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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

South Texas Project
Unit 1
Docket No. STN 50-498
Special Report Regarding An Inoperable
Channel of the Reactor Vessel Water Level Indication System

Pursuant to the South Texas Project Electric Generating Station Technical Specification 3.3.3.6, "Accident Monitoring Instrumentation," Houston Lighting & Power (HL&P) submits the attached Special Report regarding an inoperable Channel of the Reactor Vessel Water Level Indication System.

If you should have any questions on this matter, please contact Mr. C. A. Ayala at (512) 972-8628 or myself at (512) 972-7205.

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Attachments: Special Report Regarding Inoperable Channel of the
Reactor Vessel Water Level Indication System

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South Texas Project
Unit 1
Docket No. STN 50-498
Special Report Regarding An Inoperable
Channel of the Reactor Vessel Water Level Indication System

DESCRIPTION OF EVENT:

On April 9, 1992, Unit 1 was preparing to return to power following a planned outage. During the ascent to Mode 3, it was noted that sensors on both channels A and C of the Reactor Vessel Water Level Indication System (RVWLIS) were indicating "inoperable" on the Qualified Display Processing System (QDPS) in the control room. The RVWLI system is required to be operable in modes 1, 2 and 3. The inoperable sensors in probe A would not affect the operability of the channel. However, troubleshooting conducted on probe C showed that the number and configuration of sensor failures would render the channel inoperable. Following further plant heat-up, the problems associated with the inconsistent readings for channels A and C cleared and the present indication is correct. Channel C remains inoperable due to the problems experienced at low RCS temperatures and the questionable reliability of the channel if required in a post accident monitoring situation. Since restoration of Channel C could not be accomplished within seven days, a special report is being submitted per Technical Specification 3.3.3.6.

Each RVWLIS channel consists of a probe with eight sensors located at discrete intervals along the length. Each sensor consists of a heated junction thermocouple (HJTC) located near a heater and a separate thermocouple located at an unheated reference junction. When the heated and unheated thermocouples are covered with water the temperature difference, and therefore the voltage difference, between the two is negligible. When the thermocouples are uncovered the temperature difference increases and the resultant voltage difference is utilized to indicate that a liquid inventory does not exist at that level. The heater circuits for HJTC 1, 3, 5 and 7 are wired in series and are powered from the same power supply. A similar arrangement exists for sensors 2, 4, 6 and 8. A short or open in one heater circuit will render the remaining sensors associated with the series heater circuit inoperable. Sensors 1 and 2 monitor the upper head region of the reactor vessel while the remaining sensors monitor the upper plenum region. Technical Specification 3.3.3.6 requires that at least 1 sensor in the upper head region and 3 sensors in the plenum region must be operable to consider the channel operable.

DESCRIPTION OF EVENT: (Continued)

Troubleshooting conducted on channel C initially indicated that heaters associated with sensors 3, 7 and 8 were open which would render both loops in channel C inoperable. Further testing indicated that sensor 7 was reading correctly and that the heater circuits associated with sensors 3, 6 and 8 were open. Instructions for bypassing an open heater with a resistive load to return the remaining functional heaters to operability are available. With four heater circuits monitoring the plenum area potentially open, bypassing the heaters will not restore the channel to operability per the technical specification definition. However, bypassing the open heaters will restore the remaining operable sensors. The inconsistent data associated with channel A was limited to one loop, therefore the channel is still considered operable.

During the return to power following a Unit 1 reactor trip in October, 1991 open heater circuits were identified for sensors 2 and 8 in RVWLIS channels A and C respectively. In both cases the open circuit cleared at higher RCS temperatures. Problems have also been experienced in Unit 2 with open heater circuits and have resulted in the replacement of one probe during the last refueling outage with an identical unit. Combustion Engineering (CE), the supplier of the RVWLIS probes, has previously investigated problems with open heater circuits experienced by other utilities using probes of similar design. Investigation to date indicates that the cause of the failure can be attributed to the type of material used for the heater power lead. The copper wire used is susceptible to creep rupture due to some as yet unidentified source of tensile loading. The wire separates with little or no lateral displacement. The failures have not been uniformly experienced by all users of the probes and appear to occur within the first one or two fuel cycles. CE has recommended replacement probes for the heater circuit which use a copper alloy that has a higher tensile strength. Efforts are underway to procure replacement probes with the improved heater circuit wiring material for installation in both units.

CAUSE:

The cause of the inoperable condition of the RVWLIS probe is attributed to open heater circuits due to the type of copper wiring used in the circuit. Since the failure mode observed by the vendor involves little lateral movement of the wire, the thermal expansion of the material seen during higher temperature operation may be sufficient to complete a defective circuit which may account for the intermittent nature of the failures.

CORRECTIVE ACTION:

The RVWLIS probes for channels A and C in Unit 1 are currently scheduled to be replaced with probes utilizing the new heater circuit material during the next refueling outage; however, if receipt, inspection and testing of the new probes is not complete prior to the outage scheduled completion date of November 20, 1992, the probes will be replaced during the following refueling outage for Unit 1.