TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

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April 3, 1984

WBRD-50-390/82-36
WBRD-50-391/82-33

U.S. Nuclear Regulatory Commission
Region II
Attn: Mr. James P. O'Reilly, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30303

Dear Mr. O'Reilly:

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2 - AMBIGUOUS OUTPUTS FROM BARTON PRESSURE TRANSMITTERS IN THE REACTOR COOLANT SYSTEM - WBRD-50-390/82-36, WBRD-50-391/82-33 - REVISED FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector D. Quick on April 9, 1982 in accordance with 10 CFR 50.55(e) as NCR WBN NEB 8208. Interim reports were submitted on May 13, July 19, and October 29, 1982 and March 7 and June 30, 1983. A final report was submitted on October 3, 1983. Enclosed is our revised final report. We consider 10 CFR Part 21 applicable to this deficiency.

If you have any questions, please get in touch with R. H. Shell at FTS 858-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills

L. M. Mills, Manager
Nuclear Licensing

Enclosure
cc: Mr. Richard C. DeYoung, Director (Enclosure)
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
AMBIGUOUS OUTPUTS FROM BARTON PRESSURE TRANSMITTERS
IN THE REACTOR COOLANT SYSTEM
NCR WBN NEB 8208
WBRD-50-390/82-36, WBRD-50-391/82-33
10 CFR 50.55(e)
REVISED FINAL REPORT

Description of Deficiency

Westinghouse Electric Corporation, Pittsburgh, Pennsylvania, recently completed a review of all requirements imposed on the reactor coolant system (RCS) wide range pressure instrumentation. As a result of their review, it was determined that the existing hardware does not meet all their current functional requirements. Postaccident inaccuracy of the instrumentation is such that it could result in inappropriate operator actions, in particular with respect to termination of safety injection (SI). This condition was also reported in a letter dated April 21, 1982, by Westinghouse to NRC-OIE Washington (Richard C. DeYoung).

Safety Implications

For the case of the main steam line break, failure by the operator to terminate SI at the proper time could result in overpressurization of the reactor vessel at low temperatures with attendant challenge to vessel integrity. Further, this could lead to the possibility that the pressurizer power operated relief valves (PORVs) may be opened before termination of SI. This could result in a greater number of valve challenges, thus, increasing the probability of a small loss-of-coolant accident (LOCA) due to the valve failing open. Conversely, early termination of safety injection could result in inadequate core cooling scenarios. Therefore, if left uncorrected, inaccurate indication of postaccident RCS pressure could have jeopardized the safe operation of the plant.

Corrective Action

Westinghouse has defined long-term corrective action for Watts Bar which will require the addition of new RCS wide-range pressure transmitters outside containment. Westinghouse has since advised TVA that the hardware required for installation of the new instrument channels cannot be procured and delivered before fuel loading of Watts Bar unit 1. New RCS transmitters will be installed outside containment by the end of the first refueling outage. TVA's Watts Bar emergency operating instructions take into account the wide-range pressure transmitter error and will allow safe operation of the plant in the interim period between fuel loading and the first refueling outage.

Since our last report, Westinghouse notified TVA of additional errors which affect some of the lots of Barton transmitters. The cause and impact of these additional errors is being investigated under NCR WBN NEB 8401 (WBRD-50-390/84-11 and WBRD-50-391/84-11). For the wide-range RCS pressure

channels under postaccident conditions, a potential positive bias of 195 lb/in^2 must be considered in addition to the $\pm$ 390 lb/in^2 error reported previously. If left uncorrected, the total positive error in the wide-range RCS pressure channel could be too large to allow the operator to safely terminate safety injection at low RCS pressure. Therefore, we are replacing the lot 1 wide-range RCS pressure transmitters located inside containment with acceptable units which were manufactured after January 1, 1983. Per Westinghouse, Barton corrected the source of additional errors in all units manufactured after that date. The replacement transmitters will be installed as part of the corrective action under TVA's NUREG-0588 program for NCR WBN NEB 8130R1.

Potential channel inaccuracies are as follows:

Trip accuracy, normal environment: $\pm$ 63 lb/in^2
Trip accuracy, accident environment: $\pm$ 363 lb/in^2
Indication accuracy, normal environment: $\pm$ 90 lb/in^2
Indication accuracy, accident environment: $\pm$ 390 lb/in^2

For each of the applications of the wide-range pressure measurement, Westinghouse and TVA have reviewed the above-listed accuracies against the Watts Bar functional requirements. Conclusions with regard to the safety consequences are discussed in the following paragraphs.

Normal Operation

The wide-range pressure measurement is used for monitoring of the reactor coolant pressure outside the range of the narrow-range pressurizer pressure measurement, for interlocking the residual heat removal system (RHRS) isolation valves to prevent overpressurization of the RHRS, and for providing input to the cold overpressure mitigation system to prevent overpressurization of the RCS at cold conditions. For each of these applications, the existing instrument accuracy is acceptable.

Postaccident Operation

The wide-range RCS pressure indication is used by the operator in postaccident recovery. Specifically, the measurement is used by the operator for safety injection termination guidance, for monitoring core subcooling, and for determining when to trip the reactor coolant pumps. With the possible exception of safety injection termination, the postaccident functional requirements of the wide-range pressure channel are met with the transmitters located inside containment.

For small break LOCAs and secondary side breaks, the RCS can be repressurized by the high head safety injection pumps. To prevent opening the PORVs, the operator must be able to terminate safety injection at an RCS pressure below the PORV set point, yet high enough to ensure subcooling. With the transmitters located inside containment, the wide-range RCS pressure indication may not be sufficiently accurate for this function.

Therefore, the Watts Bar emergency operating instructions require the operator to use the narrow range pressurizer pressure instrumentation in determining when to terminate safety injection. The pressurizer pressure postaccident channel accuracy is $\pm$224 lb/in^2 and meets the functional requirement of $\pm$ 325 lb/in^2.

The wide-range RCS pressure instrumentation is sufficiently accurate to guide safety injection termination at low RCS pressure.

Should the RHRS eventually be placed in service to cool the RCS to cold shutdown conditions following an accident, the possibility exists for opening the RHRS to the RCS at RCS pressures as high as 743 lb/in^2g since the RHR isolation valves are interlocked with the wide-range RCS pressure signal as discussed earlier.

In the event that the RHRS were overpressurized, the inlet relief valve could be lifted (at 450 lb/in^2g) and the RHRS design pressure (600 lb/in^2g) could be exceeded. Westinghouse has evaluated the RHRS components and piping and determined that the pressure boundary will be maintained to at least 800 lb/in^2g. Additionally, the consequences of a limited blowdown of the RHR relief valve inside containment is considered to be bound by current FSAR analyses and WCAP-9600, "Report on Small Break Accidents for Westinghouse NSSS System."

The likelihood of this occurrence is small since the plant is considered to be in a safe condition at hot standby, and there are no time limitations for proceeding to cold shutdown. The operators have been alerted to the fact that the wide-range RCS pressure indication can be in error by $\pm$ 300 lb/in^2, and any decision to proceed to cold shutdown would only be made after thoroughly evaluating plant conditions.

Based on the above discussion, the plant can be operated until the first refueling outage within necessary plant safety limits with the wide-range RCS pressure transmitters located inside containment.