Westinghouse Electric Corporation Energy Systems

Box 355
Pittsburgh Pennsylvania 15230 0355

April 5, 1991
NS-NRC-91-3581

Document Control Desk
US Nuclear Regulatory Commission
Washington, DC 20555

Attention: Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

Dear Dr. Murley:

The following information is provided pursuant to the requirements of 10 CFR Part 21 to report the potential for the existence of a substantial safety hazard as communicated by P. A. Loftus of Westinghouse to C. E. Rossi of the Nuclear Regulatory Commission by telephone on April 4, 1991. This issue concerns anomalies discovered in the equations of the Eagle-21 system automatic surveillance tester software which incorrectly reports the measured comparator trip setpoints such that I&C personnel performing the periodic surveillance tests may not diagnose a protection system setpoint that is outside the channel allowable value specified in the surveillance test procedures.

BACKGROUND

Following installation of the Eagle-21 process protection system replacement hardware at Sequoyah Units 1 and 2, anomalies were discovered in the equations which compute the reported comparator trip setpoints in the automatic surveillance tester software during implementation of design modifications on other Eagle-21 systems that incorporate similar surveillance tester software. Two software anomalies were identified during this process: (a) the reported comparator trip setpoints based upon the uncertainties exhibited by the system hardware were found to be incorrect and (b) the comparator trip setpoints that were reported for the Overtemperature and Overpower setpoints did not incorporate all necessary contributing terms.

The only Eagle-21 systems that exhibit the anomaly in the equations of the surveillance tester software are installed and operational at Sequoyah Units 1 and 2. The Eagle-21 systems that are scheduled to be installed at Turkey Point Units 3 and 4, Diablo Canyon Units 1 and 2, and Zion Units 1 and 2 had the equations in their surveillance tester modified during their design process. Therefore, the surveillance tester software equations did not exhibit these anomalies when shipped to these plants. The Eagle-21 system installed at Watts Bar Unit 1 does not exhibit this anomaly due to different surveillance tester equations.

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EVALUATION

The equations for calculating the reported comparator trip setpoints were stated incorrectly in the surveillance tester software specification documents. As a result, the comparator trip setpoints are incorrectly calculated by the surveillance tester. The worst case minimum and maximum deviations from the nominal setpoints are correctly computed, but the deviations are applied incorrectly in the calculation of the window in which the trip will occur (minimum and maximum setpoint).

Upon discovery of the anomaly in the equations in the surveillance tester, a complete review of all equations utilized in the automatic surveillance tester software was conducted. During this evaluation, an additional software anomaly was discovered in the equations that were used to compute the Overtemperature and Overpower setpoints. The error contributions of neutron flux inputs (flux imbalance penalty calculations) to the Overpower and Overtemperature setpoints were not included in the reported comparator trip setpoints. In addition, a scaling factor that was utilized in the equations was found to be incorrect. All other equations were verified to be correct.

SAFETY IMPACT

For the first reported anomaly, if the personnel that perform the surveillance testing use the minimum and maximum setpoints that are reported by the surveillance tester software and only verify that the setpoints meet the specified allowable setpoint in the direction that is required by the applicable automatic protection function (e.g., greater than or less than the allowable value), the potential exists that the Eagle-21 system may not automatically initiate protection functions within applicable allowable values as specified in the plant Technical Specifications.

If remedial action is not taken, the anomalies in the equations for computing the comparator trip setpoints could result in a delay in the time at which the trip setpoint is reached or, in the worst postulated scenario, the trip setpoint may not be reached for the plant safety analyses licensing bases.

However, if the personnel performing the surveillance tests compare the minimum and maximum calculated setpoints, not only in the direction that is required for the applicable automatic protection function but also in the other direction, the consequences of this anomaly would be mitigated.

For the second anomaly, the Overtemperature and Overpower reactor trip setpoints may exhibit a bias such that these trip functions may be delayed or, under the most consevative scenario, the trip functions may not be reached for the plant safety analyses licensing bases.

CORRECTIVE ACTION

The Tennessee Valley Authority (TVA) was informed of the anomalies in the surveillance tester software in February, 1991. It was recommended that corrective action be taken to account for the anomalies in the equations of the surveillance tester software until the system software is upgraded at the site. The areas that were addressed are the following: (a) emphasizing that the technicians performing the surveillance tests ensure that the surveillance tester reported comparator trip setpoints fall within the allowable values in both directions; and (b) providing instructions for manually correcting the reported minimum and maximum Overtemperature and Overpower setpoints. These instructions account for the flux imbalance penalty and scaling factor errors.

Following the February communication with the utility concerning the corrective actions that must be taken to address the surveillance tester software anomalies, a detailed safety assessment of the issue was initiated within Westinghouse. The culmination of the study was the presentation of the issue to the Westinghouse Inter-Business Safety Review Committee on April 2, 1991.

Westinghouse and TVA are currently upgrading the surveillance tester software which corrects the identified anomalies. This is scheduled for completion by the end of June 1991.

COMMUNICATIONS

TVA (Sequoyah) has been aware of this issue since discovery of the anomalies in February, 1991. This specific communication is being provided to TVA (Sequoyah) since they are the only plants affected. The other utilities that have ordered and/or installed Eagle-21 process protection replacement systems have also been notified of this issue for information only, since the safety concern is not applicable to their plants.

If you have any questions regarding this matter, please contact Mr. P. J. Morris of my staff at (412) 374-5761, or myself.

Sincerely,

S. R. Tritch, Manager
Nuclear Safety Department

Box 355
Pittsburgh, Pennsylvania 15230 0355

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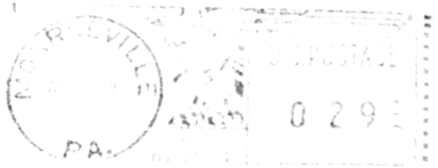

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