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Nuclear Business Unit

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United States Nuclear Regulatory Commission
Document Control Desk
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Special Report
Salem Nuclear Generating Station Unit No. 1
Facility Operating License DPR-70
Docket No. 50-272

Gentlemen:

This special report is being submitted pursuant to the requirements of Technical Specification 6.9.4 which requires that a special report be submitted when an inoperable Reactor Vessel Level Indicating System (RVLIS) channel has not been restored to OPERABLE status within thirty days.

Should there be any questions regarding this matter please contact John Nagle at 609-339-3171.

Sincerely,


A. C. Bakken III
General Manager
Salem Operations

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Attachment

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/JCN

Distribution
LER File 3.7

The power is in your hands.

Description of Occurrence

On October 6, 1998 operators noted that train B of the reactor vessel level indicating system was indicating that there was a malfunction. In accordance with Technical Specification Action Statement 3.3.3.7, the required number of OPERABLE RVLIS channels is two, therefore the LCO was entered, which requires returning the channel to OPERABLE Status within 30 days or submit a special report. The Action further requires that the Special Report outline the preplanned alternative method of monitoring for adequate core cooling, the cause of the inoperability and the plans and schedules for returning the channel to OPERABLE status. Activities directed at returning the malfunctioning channel to OPERABLE status have been unsuccessful, therefore, it is necessary to submit the report contained herein.

Preplanned Alternate Monitoring Method

Procedure S1.OP-SO.RVL-0001(Q) "REACTOR VESSEL LEVEL INSTRUMENTATION SYSTEM" notes, in Step 3.6, that the preplanned method of monitoring for inadequate core cooling is that the required channels in Tech Spec Table 3.3-11 for both the RCS Sub-cooling Margin Monitor and the Core Exit Thermocouples (CET) are OPERABLE when one or both RVLIS channels are inoperable.

Upon the determination that a RVLIS channel is inoperable Operations personnel entered into the Action Statement of LCO 3.3.3.7. The Unit will remain in the LCO Action Statement until such time as the RVLIS channel is returned to OPERABLE status. Each on - coming shift is sensitized to active LCOs Action Statements during shift turnovers so that they are aware that a channel of RVLIS is not available and they may have to use an alternate monitoring method should the need arise. Operator training has prepared the operators for using alternate methods of determining and assuring adequate core cooling.

RVLIS is part of the safety related display instrumentation. Its function is to provide information for the operator to assist him in performing required manual functions and to evaluate the effect of those manual functions following a reactor trip due to operational occurrences or accident conditions described in Chapter 15 of the UFSAR. RVLIS performs no automatic functions designed to mitigate the consequences of any accident.

Cause of the Inoperability

The investigation of this RVLIS malfunction has identified the apparent cause of failure to be a loss of fill in the capillary sensing line between the sensor bellows

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at the seal table and the hydraulic isolator for the full and dynamic range transmitters.

Extensive troubleshooting was performed on the system in order to draw the conclusion cited above. A summary of the failure modes which were investigated follows:

Good Field Input and Faulty Display or Processing - During troubleshooting, the field transmitter signals were disconnected and a simulated transmitter signal was applied. The system responded as expected to the test input signals. This indicated the problem was in the field and not with the processor.

Common Power Supply Failure - Voltage readings were taken at the instrument rack and transmitters. All voltage values were within the expected range. The transmitter output was tested by series connection to measure the current loop output. The expected value is 4-20 mA, all three transmitters read $< \sim 3.5$ mA. This indicates that the hydraulic inputs to the Full and Dynamic Range transmitters are faulted and since the Upper Range expected state is failed low this input is indeterminate.

Transmitter Failure (Dynamic and Full Range) - Electrical current readings taken at the transmitter output do not fluctuate as would be expected if there were any hydraulic input to the transmitter. Simultaneous failure of two transmitters with identical failure modes is very unlikely.

Magnex Valve Out of Position, Failed or Blocked - During troubleshooting activities the Magnex valves were cycled and the valve position was inspected. The Hot Leg valve was identified to be stuck in the open position and a repair request has been initiated. This has no bearing on the present condition.

Hydraulic Isolator - Position indication of the isolator was compared to data taken prior to the last re-start. This data indicates that the bellows has shifted which indicates a loss of fill in the capillary. The Seal Table hydraulic input is common to both the Full and Dynamic Range transmitters, supporting the apparent cause determination.

Tubing Damaged or Leaking - Visual inspection of a limited area of exposed tubing in the Seal Table and penetration areas did not disclose any problems. No obvious leaks or damage was identified. It should be noted this was a very limited inspection due to tube location and enclosed tube tray configuration.

Sensor Bellows Damaged or Leaking - A cursory visual inspection of the seal table sensor bellows was made. No direct inspection of the head sensor bellows is possible at this time due to location. These are possible failure points, however disassembly is required for inspection.

Plans for Return to Operable Status

Current plans are to perform additional troubleshooting to identify the exact location of the leak and then to perform necessary repairs and capillary sensing line refilling during the next refueling outage or at the first outage of sufficient duration that occurs prior to the refueling outage. The next refueling outage is currently scheduled for September 1999.

Performing additional troubleshooting and necessary repairs with the Unit at power has been evaluated and determined to be unacceptable for various reasons including:

- 1) ALARA Concerns - Most of the capillary tubing runs within the biological shield. Repair to a postulated leak would require large quantities of time for both leak location identification and repair and result in large radiation doses. In addition, the tubing is in an enclosed tray requiring scaffold construction which would further add to both manpower and exposure time. Dose rates at the current power level are as high as 75 R / hr;
- 2) Operations Concerns - There are concerns that repair efforts would cause the loss of the operable redundant train of RVLIS; and
- 3) Technical Concerns - Calibration uncertainties introduced through only filling one capillary may be outside the acceptable tolerance for the system.

Delaying the return to operability of Train B of RVLIS for the proposed duration is acceptable because of the availability of alternate methods of indication and of the continuing operability of the redundant channel. The troubleshooting and failure modes and effects analysis (FMEA) which has been performed and the lack of industry issues with leaking capillaries eliminates any practical concern of a common failure mode affecting the redundant channel.