

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Number: 50-309/94-03
Docket Number: 50-309
License Number: DPR-36
Licensee: Maine Yankee Atomic Power Company
83 Edison Drive
Augusta, Maine 04336
Facility: Maine Yankee Nuclear Generating Station
Inspection Date: February 6 to March 12, 1994
Inspectors: J. Yerokun, Senior Resident Inspector
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Approved by: *W. J. Lazarus* 4/7/94
W. J. Lazarus, Chief, Reactor Projects Section 3B Date

Scope: Resident inspection of plant activities including operations, maintenance and surveillance, engineering and technical support, and overall plant support.

Overview: See executive summary.

EXECUTIVE SUMMARY

Operations

Operators responded promptly and adequately to a condenser vacuum transient and took proper actions to avert a potential plant trip. The plant continued to closely monitor the primary to secondary leakage and adequately maintain a trend and evaluation of the leakage.

Maintenance and Surveillance

Excellent safety perspective was demonstrated when Maine Yankee promptly identified and corrected a situation when the valve packing on a safety related valve had been adjusted without the proper work order. This safety perspective was also demonstrated when the problem with crimper calibration was identified and addressed.

Engineering and Technical Support

Engineering efforts to address the low service water pump flow, and high steam generator blowdown flow concerns have been excellent.

Plant Support

Radiological controls and security continue to be well implemented.

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DETAILS

1. OPERATIONS

The plant was operated at full power during this period except on February 17, to 18, 1994 when power was reduced to 75% to backwash the condenser and inspect service water pump 29A. On a daily basis, inspectors verified adequate staffing, appropriate access control, adherence to procedures and technical specifications limiting conditions for operation, and operability of protective systems, including emergency power source. The inspectors also verified operability of selected Engineered Safety Features (ESF) trains and assessed the condition of plant equipment, radiological controls, security and safety. The inspectors evaluated plant housekeeping and cleanliness. The inspectors observed shift turnovers to ascertain that they were performed professionally, comprehensive, and with proper transfer of information. The inspectors monitored the status of control room annunciators and radiation monitors to ascertain that they were being maintained adequately.

During the inspection period the inspectors conducted backshift inspection on 2/7, 2/10, 2/28, and 3/9, and deep backshift inspection on 2/12, 2/17, 2/28, 3/12, and 3/21.

1.1 Station Computer Failures

On February 5, Maine Yankee operations personnel discovered that the emergency supply system (ESS) portion of the station monitoring computer system (MODCOMP) was inoperable. This was determined when control room operators obtained an incore analysis (INCA) program print out and attempted to obtain a detector check print out. This evolution is performed every shift. The printer did not respond to the requested detector check. During subsequent troubleshooting and repair efforts, the ESS portion of the computer failed again on several occasions. The licensee documented this issue in an unusual occurrence report (UOR), 94-01.

The ESS portion of the plant computer runs the INCA program and provides historical data to the safety parameter display system (SPDS) in the emergency response center and to the emergency response data system (ERDS) for the NRC. The SPDS in the control room was not effected, because it's information is provided by the operational support system (OSS) portion of the plant computer. The plant continued to perform incore analysis as required by technical specifications 3.10.C, Power Distribution Limits, without the plant computer. The ENS phone to the NRC was available as backup to the ERDS. Therefore, the safety significance of the ESS failure was minimal.

The inspectors noted that troubleshooting efforts were adequate. Appropriate work control under work orders WO 94-00528 and WO 94-00673 were established to control the troubleshooting and repair process. Close-out plan (COP) 94-003 was developed to address the issues, identify the significance of problems, and implement the proper corrective actions.

Throughout these failures, the plant computer central processing units (CPU) continued to run, and the OSS portion remained unaffected. The disk drive for the ESS portion of the plant computer failed several times during this process. Following repair efforts, including the installation of a new CPU on February 17, 1994, the ESS has remained operational.

The problem was adequately addressed by operators and the computer section. Operator response to the problem was adequate. Operators ensured that the requirements of technical specifications regarding power distribution limits and core instrumentation continued to be met and properly referred to procedure OP 1-4-1, Plant Operations without the plant computer, as required.

1.2 Improper Operation of the Hydrogen Dryer

On February 6, 1994, a nuclear plant operator (NPO) was in the process of purging the main generator hydrogen dryer when the operator witnessed a spark and heard a popping noise. The NPO checked the circuit breakers for the unit fan motor and heaters, verified air flow and found no abnormalities. The NPO then informed the Plant Shift Supervisor (PSS) and Shift Operating Supervisor (SOS) of the problem. The SOS rechecked the above items and also found no abnormalities. After verifying no combustible gasses were present in the area the unit was placed back in service. Later in the shift, the SOS with assistance from the NPO, attempted to duplicate the original actions of the NPO when the hydrogen dryer was placed in the purge mode of operation. At this time nothing unusual was noted. When the unit was vented, the SOS measured hydrogen readings of 20% Lowest Exposure Limit (LEL) and this quickly dissipated.

The most likely cause of the spark and popping noise was determined to be that the residual hydrogen in the unit being vented was in close proximity to the circuit breakers and fan motor which were also operated at this time. Following discussions with the on-coming SOS, a Maine Yankee Operations Information Notice (MYOIN) was posted on the unit and the unit was taken out of service pending review of the circumstances of the event.

Maine Yankee management determined that the event occurred due to improper guidance to the NPO. Plant procedure 1-102-4, Generator Gas System was revised. An attachment (Hydrogen Dryer Regeneration) was added to the procedure by operations department to provide specific guidance to NPOs when placing the Hydrogen Dryer unit in service to preclude inadvertent sequencing of the system circuit breakers prior to the unit being completely vented.

The inspector concluded that Maine Yankee's actions to resolve this problem were comprehensive and safe with excellent supervisory oversight. The inspector had no further questions regarding this matter.

1.3 Steam Generator Blowdown Tank Rupture Disk Failure

On March 5, 1994, Operators entered Abnormal Operating Procedure (AOP) 2-2, Degraded or Loss of Condenser Vacuum because condenser vacuum was decreasing and corresponding alarms were received in the control room. Operators placed an air ejector (EJ-1A) in service in an attempt to arrest decreasing condenser vacuum. When the condenser absolute pressure reached 6.783 in Hg. Abs., a second air ejector was placed in service and condenser vacuum began to recover.

Operators responded promptly to this transient and quickly identified the leak path as through the blowdown system. This was done in conjunction with chemistry analysis of steam generator and blowdown samples. Operators performed troubleshooting activities on the blowdown system alignment and determined that rupture disk RD-16 had failed. The disk was isolated from the normal blowdown flowpath and blowdown was aligned to the condenser. The disk was subsequently replaced and engineering evaluation to determine the cause of the disk failure was initiated. While this failure occurred in a non-safety related system, the resulting transient could have caused a plant trip.

The inspectors observed that operators responded promptly and correctly to the transient and took proper actions to avert a potential plant trip.

1.4 Primary to Secondary Leakage

Throughout the inspection period, the inspectors closely monitored the licensee's actions regarding the primary to secondary leakage. The leakage rate continued to trend very slightly up but remained below 7 gallons per day (gpd). At 7 gpd, a sample of the secondary system during every shift would be required per AOP 2-49, Steam Generator Tube Leak. At 50 gpd, plant shutdown is required per the AOP. Technical specifications (TS) 3.14, primary system leakage, has a limit of .15 gallons per minute (gpm) or 216 gpd from any one steam generator.

As a precaution, operators reviewed procedure AOP 2-49, Steam Generator Tube Leak, to be properly prepared to take necessary actions should the leak suddenly worsen. The operations department chemistry personnel were also monitoring and trending the leak rate and providing excellent feedback to the plant manager. The leakage rate has remained so low that the licensee has been unable to determine which of the steam generators is leaking.

The inspectors closely monitored the licensee's actions regarding this issue and concluded that appropriate actions were being taken.

2. MAINTENANCE and SURVEILLANCE

The inspectors observed and reviewed maintenance and problem investigation activities to verify compliance with regulations, administrative and maintenance procedures. The inspector ascertained that maintenance activities on Safety Related equipment were performed in accordance with approved work order requirements, codes and standards, with proper QA/QC involvement, proper safety tag and jumper use, and equipment alignment.

The inspector witnessed surveillance testing activities and ascertained that they were performed in accordance with technical specification requirements, codes and standards and administrative and surveillance procedures. The inspector observed portions of the following:

- WO 94-00658, Service Water Pump 29D field inspection
- WO 94-00564, Megger PCC Pump 9A motor
- WO 94-00124, HPSI pump 14A coupling
- WO 94-01150, Valve HSI-M-54 diagnostics
- WO 94-00317, Thermolag fire barrier replacement

- Surveillance 3-1-5.3, Aux. feed pump 25B test

Maine Yankee personnel performed the observed maintenance and surveillance activities in accordance with station directives and procedures. Designated quality control (QC) hold points were properly observed and QC personnel demonstrated good safety perspective and involvement with ongoing activities.

2.1 High Pressure Safety Injection Valve HSI-M-54

On March 10, 1994, a maintenance mechanic adjusted the packing on HSI-M-54 without a work order. HSI-M-54 is a HPSI pump suction valve which opens on a Recirculation Actuation Signal (RAS) to allow containment spray pump flow to the suction of the HPSI pump. This motor operated valve (MOV) is covered under Maine Yankee's MOV program. A work order is required for packing adjustment on safety related MOVs per plant procedure 0-16-3, Work Order Processing Procedure, revision 8. Therefore, the action was contrary to the requirements of the plant procedure.

This item is not being cited as a violation because of the following reasons:

- (1) Maine Yankee promptly identified the discrepancy when a maintenance supervisor noted that the packing adjustment had been made as a level 3 safety class maintenance instead of a level 1 or 2 when a work order should have been written.

- (2) Immediate corrective actions were taken and along with disciplinary actions for the individual involved, included performing a stroke test of the valve and then a full diagnostic test to ascertain valve operability.
- (3) The act was not a repetitious act that could have been prevented by corrective actions from a previous violation.
- (4) It was not a willful violation and involved the acts of a low level individual.
- (5) The Safety Significance was minimal since subsequent tests showed that the valve could still perform its safety function without any additional adjustments.

The inspectors monitored the licensee's actions regarding this event to ascertain that proper short term and long term corrective actions were taken and are planned. Training records of the individual involved were reviewed to verify that proper training had been provided thereby ensuring that the event was not a result of weakness in the training program. Further reviews of the training process are being performed and the licensee will enhance the program as required. A departmental root cause process was initiated as well as a Human Performance Evaluation Process (HPES). The inspectors concluded that the licensee was adequately addressing this issue.

2.2 Crimper Calibration Uncertainty

On February 24, 1994, Maine Yankee electrical maintenance personnel were notified by Thomas and Betts (T&B) tool repair company that an additional calibration specification was required to calibrate the crimping tools that had been purchased in 1982 and 1984. When performed on six Maine Yankee crimping tools, 5 of 6 failed the calibration test. The electrical maintenance section head immediately notified the control room of the crimper calibration issue. All plant equipment with electrical wiring terminated with insulated compression lugged connections (crimped) installed since 1982 were affected.

Maine Yankee generated a Safety Issue Concern (SIC 94-001) to document the problem and make an initial operability determination concerning affected plant equipment. Equipment operability was ascertained since infra-red thermography did not reveal any loose crimps in the past; testing by electrical maintenance verified that the crimps previously made passed pull testing; and previous surveillance testing of safety class equipment were satisfactorily completed. Visual inspection of previously made crimps also did not reveal any defective crimps.

The maintenance department developed a Close Out Plan (COP 94-004) to deal with the issue. The close out plan identified eight items requiring resolution and at the end of the inspection period five items remained open. The remaining open items are:

- Evaluate the existing M&TE program for possible new unknown vendor calibration requirements.
- Upgrade the crimpers to the new positive stop type crimper.
- Provide training to all plant and contractor electricians.
- Perform a root cause determination.
- Perform a Part 21 screening.

The inspector reviewed Maine Yankee's completed actions and plans and determined that they were appropriate to resolve the issue. The maintenance department section head demonstrated excellent safety perspective by reporting the problem promptly to the shift supervisor and providing excellent follow-up to close out the issue.

2.3 Reactor Coolant Charging Pump P-14B Coupling Replacement

The inspector reviewed the work package for the replacement of the coupling between the speed increaser and the motor of charging pump P-14B. The work was performed per station work order WO-94-00124-01, and radiological access was controlled under radiation work permit 94-00057. All requirements of the station work control procedure, G-16-3, were followed. The station Quality Programs Department placed QC "holds" on two areas of the work. The first QC hold was to witness the torquing sequence after reassembly of motor side coupling and the second was to witness the coupling alignment runout measurement. These steps were completed satisfactorily. After completion of repairs, the charging pump was tested satisfactorily in accordance with plant procedure 3.17.6.6, Inservice Testing of Safeguards Pumps, prior to being declared operable. After completion of testing and verification of no leakage from the mechanical seals, the pump was declared operable on March 17, 1994.

The inspector concluded that Maine Yankee properly scheduled and performed complex repairs of the safety related equipment as required by plant technical specifications and the work control program. The inspector had no further questions regarding this work effort.

3. ENGINEERING and TECHNICAL SUPPORT

3.1 (Open) Unresolved Item No. 50-309/94-01-01 Service Water Pumps Flow

On February 18, 1994, the NRC Resident Inspectors met with the licensee and Yankee Nuclear Service Department (YNSD) engineering staff to discuss the service water pumps flow issues and the effect on system operability. This issue had previously been identified in the NRC inspection report 50-309/94-01 as an unresolved item.

Flow concern became an issue following full flow tests performed in December 1993, when flows as low as 9,500 gpm were obtained. Additional data collected in January 1994, indicated flows as low as 8,000 gpm. The service water flow assumed in the original safety analysis was 10,000 gpm for each pump. Preliminary engineering evaluation determined that the reliability of the annubars used for flow measurement was questionable, and that actual pump flows might be higher than indicated. A limiting water inlet temperature of 40 degrees Fahrenheit was established to accommodate the apparent less than design basis full flow. Design basis screen (DBS) No. 94-001 was developed to provide justification and appropriate limitations for system operability. Maine Yankee determined that with the lowest service water flows measured, the system will continue to perform its intended safety function with certain restrictions on service water inlet temperatures. Operations procedure AOP 2-31, Service Water Abnormalities, Rev 11, was revised to reflect the allowed service water inlet temperatures. Operators also adjusted the computer alarm setpoints to adequately reflect the changes made to the AOP regarding service water inlet temperature.

The licensee also determined that service water flow will not be adequate during the summer months when service water inlet temperatures exceeds 40 degrees Fahrenheit. A physical inspection of the pumps indicated no excessive degradation was present. The licensee is taking actions to:

- (1) Determine the cause of the apparent pumps flow degradation.
- (2) Attempt to reduce the introduction of debris into the system by upgrading the traveling water screens and screen wash nozzles.
- (3) Attempt to reduce the amount of flow lost through the assumed failure of the non-seismically designed connections to the service water systems.
- (4) Assess the feasibility of taking credit for two pumps operating during times of high service water inlet temperatures. The system is designed with two pumps per train, but credit is taken for only one pump per train operating post accident.

The inspectors were satisfied with the immediate system operability determination and the limitations imposed to ensure that the system will perform as designed. Adequate administrative controls were established and operations personnel were aware of the temperature limitations. The inspectors concluded that the licensee is taking adequate actions to address the long term corrective action and is maintaining current documented analysis of the system operability.

3.2 (Open) Unresolved Item No. 50-309/93-28-01, Steam Generator Blowdown

The issue surrounding steam generator (S/G) blowdown flowrates relative to the impact on the ability of the emergency feedwater (EFW) system to perform as designed was discussed in previous NRC report 50-309/93-28. The issue was left unresolved pending completion of

licensee's determination of the limiting post accident S/G blowdown flowrates. Meanwhile, a maximum limit of 51 gpm blowdown flow for all three steam generators was established by the licensee.

On February 18, 1994, the NRC resident inspectors met with the licensee and YNSD staff to discuss the status of the S/G blowdown flow issue and its effect on EFW system operability. YNSD indicated that while the evaluation process was still on-going, it was determined that based on recently identified subcooled critical flow conditions in the steam generator, a conservative limit of 45 gpm total S/G blowdown flow was necessary. Maine Yankee imposed a limit of 45 gpm S/G blowdown flow, to ensure that the safety analysis for EFW system was satisfied.

Engineering determinations were quickly communicated to operations and appropriate actions were promptly taken. The inspectors discussed the status of the blowdown system flow with operators and were satisfied that communication between engineering and operations was well maintained relative to this issue. The inspectors were satisfied that the current limit of 45 gpm is acceptable. The licensee is re-evaluating the design basis to see if flow can be increased.

3.3 NRC Bulletin 92-01 (Thermo-Lag) Update

The inspector reviewed Maine Yankee's response to NRC Bulletin 92-01 in inspection report 50-309/92-12. In the response to the NRC, Maine Yankee committed to replacing and/or modifying the existing Thermo Log fire barriers at Maine Yankee to eliminate the possible fire hazard. The station Corporate Engineering Department (CED) initiated engineering design change request (EDCR 94-28) to replace the existing Thermo-Lag fire barriers in the High Pressure Safety Injection (HPSI) valve room and in the vicinity of the Auxiliary Charging Pump with approved 3 hour masonry fire barrier. The remaining barriers are currently being reviewed to determine the proper course of action to resolve the barrier. The required changes will be accomplished by an engineering change notice (ECN) to EDCR 94-28 during the next refueling outage.

The inspector reviewed the EDCR and witnessed the work in the field during installation of the new masonry block walls. The work was accomplished by contractor personnel under supervision of Maine Yankee/Yankee Atomic Engineering personnel. The work was accomplished as required by the EDCR in a professional manner with no problems identified by the inspector. Upon completion of acceptance testing, the new fire barriers will be placed in service and the existing fire watches for these barriers will be terminated.

3.4 Trevitesting of Main Steam Safety Valves

Prior to the last refueling outage, Maine Yankee conducted Trevitesting of main steam safety valves as reported in Inspection Report 50-309/93-18. During this inspection period the inspectors received information concerning problems associated with Trevitesting conducted by a vendor at a NRC Region III licensee site. The vendor notified the licensee that the

licensee's determination of the limiting post accident S/G blowdown flowrates. Meanwhile, a maximum limit of 51 gpm blowdown flow for all three steam generators was established by the licensee.

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Trevitest performed on the stations main steam safety valves may have left them outside the technical specifications required tolerances. The vendor indicated that an improper value for the mean seat area was used for the calculation that controlled the testing for the valve. These licensee valves were supplied by Dresser (Consolidated) 3707R series and were the only valves affected by this problem.

The Maine Yankee plant engineering department investigated this information and determined that the valves installed at Maine Yankee are manufactured by Crosby Valve Co. In addition the cognizant engineer for the project independently verified the calculations supplied by the vendor. The inspector determined that Maine Yankee response to this problem was prompt and demonstrated a strong safety perspective. The inspector had no further question regarding this matter.

4. PLANT SUPPORT

4.1 Radiological Controls

Inspectors routinely reviewed radiological controls including Organization and Management, external radiation exposure control and contamination control. The inspectors also monitored standard industry radiological work practices, and conformance to radiological control procedures and 10 CFR 20 requirements.

The inspector reviewed some Radiological Incident Reports (RIR) to ensure that the requirements of station procedure 9-301-6, Radiological Incident Report are being met. The inspector reviewed RIR #93-4, 93-5 and 94-2. The reports were written as required by the procedure with sufficient detail to fully describe and assess the radiological incident. The root cause determinations were promptly performed and the conclusions were appropriate. Maine Yankee's corrective actions to resolve the identified issues were comprehensive and prompt with proper management review and approval. The inspector had no further questions concerning this review.

4.2 Security

The inspectors verified that security conditions met regulatory requirements, the requirements of the physical security plan, and complied with approved procedures. The checks included security staffing, protected and vital area barriers, vehicle searches and personnel identification, access control, badging, and compensatory measures when required.

5. FOLLOWUP

5.1 (Closed) Inspector Followup Item 93-25-01

The NRC has reviewed the changes to the Maine Yankee Station Security Training and Qualification Plan identified as Revision 7. The NRC determined that the changes are consistent with the provisions of 10 CFR 50.54 (P) and are acceptable for inclusion in the plan. (Ref. NRC Letter dated February 18, 1994, to Maine Yankee). This item is closed.

6. ADMINISTRATIVE

6.1 Persons Contacted

During this report period, inspectors conducted interviews and discussions with various licensee personnel, including plant operators, maintenance technicians and the licensee management.

6.2 Summary of Facility Activities

Other inspections conducted during this inspection period include Erosion/Corrosion Program (50-309/94-04) and Pipe Support (50-309/94-05).

6.3 Interface with the State of Maine

Periodically, the resident inspectors and the onsite representative of the State of Maine discussed findings and activities of their corresponding organizations. No unacceptable plant conditions were identified.

6.4 Exit Meeting

Inspectors periodically held meetings with senior facility management to discuss the inspection scope and findings. At the conclusion of the inspection, the inspectors also presented a summary of findings for the report period.