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SUBJECT: RO: on 970828, Unit 2 Inadequate Core Cooling Monitor Train B
 Reactor Vessel Level Instrumentation Sys (RVLIS) inoperable
 greater than seven days. Caused by failure of temp input.
 Conducted force outage & replaced RTD 2RC RDC0186.

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U. S. Nuclear Regulatory Commission

September 26, 1997

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ATTACHMENT

REPORT ON RVLIS INOPERABILITY PER TECHNICAL SPECIFICATION 3.5.6

PURPOSE

This report provides information on the inoperability of the Unit 2 Inadequate Core Cooling Monitor (ICCM) Train B Reactor Vessel Level Instrumentation System (RVLIS) in accordance with Technical Specification requirements. Technical Specification 3.5.6, Table 3.5.6-1, requires that a report be submitted to the NRC in the event that a train of RVLIS is inoperable greater than seven days.

SYSTEM DESCRIPTION

The Westinghouse Electric Corporation ICCM is a redundant monitoring device. ICCM is composed of three interrelated monitoring systems; RVLIS, Subcooling Margin Monitor (SMM), and Core Exit Thermocouple Monitor (CETC). ICCM is designed to be used during a small break loss of coolant accident, steam line break, and/or steam generator tube failure. The function of the RVLIS is to provide information to assess plant conditions during these selected UFSAR Chapter 15 design basis accidents.

RVLIS utilizes differential pressure transmitters to determine reactor vessel level and hot leg level. This is accomplished by measuring the pressure drop from the bottom of the hot leg to the top of the reactor vessel (vessel level) and from the bottom of the hot leg to the top of the hot leg (hot leg level). The transmitters are located outside of containment and system pressure is transferred to these transmitters via capillary tubing. A resistance temperature detector (RTD) is attached at the midpoint of each vertical run of capillary tubing. The RTD temperature input is used to calculate the density of the water columns associated with each vertical run of capillary tubing. The density calculations are then used to correct the pressure signal received by the ICCM cabinet so that true reactor vessel and hot leg levels are displayed. It should be noted that RVLIS indications

are only valid when all Reactor Coolant Pumps and Low Pressure Injections Pumps are off.

TECHNICAL SPECIFICATION REQUIREMENTS

There are various Technical Specifications associated with ICCM. The specification associated specifically with RVLIS operability is addressed in this report.

Technical Specification 3.5.6 applies to accident monitoring instrumentation. The objective of this specification is to ensure that sufficient information is available on selected plant parameters to monitor and assess such parameters following an accident. Specification Table 3.5.6-1 provides a listing of the accident monitoring instrumentation, the required number of operable channels for each instrument, actions necessary if the required number of operable channels is not satisfied, and the applicability of this specification. Hot Leg Level (RC-LT0123, RC-LT0124) and Reactor Vessel Level (RC-LT0125, RC-LT0126) are instruments listed in Specification Table 3.5.6-1. Both Hot Leg Level and Reactor Vessel Level are required to have 2 out of 2 channels operable above the hot shutdown condition. If the required number of operable channels can not be satisfied, then the actions stated below are required by Specification 3.5.6.2.

- "If one channel is inoperable , the channel shall be restored to operable status within 7 days, or a report shall be submitted to the Commission within the next 30 days outlining the cause of the inoperability and the plans and schedule for restoring the channel to operable status.
- If two channels are inoperable, at least one channel shall be restored to operable status within 7 days, or the unit shall be in hot shutdown within the next 12 hours."

NATURE OF INOPERABILITY

On August 20, 1997, a work request was initiated by Operations in response to statalarm 2SA-18/D-8 (ICCM B Trouble) alarming sporadically. Investigation into this problem by I&E technicians determined that a failure in RTD# 2RC RD0189 was the cause of the statalarm actuation. This RTD provides density compensation for a section of ICCM Train B RVLIS instrumentation. Without this RTD, the proper density compensation can not be applied to ICCM Train B RVLIS indications. The failure of this instrumentation was appropriately entered into the corrective action program.

After further investigation, it was determined that the RTD was sensing a temperature which was above the upper limit of the RTD range. The RTD was reading off scale high for two reasons: 1) A valve (2LP-1) had an RCS leak in the Unit 2 decay heat drop line being monitored by the RTD, causing hot RCS water to move through the line, and, 2) the upper range of the RTD was set too low to provide the full range of indications needed for the function of the RVLIS. This problem was not observed on Unit 3 because there was no valve leakage to cause heat-up of the line being monitored. This situation is not applicable to Unit 1 due to a different design.

The apparent cause of this problem was the selection of an upper range limit for RTD# 2RC RD0189 on Units 2 and 3 that could be exceeded during accident conditions.

The apparent cause for this improper selection is that the ICCM System is a Westinghouse design and was originally intended for Westinghouse plants. Oconee is unique in that it is a Babcock and Wilcox plant and has a modified version of the Westinghouse ICCM System. Oconee's unique system design requires the decay heat drop line on Unit 2 and Unit 3 to be temperature compensated to provide accurate level indication. The RTD on the decay heat drop line was upper range limited to the same value (420 °F) as the RTDs attached to the capillary lines. This upper range limit is adequate for the capillary lines, however, this upper range limit can induce an error into the RVLIS calculation.

Therefore, the root cause of this problem is that an adequate and thorough review of the Westinghouse modified ICCM design for Oconee was not performed by Westinghouse and/or Duke with due consideration to potential temperature compensation effects.

SCHEDULE FOR RESTORATION

This equipment failure was added to the Unit 2 Hot List for repair. The Hot List is a listing of important tasks that need to be accomplished should a unit be forced to shut down prior to its scheduled refueling date. Adding this equipment failure to the Hot List ensured that the equipment would be repaired and the channel would be returned to operable status at the earliest opportunity. Additionally, this equipment failure was added to the outage work schedule to ensure that, if not repaired prior to the next scheduled refueling outage, the equipment would be repaired during the next refueling outage.

A Unit 2 forced outage was conducted from September 4, 1997 to September 11, 1997, to repair leaking valve 2LP-1. As a result, the RTD 2RC RDC0189 was replaced. In addition, the upper end of the temperature range for the new RTD was raised to the appropriate value of 700 °F. Therefore, RVLIS Train B was restored to full operability.

In addition, the upper end of the temperature range for the Unit 3 RTD was also raised to the appropriate value of 700 °F.

JUSTIFICATION FOR RESTORATION SCHEDULE

The location of 2RC RDC0189 is inside containment in the 2A steam generator cavity on the decay heat drop line. The estimated work force and stay time for this repair is 15 person-hours. The estimated dose rate at this location during unit operation is 600-1500 mrem/hr (gamma) and 2-4 mrem/hr (neutron) general area. The

combination of work force, stay time, and dose rate prohibits equipment repair while the unit is operating. Therefore, this RTD could not reasonably have been replaced without shutting down the affected unit.

SAFETY SIGNIFICANCE FOR PERIOD OF INOPERABILITY

The Unit 2 ICCM is a two channel monitoring system. The failure of one channel of instrumentation, Train B RVLIS, did not result in a complete loss of RVLIS indication. The other channel of instrumentation, Train A RVLIS, was still operable. If Train A of RVLIS had become inoperable, unit operation would have been limited to 7 days as stated in Specification 3.5.6. If one channel could not have been restored within 7 days, Specification 3.5.6 would have required that the unit be in hot shutdown within the next 12 hours.

Based on the remaining channel of RVLIS instrumentation being operable, and the limiting conditions for operation specified in Specification 3.5.6, it was considered acceptable to continue to operate Unit 2 with ICCM Train B RVLIS indications inoperable.

In addition, the probability of a design basis accident occurring during the short period of inoperability of RVLIS Train B beyond the 7-day period was acceptably low so as to preclude the need for a forced unit shutdown. Therefore, this period of inoperability of RVLIS Train B was not inimical to public health and safety.