U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Docket/Report: 50-309/85-19 License: DPR-36

Licensee: Maine Yankee Atomic Power Company
83 Edison Drive
Augusta, Maine 04366

Inspection at: Maine Yankee Nuclear Power Plant, Wiscasset, Maine

Dates: August 8-16, 1985

Inspectors: K P Ferlic (for) 8/26/85
C. Holden, Senior Resident Inspector Date

K P Ferlic 8/26/85
K. Ferlic, Project Engineer Date

Approved by: [signature] for 8/26/85
T. C. Elsasser, Chief, Reactor Projects Section 3C Date

Summary: Inspection Report 50-309/85-19 (August 8-16, 1985)

Areas Inspected: This special inspection (82 hours) was conducted to determine the circumstances surrounding the discovery of nine of the twelve root valves for the steam generator pressure instruments that were not fully open and may have been shut. The inspection involved a review of plant systems involved, documentation reviews, and interviews with plant personnel.

Results: One violation was found.

DETAILS

1. Description of the Event

On August 7, 1985, the control room operators noted that the steam generator (S/G) pressure indication for S/G #1 Channel "D" was reading approximately 520 psig on the sigma meter on the main control board. The three other sigma meters for #1 S/G and the eight sigma meters associated with #2 and #3 S/G were all reading approximately 630 psig. The operators reported the deficiency to the Instrument and Controls (I&C) section via Discrepancy Report (DR) #3777-85.

I&C technicians conducted a calibration of the pressure detector using Procedure 3-6.2.1.2, Protective and Safeguard Channel Calibration, Steam Generator Pressure, Revision 10, dated June 13, 1985. The calibration was satisfactory and the technicians suspected that the instrument line may have been blocked. Using the drain line, the technicians blew down the line and found that after an initial volume of water was drained, the steam pressure in the line was minimal.

After discussions with the control room, an operator was sent to the mechanical penetration room at 7:30 p.m. on August 7, 1985, to check the position of the instrument root valve. I&C technicians routinely operate instrument isolation valves (near the instrument) and plant operators manipulate the root valves (near the connection to the process).

The operator, suspecting that the valve for S/G #1 Channel B was open, attempted to verify it as open by turning the valve in the open direction and discovered the valve was, in fact, not open. The exact position of the valve is not known but the operator believes the valve (MS-46) was moved through its entire range of travel as he opened it. The next valve checked was MS-47 which was also checked in the open direction and was found to be similar to MS-46. As a result, the remaining root valves were initially checked in the shut direction in an attempt to verify their position.

All root valves (four for each of the three S/G's) were checked. Three valves were found open (MS-45, 65, and 85). These three valves are the Channel "A" pressure detector root valves. The other nine root valves were found nearly shut. The operator reported moving a number of valves approximately 1/16 to 1/32 of a turn in the closed direction. Full stem travel is approximately 5 and 1/2 turns. The operator reported that three valves were found open, six valves (MS-44, 64, 66, 84, 86, 87) were found cracked open and three valves (MS-46, 47, 67) were closed. Of the three valves reported as found closed, two were checked in the open direction and therefore the original position is indeterminate. The third valve reported as closed is physically difficult to operate because of nearby pipe insulation.

2. Immediate Corrective Action

The control room directed the operator to open/verify open all of the steam generator pressure root valves (this was done in conjunction with checking the valve position as described above). The root valves for S/G pressure were then tagged in the open position within one hour.

Using the instruments described in Tables 4.1-1, 2, and 3 of the Technical Specifications (TS) the operators established a list of safety related instruments. Those instrument root valves which were accessible were checked for proper position. The instrument root valves that were not accessible were verified open by establishing the operability of the associated instrumentation. Some of the instrument root valves were controlled by plant procedures. These procedures were checked to ensure these valves were in fact verified open by that procedure the last time it was performed.

The three plant procedures which controlled root valve position are Procedure 1-12-2, Containment Leak Monitoring; Procedure 1-12-5, Establishment of Containment Integrity; and Procedure 3-1-2, Emergency Core Cooling Routine Testing. The combination of these three procedures either provides for routine checking of the instrument root valves or verifies the position of those valves at the conclusion of the outage and prior to plant startup. The total number of root valves checked by these procedures is 105. The total number of safety related root valves is 202. Out of the sixteen systems identified by the licensee as safety related systems, these procedures cover only three of those systems.

The event was presented at the morning managers meeting on August 8, 1985, and a special review of the event was begun. The operability of the other instruments was the first issue addressed. A critical review of the list of root valves was undertaken and available evidence of the operability of the instruments associated with the inaccessible root valves was presented to a PORC meeting held on August 9, 1985.

The instrument root valves that were inaccessible and did not allow actual visual inspection of valve position were Pressurizer Level and Pressure, Safety Injection Tank (SIT) Level and Pressure, and S/G Level and Reactor Coolant System (RCS) Flow. The root valves for these instruments are located in high radiation areas in containment when the plant is at power.

Pressurizer Level and Pressure Instrumentation were checked using log readings of system response during plant heatup, chart recorder traces, post trip review and sequence of events data from the plant computer which recorded the fluctuation of pressurizer level during a plant trip on November 3, 1984. SIT Level and Pressure are trended using a manual plot of levels and pressures over the operating cycle. These plots were reviewed and determined to be characteristic of SIT fluctuations over the cycle. RCS Flow was similarly determined to be characteristic of expected performance based on previous startup data and current instrument readings. S/G Level instrumentation was checked using plant trip data from November 3 and November 11, 1984 which showed all low level S/G trips actuated.

3. Steam Generator Pressure Instruments and Plant Protection

Steam generator pressure provides several protection signals in the event of a main steam line break. The three main steam lines exit containment into the Mechanical Penetrations Room where each line is provided with an isolation Non-Return valve and an Excess Flow Check valve. Each of these steam lines has four instrument taps between the Non-Return Valve and the containment wall. Each instrument tap contains a root valve, instrument isolation valve, a pressure transmitter, and a drain valve. These four instrument taps provide the pressure signal for the four independent measurement channels A, B, C, and D. Each independent measurement channel provides the following:

-- Pressure indication on the main control board (MCB) sigma meter for each steam generator. (Sigma meters are a brand name of a small horizontally mounted meter. All twelve sigma meters are located in the same area of the MCB so that all channels can be easily compared.)

-- An input to the Reactor Protection System (RPS). The low S/G pressure trip setpoint is 485 psig. RPS logic is any 2 of 4 low S/G pressure signals on any two independent protection channels from one or more steam generators.

-- Independent of RCS:

- An input to close all Excess Flow Check Valves on low pressure (400 psig) from a single steam generator and provide a pre-trip alarm (535 psig). Signal is any 2/4 from a single steam generator.

- A low S/G pressure signal to provide a feedwater isolation signal. Signal is 2/4 from a single steam generator.

- A low S/G pressure signal coincident with a safety injection actuation signal to provide a main feedwater pump train trip. Signal is 2/4 from a single steam generator.

In addition to the above, Channel A provides an input to the plant computer, indication on the Appendix R Safe Shutdown Panel and a second meter on the MCB.

4. Event Analysis

During the last refueling outage, completed in June of 1984, several modifications were made to the systems involved in this event. The first was the installation of additional valves in the auxiliary feedwater system for the feedwater trip system. The addition of these valves necessitated a S/G hydrostatic test. The second modification was the installation of the Safe Shutdown Panel for Appendix R. This modification installed an additional pressure transmitter in each of the Channel "A" S/G pressure sensing lines. These transmitters provided S/G pressure indication on the Safe Shutdown Panel.

The plant controls S/G hydrostatic tests using two procedures. The first procedure, Procedure 4-1-4, Hydrostatic Fill and Test, Revision 0, dated May 24, 1984 provides guidance on the filling, venting, and aligning of the S/G. It is intended to cover the realignment of the feedwater, main steam, and S/G blowdown systems. This procedure requires the root valves for the S/G pressure instruments to be closed by operations personnel and the instrumentation valves for the S/G pressure and level instruments to be closed by I&C personnel. The procedure does not address the closure of the S/G level transmitter root valves and therefore these valves were not manipulated during the test. At the conclusion of the test, Step 8.3.6 directs I&C to place the individual level and pressure transmitters back in service. Each transmitter was initialed as returned to service in Step 8.3.6. Step 8.3.7 directs the Operations Department to realign the affected systems but does not identify the individual valves to be manipulated. Specifically, this step states "Realign steam, feedwater, and blowdown systems for normal operation."

The second procedure used during a S/G hydrostatic test is Procedure 17.25, System and Component Pressure/Leak Test, Revision 1, dated May 1, 1984. This procedure dictates the acceptance limits, the sequence of activities required to perform the test and the verification that the systems satisfy the design requirements of the hydrostatic test. In Section 10 of this procedure I&C is required to return the pressure and level transmitters to service. Instrument root valves are not addressed by this procedure.

The inspector concluded, based on the above information, that all root valves for S/G pressure had been shut for the hydrostatic tests of the S/G's which were conducted on or about May 31, 1984. Since both procedures associated with the hydrostatic test do not require the root valves to be opened at the completion of the test, they remained shut. Channel "A" S/G pressure root valves were opened on June 7, 1984 when tagout 742-84 was cleared. Low S/G pressure instrumentation was required to be operable for the Reactor Protective System on June 22, 1984 at approximately 11:00 p.m. when the plant increased power above 2 percent. Low S/G pressure instrumentation was required to be operable on June 20, 1984 for the Feedwater Trip system when the boron concentration of the plant was reduced below the hot shutdown boron concentration. Since the root valves for the low S/G pressure channels B, C, and D were left in the closed position, these channels were not available to perform their intended safety function. This is a violation of Technical Specifications 3.9 and 3.2.2 (VIO 309/85-19-01).

Interviews conducted by the inspector determined that the operational philosophy at Maine Yankee concerning instrument root valves has been that these valves are intentionally open, remain open, and instrument operability checked during startup by the operator's assessment of control board indications. Consequently, the licensee determined that there was no need to add root valves to system lineups or administratively controlled valve lists. Instrument isolation would be accomplished by I&C personnel utilizing the instrument isolation valve in accordance with approved procedures or by operations personnel closing, and subsequently opening, the root valve in accordance with the plant tagging procedures. Some instrument root valves (containment

hydrogen monitor, RWST level indicator, and containment pressure) were added to the valve list in specific procedures to address a specific requirement. Consequently, when Step 8.3.7 of the hydrostatic procedure that required the operator to: "Realign steam, feedwater, and blowdown systems for normal operations," it was not clear with regards to requiring manipulation of the root valves after completion of the procedure. These valves are not manipulated in alignment for normal operations.

5. Exit Interview

Meetings were periodically held with senior facility management to discuss the inspection scope and findings. A summary of the findings was presented to the licensee at the end of the inspection.