (RVLIS), and Core Exit Thermocouples (CET). All of the equipment is installed and operational. However, the RVLIS for both units was turned off and the sensing lines were valved out due to a microprocessor malfunction. The RVLIS problem is expected to be resolved and the system will be functionally tested prior to restart for the 1984 Unit 1 and Unit 2 refueling outages.

The staff evaluation (1) of the Virginia Electric and Power Company (VEPCO) response (2) to NRC Generic Letter No. 82-28 (GL 82-28) concluded that additional information with respect to the SMM and CET design, the schedule for completion of CET upgrade, and an implementation letter report were needed in order for the staff to conclude that the ICC instrumentation system conforms to NUREG-0737 design requirements.

In response to the staff's request (1) for additional information and for the implementation letter report, the licensee has transmitted letters (3),(4), (5),(6) from W. L. Stewart (VEPCO) to H. R. Denton (NRC) to address those concerns as follows:

A. Response to CET and SMM design

1. The subcooling margin monitor (redundant channels) has an analog meter mounted on the main control board in the control room. The monitor has horizontal indicator movement indicating degree of saturation margin. Indications are in ΔT degree units and range from 200°F subcooling to 2,000°F superheat.

2. Qualified isolation devices are installed between Class 1E and non-Class 1E devices and signals for the RVLIS system per the requirements of Regulatory Guide 1.97. Pressure and loop temperature indications for the SMM also have qualified isolators. The CET system and CET inputs to the SMM will have qualified isolators following the upgrade of the CET system. The SMM displays are seismically qualified but the SMM computer is not. The SMM computer may ultimately be seismically qualified pending a final design option to place the SMM computer in seismically qualified cabinets with the CET hardware.

3. The existing CET system will be replaced and the final CET system design will meet the NUREG-0737 Item II.F.2 requirements. The upgraded CET system will be installed prior to or during the 1987 refueling outage for both units.

4. The primary display for CET will be reviewed as part of the Control Room Design Review to be performed. The primary and backup displays will be evaluated in conjunction with their use in the emergency procedures. The primary CET display will be electrically independent from the Class 1E backup display system. The current primary CET display system via the PRODAC P-250 Process Computer has the capability for spatially oriented core maps, time history, and trend information. The presently installed backup displays are two core cooling monitor microprocessors, each capable of displaying two thermocouples/quadrant with a digital temperature of 0 to 2300°F.

B. Response to the Implementation Letter Report

1. Installation of the Unit 1 and Unit 2 RVLIS has been completed. Each system has been filled, vented, and calibrated and the calibration records are available at North Anna Power Station. Due to problems with the microprocessor unit or the systems, the systems are turned off and the sensing lines were valved out. The problems

will be resolved and the systems will be operable at the next refueling outage or during an outage at cold shutdown conditions.

2. Based on test results to date, the system meets manufacturer's specifications.

3. Based on the Westinghouse recommendation, the bypass valves on the transmitters have been permanently locked shut and will be removed from the system at the earliest opportunity. Software changes have been made by Westinghouse to provide compatible display terminology with the new station EOPs.

4. The proposed North Anna Technical Specification changes [7] for Units 1 and 2 contain requirements on operability and surveillance of the SMM and RVLIS system. However, the CET system was not included in Table 3.3-10 Accident Monitoring Instrumentation and Table 4.3-7 Accident Monitoring Instrumentation Surveillance Requirements.

5. Presently, North Anna has implemented revised Emergency Procedures (EPs) which are based on the Westinghouse Generic Emergency Response Guidelines (Revision 0). VEPCO will upgrade their EPs further (to Revision 1 of the Westinghouse ERGs) as part of the Detailed Control Room Design Review which is currently in progress.

EVALUATION

The staff has reviewed the VEPCO responses [3],[4],[5],[6] to NRC concerns with respect to conformance with the requirements of NUREG-0737, Item II.F.2. Based on this review in conjunction with our previous evaluation [1] and the implementation review of the ICCI installation conducted at the Surry Station on March 3, 1984 for both Surry and North Anna (which have similar

designs for the ICCI Systems), our conclusions follow:

1. Based on the Surry RVLIS operating experience, the current installed redundant RVLIS system for North Anna Units 1 and 2, which is the same as the one installed in Surry, will be acceptable upon the completion of the full functional test and calibration with test results available for inspection. VEPCO committed to complete the functional test for each unit at their respective startup after the 1984 refueling outages.

2. The commitments to upgrade the CET and SMM, and to update emergency procedures based on WOG ERG Rev. 1 are acceptable. The features of the final upgraded CET system are given as follow:

   (1) The connectors, cable and hardware external to the reactor vessel and located in a harsh environment will be environmentally qualified to meet the requirements of NUREG-0588 Category 1 and will be seismically qualified to meet the requirements of Regulatory Guide 1.100.

   (2) Qualification will be applied up to and including channel isolation devices.

   (3) The backup display and associated hardware will be Class 1E and will meet the requirements of NUREG-0737 Item II.F.2.

   (4) The cable routing will not necessarily be to the requirements of Regulatory Guide 1.75 as this was not a licensing basis for North Anna Power Station. However, the staff requires that the cable routing for the CET system should meet the same criteria as the Engineered Safety Feature systems installed at North Anna.

3. The proposed schedule to complete upgrading of the existing CET system prior to or during the 1987 refueling outage for North Anna Units 1 and 2, and to upgrade EPs further to Revision 1 of the Westinghouse ERGs (currently North Anna has implemented revised EPs based on WOG ERGs Rev. 0) in mid-1985 is acceptable.

4. The proposed technical specification changes to the Accident Monitoring Instrumentation to incorporate SMM and RVLIS in Tables 3.3-10 and 4.3-7 are acceptable. However, these tables should include the CET system after completion of the CET upgrade.

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

Based on the results of our review, we conclude that, upon completion of the proposed upgrading of the existing ICCI, implementation of the revised procedures for ICC, and implementation of Technical Specification changes for the CET system, the ICC instrumentation for North Anna Power Station Units 1 and 2 in response to Generic Letter 82-28 will be in compliance with the NUREG-0737 Item II.F.2 requirements and is acceptable. In the interim, the RVLIS is approved for implementation subsequent to completion of testing described in Item 1 and implementation of the revised technical specifications relating to the RVLIS and the SMM.

REFERENCES

1. USNRC letter to VEPCO, dated January 16, 1984.

2. VEPCO letter to USNRC, dated May 12, 1983.

3. VEPCO letter to USNRC, dated March 7, 1984.

4. VEPCO letter to USNRC, dated March 23, 1984.

5. VEPCO letter to USNRC, dated July 6, 1984.

6. VEPCO letter to USNRC, dated August 3, 1984.

7. VEPCO letter to USNRC, dated June 3, 1983.

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