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South Texas Project Electric Generating Station
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Final Report Concerning Veritrak Transmitters

On August 1, 1986 Houston Lighting & Power Company notified your office pursuant to 10CFR50.55(e), of an item concerning Veritrak Transmitters at the South Texas Project. Enclosed is the Final Report on this item. Westinghouse has completed a test program which demonstrates that temperature drift will not increase with time. The interim setpoints currently in use are conservative. The item has been determined to be reportable pursuant to 10CFR50.55(e).

If you should have any questions on this matter, please contact Mr. M. F. Polishak at (512) 972-7071.

J. H. Goldberg
Group Vice President, Nuclear

THC/hg

Attachment: Final Report Concerning Veritrak Transmitters

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Final Report Concerning Veritrak Transmitters

I. Summary

On August 1, 1986, Houston Lighting & Power (HL&P) notified the NRC Region IV of a potentially reportable item concerning excessive change in Veritrak transmitter accuracy under ambient temperature conditions.

Westinghouse reported that Veritrak transmitters used to provide input for various Reactor Protection System trip functions, ESF actuation, and post-accident monitoring are subject to excessive drift in their outputs under varying ambient temperature conditions. This concern applies only to safety-related Veritrak and TOBAR transmitters.

Based on Westinghouse evaluation of Reactor Protection System trip and ESF actuation functions, the conclusions stated in the STP FSAR remain valid when the effect of the increased Veritrak transmitter uncertainties is included. Results of the transmitter test program support the initial evaluation. Reactor protection setpoints currently in use are conservative and no hardware changes are required. This item has been determined to be reportable pursuant to 10CFR50.55(e).

II. Description of Deficiency

In early 1986, Public Service of New Hampshire reported an excessive change in Veritrak transmitter accuracy as the ambient temperature changed. Initial tests were limited to 130°F, but subsequent testing on a larger sample of Veritrak units supplied by TOBAR (formerly Veritrak) at all original calibration points (130, 280, 320°F) demonstrated significant errors. In March of 1986, Public Service of New Hampshire reported, pursuant to 10CFR50.55(e), that excessive changes in Veritrak transmitter accuracy as the ambient temperature changed were observed which could create a condition that could violate allowable performance specification limits. TOBAR transmitters exhibit the same problem although to a lesser extent.

Table 1 provides a list of functions at STP which are affected by this concern. The protective actions listed are assumed to occur as part of the basis for various FSAR accident analyses, while pressurizer pressure control is assumed to be available for all events. Because temperatures in the Reactor Containment Building (RCB) and Isolation Valve Cubicle (IVC) are potentially much higher post-accident than during normal

conditions, and transmitters in the Mechanical Auxiliary Building (MAB) and Fuel Handling Building (FHB) are post accident monitoring instruments not affected by DBA temperatures, Table 1 lists only transmitters located in the RCB and IVC.

III. Corrective Action

Westinghouse has completed a test program to evaluate the temperature drift. In order to address this concern in the interim, Westinghouse has systematically combined the drift values observed in the test sample and applied those values to transmitters installed at STP for the affected reactor protection trip and ESF actuation functions.

The Westinghouse safety evaluation demonstrated acceptability of the existing FSAR analyses and protection system setpoints. For some events, the low pressurizer pressure safety injection (SI) signal may not have been generated by the Veritrak instruments; however, protection would have been provided by alternate means. To assure that low pressurizer pressure ESF actuation from the Veritrak instruments does occur, taking into account the additional errors associated with these transmitters, the low pressurizer pressure SI setpoint was raised to 1869 psig. This interim setpoint was incorporated into the STP Technical Specifications. This action is not required to demonstrate protection, but is a conservative measure. Since the Westinghouse analyses are conservative in assuring plant safety, no hardware modifications are required.

Emergency Operating Procedure (EOP) operator action points for five parameters were revised to include an additional uncertainty allowance, as discussed in the Safety Analysis section. The parameters affected include pressurizer pressure, pressurizer level, wide range steam generator level, narrow range steam generator level, and steamline pressure. This revision was completed prior to initial criticality of STP Unit 1.

Westinghouse has subsequently completed a test program in which each major subassembly of the transmitter was tested separately - the flexure (which contains the electrical bridge), the capsule assembly (both compensated and uncompensated), and the amplifier. Each subassembly was independently subjected to high temperature cycling, thermal aging and high temperature transient tests to determine their effect on the temperature compensation (T/C) characteristics for that subassembly. The test results showed that aging and high temperature cycling had no detrimental effect on any of these subassemblies. Thus, Westinghouse concluded that the statistical errors applied in the interim safety analyses and EOPs bound the T/C shift over the qualified life of the transmitters. Although the test program yielded results that supported the initial justification for continued operation, the program did not identify the cause of the shift nor identify a field unit modification.

This test program demonstrated that some amount of T/C shift is to be expected. The test results suggest that temperature cycling (in conjunction with mechanical cycling) prior to temperature compensation will have a stabilizing effect and that the temperature shift errors will not further increase with time. Therefore, Westinghouse compiled certain thermal data taken from the total sample of transmitters to finalize the temperature shift errors. This change in sample size allowed the trip and monitoring temperature shift error to be reduced by approximately 2.8 percent.

The reduction in temperature error will provide for an overall reduced Environmental Allowance (EA), which could be used for the calculation of revised trip and EOP setpoints. In addition to the reduction in temperature error, Westinghouse evaluated the possibility of reducing the radiation errors for trip and monitoring functions and concluded that this was not possible. However, the radiation allowance could be eliminated for the Steam Generator Narrow Range Level application due to its trip related function (Feed Line Break) and for Steamline Pressure due to its location outside of containment.

The overall results of the temperature and radiation analyses were combined to develop a total EA for each function to be used for the safety analyses and EOPs. Final setpoints determined from these EAs will be evaluated as deemed appropriate. Since the interim values presently in use are conservative; changes will only be incorporated into the Technical Specifications and EOPs where an operationally significant amount of margin can be gained. Any such changes will be processed through the normal channels for technical specification and procedure changes.

IV. Recurrence Control

This is an isolated situation; therefore, no recurrence control measures are required.

V. Safety Analysis

Based on results of the Westinghouse Veritrak transmitter test program, Westinghouse has determined conservative values of thermal drift allowance for the affected protection functions As stated above, these values were systematically combined to determine new, conservative channel uncertainty allowances. Application of the new uncertainty

analyses resulted in the need to raise the low pressurizer pressure SI setpoint to ensure the SI signal will be generated as assumed in the STP safety analysis. Reactor protection would, however, be provided by either containment high pressure SI or low steamline pressure SI for those events where a low pressurizer pressure SI might not have been generated as assumed.

Post-accident monitoring parameters listed in Table 1 were also reviewed to identif any similar safety concerns relative to maintaining the critical safety functions. Indication was found to be adequate for post-accident monitoring; however, several of these instruments are associated with operator action points specified in the EOPs. Additional indication uncertainties have a minor impact on these operator action points. Additional allowances have been included in the Westinghouse adverse containment environment instrument uncertainty calculation for pressurizer pressure, pressurizer level, wide range steam generator level, narrow range steam generator level, and steamline pressure. These allowances average approximately six percent of instrument span. Since the uncertainty calculations are very conservative, the presence or absence of this additional conservatism is not considered a safety impact. Had the additional uncertainties not been included, operator actions based on the previous action points would not be expected to create an unsafe plant condition.

Based on the extensive analysis and setpoints which were revised, this item has been determined to be reportable pursuant to 10CFR50.55(e).

TABLE 1

Functions Performed by Veritrak/TOBAR Transmitters
(Located in RCB or IVC Only)*

Reactor Trip Functions

Overtemperature delta-T

Pressurizer level high

Steam generator water level lo-lo

Pressurizer pressure high

Pressurizer pressure lo

ESF Actuation Functions

Steam generator water level lo-lo (AFW initiation)

Steam generator water level hi-hi (turbine trip, feedwater isolation)

Pressurizer pressure lo (safety injection)

Steamline pressure low** (safety injection, steamline isolation)

Steamline pressure high negative rate of change** (steamline isolation)

Post-Accident Monitoring

Pressurizer level

Steam generator water level (wide range and narrow range)

Pressurizer pressure

LHSI discharge pressure**

SI accumulator pressure**

Steam Generator steam flow

RHR pump discharge flow**

LHSI pump hot leg recirculation flow**

Steamline pressure**

Control Functions

Pressurizer pressure control

Steam generator water level control

* Veritrak/TOBAR transmitters are also located in the MAB and FHB. They are used for RCP seal injection flow, RCS loop pressure, letdown flow and containment spray monitoring.

** TOBAR transmitters (unmarked instruments are Veritrak transmitters).

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