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United States Nuclear Regulatory Commission
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Special Report 311/01-001
Salem Nuclear Generating Station Unit No. 2
Facility Operating License DPR-70
Docket No. 50-311

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 within fourteen days when both channels of Reactor Vessel Level Indicating System (RVLIS) have not been restored to OPERABLE status within seven days.

Should there be any questions regarding this matter please contact Howard Berrick at 856-339-1862.

Sincerely,

A handwritten signature in black ink, appearing to read "D. F. Garchow".

D. F. Garchow
Vice President - Operations

Attachment

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/HGB

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NBU RM (N64)
Files No. 1.2.1
LER File 3.7
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Description of Occurrence

On December 21, 2000, between 1942 and 1959 hours, operators noted that train B of the Unit 2 Reactor Vessel Level Indicating System (RVLIS) was indicating that there was a malfunction. In accordance with Technical Specification Action Statement 3.3.3.7, Action 8 states "with one RVLIS channel inoperable, restore the RVLIS channel to OPERABLE status within 30 days, or submit a special report in accordance with Specification 6.9.4." Action was initiated to restore the RVLIS Train B channel to OPERABLE status.

On January 4, 2001, at 0220 hours train A of the RVLIS became similarly inoperable. Technical Specification Action Statement 3.3.3.7, Action 9, states "with both RVLIS channels inoperable, restore one channel to OPERABLE status within 7 days or submit a special report in accordance with Specification 6.9.4."

Specification 6.9.4 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.

As of January 11, 2001, both trains of RVLIS had not been restored to OPERABLE status.

Preplanned Alternate Monitoring Method

Procedure S2.OP-SO.RVL-0001 (Q) "REACTOR VESSEL LEVEL INSTRUMENTATION SYSTEM" notes, in Step 3.8, 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 Reactor Coolant System (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 Action Statement until such time as the RVLIS channel is returned to OPERABLE status. Each on-coming shift is sensitized to active Action Statements during shift turnovers so that they are aware that a channel of RVLIS is not available and they will 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 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

Trains A and B have intermittent digital electronics faults, where they display incorrect process parameters, annunciate control room alarms and then clear (return) to normal display values. A troubleshooting plan was to determine the cause. Part of this plan was to capture diagnostic error code information of the faulty train(s) during a RVLIS failure.

A number of areas were identified for review to determine the apparent cause(s) for these failures. These included:

1. Software configuration problems
2. Hardware, microprocessor fault, address fault, CPU board, Analog-to-Digital (A/D) board, motherboard bus problems.
3. Firmware, EPROM
4. RAM Memory, CMOS NVRAM Board
5. Field input(s), RCS THOT or wide range pressure
6. Microprocessor, Auto- calibration faults

After investigating the above areas for apparent cause(s) and following consultation with the RVLIS vendor (Westinghouse) on the multiple logged error data captured in the troubleshooting, it is believed that the trains are faulting during its auto-calibration testing. The calibration is performed in small time slices in the 2-second microprocessor RVLIS scan rate. The auto-calibration is performed every 12 hours over an 8 to 10 hour period. A digital electronics circuit board common to the intermittent multiple error codes captured, is an A/D circuit card (board). The suspect board is the most likely cause of the failures.

Plans for Return to Operable Status

The RVLIS B Train A/D circuit board has been replaced. Only time-reliable system operation can prove that an intermittent digital electronic fault has been repaired. The Post Maintenance Testing is to perform three (3) manual cold start flag calibrations (Auto-cal test offline) successfully without error, followed by 14 days of alarm-free operation.

Plans for Return to Operable Status (contd)

The three manual cold restart flag calibrations have been successfully performed on the new RVLIS B Train A/D circuit board. RVLIS B Train is operating and results are being monitored. Following successful reliable operation of RVLIS B Train, similar RVLIS A Train work will be performed.

It is anticipated that both trains of RVLIS will be operable by March 25, 2001.

The actions cited above are voluntary and do not constitute commitments.