Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

May 31, 2001

L-2001-128
10 CFR 50.4
10 CFR 50.36

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

Re: St. Lucie Unit 1
Docket No. 50-335
Date of Event: May 2, 2001
Technical Specification Special Report
Inoperable Reactor Water
Level Monitoring System Probe

The attached special report is submitted pursuant to the requirements of St. Lucie Unit 1 Technical Specification 3/4.3.3.8, Action 4, and Technical Specification 6.9.2. This report provides notification that the A channel probe of the St. Lucie Unit 1 reactor water level monitoring system is inoperable.

The attached special report outlines the action taken since the probe failed, the apparent cause of the probe failure, and the plans and schedule for restoring the A channel probe of the reactor water level monitoring system to OPERABLE status.

A regulatory commitment to repair or replace the Unit 1 A channel probe during the next St. Lucie Unit 1 refueling outage (SL1-18) is made in this letter. Please contact us if there any questions on this information.

Very truly yours,

Rajiv S. Kundalkar
Vice President
St. Lucie Plant

RSK/EJW/KWF

Attachment

cc: Luis A. Reyes, Regional Administrator, USNRC, Region II
Senior Resident Inspector, USNRC, St. Lucie Plant

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SPECIAL REPORT

I. TITLE

St. Lucie Unit 1 Inoperable Reactor Water Level Monitoring System Probe

II. EVENT DESCRIPTION

A reactor water level monitoring system probe consists of eight heated junction thermocouples (HJTCs). St. Lucie Unit 1 Technical Specification (TS) 3/4.3.3.8 requires at least four operable sensor locations (an operable sensor location consists of a heated and unheated thermocouple input) to declare the channel OPERABLE.

St. Lucie Unit 1 completed its spring 2001 refueling outage in late April. Prior to the Unit 1 refueling outage, two A channel HJTC liquid level probe (LLP) sensor locations were declared out of service. On April 4, 2001, maintenance personnel conducted troubleshooting and determined that all probe locations were providing acceptable temperature readings to the connection at the reactor head disconnect panel. This initial data was obtained to further troubleshoot the loss of the two sensor locations and provided a base line of the system configuration and status before additional work was begun.

Upon completion of refueling and reassembly of the connections to the A channel HJTC instrument, maintenance personnel noted a damaged pin connection and a white crystalline substance within the probe connector. A condition report (CR) was written to document the condition. The chemistry department analyzed a sample of the substance. Chemistry determined that the sample was not radioactive and contained very low levels of boron; therefore, it was believed not to be from the reactor coolant system (RCS). Upon replacing the pin insert, and cleaning and drying the connector, testing was performed on the LLP. All testing was satisfactory with the exception that the probe's insulation resistance measured lower than $1x10^8$ ohms (i.e., ideal conditions for a new probe). The low resistance condition was evaluated and found acceptable. The instrument was reconnected to its associated cabling.

On April 29, 2001, with St. Lucie Unit 1 in MODE 2, four of the A HJTC sensors failed. Maintenance personnel reinspected the A LLP connection in an attempt to repair and return any of the lost sensors to service. Temperature readings for all HJTC sensor pairs were taken directly at the LLP and were verified to correspond to RCS temperature. Additionally, signals were generated into the mating connector to verify the correct control room indication. All indications were as expected and, after additional cleaning, the probe was reconnected to its cable. In spite of these maintenance activities and tests, none of the failed sensors could be restored to service.

On May 2, 2001, with the unit in MODE 1, a fifth set of HJTC sensors failed resulting in HJTC sensors 1, 2, 3, 6, and 8 being out of service. St. Lucie Unit 1 Technical Specification (T/S) 3/4.3.3.8 ACTION 4 was entered, which states:

ACTION 4 - With the number of OPERABLE Channels one less than the Total Number of Channels shown in Table 3.3-11, either restore the inoperable channel to OPERABLE status within 7 days if repairs are feasible without shutting down or prepare and submit a Special Report to the Commission pursuant to the specification 6.9.2 within 30 days following the event outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the system to OPERABLE status.

III. CAUSE OF THE EVENT

A team was formed to investigate the failed LLP. The team reviewed the insulation resistance readings taken from the control room, and operating sensor status for the A HJTC LLP with the vendor, Combustion Engineering/Westinghouse (CE/W). Based on these readings, the following preliminary conclusions were reached.

Failed sensor HJTC sensor pairs 1 and 6 thermocouples are grounded. Further measurements of individual thermocouple lead resistance to ground readings show a several hundred-ohm ground on the heated thermocouples (chromel and alumel conductors), but an open condition on the unheated sensor (chromel conductor). In that both HJTC thermocouple pairs share the same reference junction (the alumel conductor), it is concluded that an open condition exists for both unheated sensors. Furthermore, the grounded sensor resistance readings are indicative of a grounded circuit several hundred feed away, most probably at the mating LLP connector or within the probe.

The high insulation resistance for all the heaters to ground and thermocouples indicates that an internal LLP failure has not occurred. CE/W operating experience has shown that this type of failure typically starts as a grounded heater conductor, then failure propagates to the thermocouples associated with the affected heater, and finally to all sensors within the probe. With this failure mechanism, all heater insulation resistance is relatively high and the heaters are operating.

Leakage from the RCS is not credible in that leakage into the connector area would first pass through the LLP's lower seal area. In the lower seal area, all thermocouple and heater conductors are exposed and would contact the RCS, which contains boric acid. The result would be loss of all instruments, as well as grounds on all conductors, especially the heater circuits.

Based on the resistance readings and the work conducted to date, the most probable cause of failure is a poor electrical connection at the LLP and the mating head lift rig cable. The area is not accessible during power operation. The source and composition of the contaminant originally discovered within the LLP remains unknown. However, it does not appear to have originated from the RCS. It is possible that residue from the contaminant remained in the LLP connectors after cleaning and may have contributed to the poor electrical connections that further degraded during plant heatup. The grounded thermocouples may also be attributed to the contaminant in that severe corrosion may produce conductive paths to the outer connector shell. Further inspection and testing of the LLP and mating cable is required to confirm this failure mode.

IV. ACTION TAKEN

1. Technical Specification 3/4.3.3.8, ACTION 4, was entered on May 2, 2001 when the A LLP failed.

2. FPL troubleshooting determined that the failed probe could not be repaired at power.

3. The Unit 1 A HJTC LLP probe connection will be inspected at the next hot shutdown to collect further information regarding the failure. Work order (WO) 31010074 has been issued to track this action.

V. SCHEDULE FOR RESTORING SYSTEM

The Unit 1 A HJTC LLP will be replaced or repaired during the next refueling outage (SL1-18).