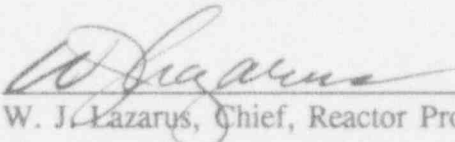


U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report Number: 50-309/93-28  
Docket Number: 50-309  
Licensee Number: DRP-36  
Licensee: Maine Yankee Atomic Power Company  
83 Edison Drive  
Augusta, Maine 04336  
Facility: Maine Yankee Atomic Power Station  
Inspection Dates: November 20 through December 31, 1993  
Inspectors: J. Yerokun, Senior Resident Inspector  
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Approved By:  \_\_\_\_\_ 1/25/94  
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

The plant maintained ESF systems in good operating condition through the implementation of effective maintenance and surveillance programs. Expedient actions were taken to address diesel generator starting concerns.

### Maintenance and Surveillance

Appropriate interim corrective measures were implemented to address the safety related 4160 volts circuit breaker limit switch problems.

### Engineering and Technical Support

The Fuel Rods Oxide Thickness/Grid Fretting Inspection was performed in a well controlled manner with good safety perspective. However, some weaknesses were identified regarding the engineering efforts to address the issues surrounding the Steam Generator Blowdown design change that was implemented during the last outage.

### Plant Support

Radiological controls and security continue to be effective.

### Safety Assessment/Quality Verification

The Nuclear Safety Audit and Review Committee (NARSC) meeting held this period was very professional with a good focus on safety. Plant Operations Review Committee (PORC) continued to maintain an excellent safety perspective.

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## DETAILS

### 1. OPERATIONS

The plant operated at full power during this inspection period except on December 3 to 6, 1993, when power was reduced to 80% to perform service water and circulating water mussel control back flush.

On a daily basis, inspectors verified adequate staffing of the control room, appropriate control room access control, adherence to procedures and technical specifications limiting conditions for operation, and operability of protective systems, including emergency power sources. 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 observed some shift turnovers and noted that they were performed properly. The inspectors monitored the status of control room annunciators and radiation monitors and reviewed portions of containment isolation valve lineup to ascertain that they were being maintained adequately. The inspectors also evaluated plant housekeeping and cleanliness.

#### 1.1 Engineered Safety System (ESF) Walkdown (71710)

During the inspection period, the inspector conducted a walkdown of the Low Pressure Safety Injection (LPSI) system. The system was properly lined up for power operation in compliance with plant technical specifications. This was verified by observation of the major valves alignment and comparison with plant operating procedures, system drawings and plant final safety analysis report requirements.

The system was well maintained. No abnormal pump or valve packing leakage was noted. System instruments were calibrated within the required calibration dates. Required support equipment was operational. With the assistance of a plant nuclear operator the interiors of the pump circuit breakers were inspected and found to be clear of debris with the exception of the LPSI valve automatic bus transfer (ABT) devices. The inspector found several keys and a piece of metal bar in one of the ABT panels. The shift supervisor stated that the ABT's are not presently used because, according to a recent technical specification amendment, the associated valves are now in the open position (safety position) and will not have to cycle upon the initiation of safety injection. The nuclear plant operator removed the foreign material found in the ABT panels. All system component circuit breakers were in the required position with proper indication on the control panels. With the exception of the above noted problem, the inspector concluded that Maine Yankee maintained the LPSI system in good operating condition through the implementation of effective maintenance and surveillance programs.

#### 1.2 Emergency Diesel Generator DG-1B Start failure Problem

On December 17, 1993, Maine Yankee operations personnel commenced a monthly surveillance testing of emergency diesel generator DG-1B to verify operability. This was done prior to commencing an inspection of 1E safety related circuit breakers because of the breakers limit switch problems identified on December 15, 1993.

Maine Yankee observed several problems during this routine monthly surveillance run of the diesel generator. During the first run, after manually starting the diesel generator from the local panel, the unit stopped after approximately one minute of run time. On the second run the nuclear plant operator again started DG-1B manually from the DG room. The engine appeared to be sluggish in starting and a Start Failure alarm annunciated on the control panel. During the shutdown phase of the second run, a Circuit Malfunction alarm was received with no apparent circuit malfunction. Due to the results of these two runs, the plant shift supervisor directed a third run of the diesel. The run was not completed because of a leaking cooling water pump seal.

Maine Yankee declared DG-1B inoperable and commenced trouble shooting efforts to determine the causes of the engine shutdown after one minute of operation on the first run, the engine start failure alarms, the sluggish start on the second run and the circuit malfunction alarm during the shutdown phase of the second run. An investigation team was formed to determine the causes for these problems and to make recommendations to resolve the identified concerns.

On December 18, 1993, operations personnel restarted DG-1B for troubleshooting efforts to allow plant engineering personnel to monitor the starting circuitry and attempt to re-create the conditions that caused DG-1B to stop running on the first run of December 17. Although the Start Failure alarm was received again, the cause of DG-1B shutting down after one minute of operation was determined to be an inadvertent actuation of a 11.5 minute timing relay in the control circuit. This inadvertent actuation occurred due to a procedural problem which occurred during the initial alignment of DG-1B for the surveillance test. This was verified during the troubleshooting run when the relay was actuated and the diesel stopped within 11 minutes and 50 seconds of actuation. This relay is normally actuated for the coastdown mode of diesel operation and is energized by pushing the two STOP buttons simultaneously on the diesel control panel. At the conclusion of the run, engineering determined that the diesel was operable with the erroneous alarm condition. Maine Yankee's investigation into the cause of the Start Failure alarm was on going at the conclusion of the report period.

The inspector determined that Maine Yankee's actions to address the diesel concerns were appropriate.

## **2. MAINTENANCE and SURVEILLANCE**

The inspectors observed and reviewed maintenance and problem investigation activities to ascertain that they were being conducted safely and in compliance with regulations, and administrative and maintenance procedures. The inspector ascertained that maintenance activities on Safety Related equipment was 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. Maine Yankee personnel performed the observed maintenance and surveillance activities in accordance with station directives and procedures. The inspectors observed portions of the following activities:

- WO 93-0448, D/G Redundant Systems Check and Diesel Overspeed Trip Test
- WO 93-4464, D/G 1B Troubleshooting
- WO 93-4428, 4429, GE Circuit Breaker Troubleshooting
- Procedure No. 3-1-5.3, Auxiliary Feed Pump Test, Monthly

### 2.1 4160 Volts Circuit Breaker Limit Switch, 52-SM/LS, Problem

On December 15, 1993, Maine Yankee maintenance electricians identified a problem with the GE 4160 volt class IE circuit breakers during routine surveillance testing. The circuit breakers failed to close because a limit switch, 52-SM/LS, which is designed to indicate the status of the charging spring, stuck open and prevented the circuit breaker from closing. This switch provides a close-permissive interlock designed to prevent the circuit breaker from attempting to close when the charging spring is not fully charged. GE replaced these limit switches when the circuit breakers were refurbished during the 1993 refueling outage.

As short term corrective actions, Maine Yankee instituted the following measures:

- During surveillance or other routine activities, after each circuit breaker is closed, a continuity check will be performed to verify that the limit switch has closed.
- A nuclear plant operator will be promptly stationed in the protected switchgear room after emergency core cooling system (ECCS) actuation in case a circuit breaker has to cycle more than once under accident conditions. If required, the operator would manually operate the breakers.

Maine Yankee engineering personnel initiated a technical evaluation (TE No. 455-93) to address temporarily removing these limit switches from the circuit breaker closing circuit by installing electrical jumpers across the switches. This would decrease the possibility of failure and allow for a longer period to evaluate GE's long term corrective actions to resolve the problem when such actions are propagated. The technical evaluation will be presented to the station plant operations review committee (PORC) in the first week of January 1994, for review and approval.

The inspectors reviewed Maine Yankee's short term corrective actions and found them to be appropriate. The safety perspective exhibited by all levels of station staff in identifying the problem, assessing it, and taking corrective measures was excellent. The inspectors interviewed operators to ascertain that they were aware of the 4160 volts circuit breaker problems and knew what actions to take if an ESF actuation were to occur. The inspectors also observed



surveillance tests to verify that the corrective actions stated above were being implemented. No discrepancies were identified. The inspector has no further questions at that time.

### 3. ENGINEERING and TECHNICAL SUPPORT

#### 3.1 Steam Generator Blowdown Limits

During the 1993 refueling outage, Maine Yankee installed engineering design change request EDCR 91-55, Blowdown Control Valve and Nozzle Replacement. The modification was made in order to increase the blowdown flow from all three steam generators from 136 gpm to about 300 gpm. The reason for trying to increase the blowdown flowrate was basically to improve the cleaning period for the steam generators during plant startup. However, the maximum flow measured during the post modification flow tests was about 150 gpm.

In early December 1993, during a review of the design change, Yankee Nuclear Services Department (YNSD) identified that the magnitude of the increase in total blowdown flow would cause the system to be outside of design bases accident analysis for emergency feedwater (EFW) flow as follow:

- In the Final Safety Analysis Report (FSAR), Section 14.10, Loss of Feedwater Flow Incident, for adequate emergency feedwater response, it is assumed that the steam generator blowdown lines remain open during a loss of main feedwater flow incident.
- In Maine Yankee's Inputs and Assumptions Source Document (IASD), Section 7.2-2, the analysis assumption for a loss of main feedwater (LOFW) in a station blackout (SBO) is 17 gpm blowdown rate per steam generator (51 gpm total) for effective emergency feedwater operation.

Maine Yankee initiated a Safety Issue Concern (SIC 93-008) to address the identified blowdown flow modification concerns. A temporary procedure change (TPC 93-455) was processed to change Procedure 1-105.2, revision 16, Steam Generator Blowdown System Operation, such that the total blowdown flow is limited to 51 gpm for all three steam generators. The licensee is performing evaluations to determine (1) the limiting total blowdown flowrates since the IASD does not clearly differentiate between limits and nominal values and the FSAR does not indicate any specific flowrates for the blowdown system in an accident situation and (2) why the IASD limiting blowdown flowrates were not considered during the development and installation of the system design change.

The post-modification tests demonstrated that a maximum total flowrate of 150 gpm could be obtained and the system had been modified for a flow of 300 gpm. The effect of the increased blowdown flow rates on the ability of the emergency feedwater system to provide adequate flow is under review by the licensee. The inspector was satisfied that the change to the procedure temporarily ensured that the plant would not be operated with excessive steam generator blowdown flow. However, this issue remains unresolved pending completion of licensee's

blowdown flow. However, this issue remains unresolved pending completion of licensee's determination of the limiting post accident steam generator blowdown flowrates and also taking actions to prevent future implementation of design changes that places the plant outside its design bases. (Unresolved Item No. 50-309/93-28--01)

### 3.2 Fuel Rods Oxide Thickness/Grid Fretting Inspection Program

In early December 1993, Maine Yankee reactor engineering personnel commenced a fuel rod inspection program that was designed to measure waterside corrosion and fuel rods-to-spacer grid fretting. These two phenomena have been identified as having potential for limiting fuel life. With increased fuel rod duty, both power and burnup have led to increased end of life fuel clad oxide thickness.

The fuel rod inspection program was designed to establish corrosion performance assessment of low tin Zircaloy-4 versus standard Zircaloy-4. Also, the program will establish the susceptibility of fuel to grid fretting specifically related to assemblies adjacent to the core shroud. Additionally, the program measures the correlation of fuel burnup and time and location in the vessel. Maine Yankee engineering personnel specifically selected fuel rods from recently discharged fuel assemblies to meet the stated program objectives. Approximately six fuel assemblies with three or four cycles of use were selected to provide the required data. Maine Yankee engineering and contractor personnel accomplished the required testing in accordance with the following PORC approved procedures:

- 4567-93-001 Single Rod Oxide Measurements of Discharged Fuel Assemblies
- STD-400-134 Procedure for Fuel Reconstitution Tool Operations
- STD-400-015 Procedure for Visual Inspection of Fuel Assemblies and Single Rods
- STD-400-006 Procedure for Eddy Current Defect Examination of 14x14 or 16x16 Single Fuel Rods
- STD-400-012 Procedure for Rod Storage Basket Use
- STD-400-122 Procedure for Single Fuel Rod Oxide Thickness Measurements

The inspector observed the inspection activities on two occasions. Maine Yankee engineering personnel controlled the inspection activities of contractor personnel as required by station procedures and provided the required safety assessment. Operations personnel performed all fuel movements in a safe manner. Prior to performing the inspections, the reactor engineering group presented the inspection plan to the station PORC committee for review and approval. At the conclusion of the inspection, the preliminary data analysis indicated that no real anomalies were present and the data indicated normal corrosion rates. The inspector found that Maine Yankee's control of the evolution was excellent. Good safety perspective was evident at all phases.



#### **4. PLANT SUPPORT**

##### **4.1 Radiological Controls (71707)**

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. No discrepancies were identified.

##### **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, access control, personnel identification and compensatory measures when required. No discrepancies were identified.

#### **5. SAFETY ASSESSMENT/QUALITY VERIFICATION**

##### **5.1 Nuclear Safety Audit and Review Committee (NSARC)**

The inspector and the NRR project manager attended the regular fall meeting (meeting no. 93-08-R) of the NSARC held on December 3, 1993. The committee met the quorum requirements of technical specification 5.5.B. Along with several other items, the committee discussed the resolution of problems identified in previous NRC inspection reports, Licensee Event Reports (LER), and the safety issues identified in Maine Yankee's Quality Program Department's (QPD) assessment report. The meeting was held in a very professional manner with good focus on safety.

##### **5.2 Plant Operations Review Committee (PORC)**

On occasions, the inspectors attended PORC meetings to ascertain that the requirements of technical specification 5.5 were met. The inspectors verified that the committee performed the required reviews and oversight to ensure nuclear safety. The committee had the proper quorum, met within the frequency specified in the station technical specifications and maintained a good safety focus. The committee demonstrated an excellent safety perspective especially during their discussion of the inspection plan for the Fuel Rod Oxide Thickness/Grid Fretting inspection program.

### 5.3 Previously Identified Open Items

#### 5.3.1 (Closed) Violation 50-309/91-09-01, Review and Approval of Procedures

On May 7, 1991, Maine Yankee conducted a post maintenance functional test of the Emergency Diesel Generator (EDG) 1-B air start motors. However, the test did not adequately demonstrate operability under accident conditions. Further, the Plant Operations Review Committee (PORC) did not review the Functional Test Instruction (FTI) prior to performing the test. Consequently, the event was cited as a violation in NRC inspection report 50-309/91-09.

In a letter to the NRC dated July 24, 1991, Maine Yankee stated that the cause of the event was the failure of the individual who prepared the functional test instruction, and the individuals conducting the initial FTI review, to recognize that the test did not verify the air start motor critical characteristics. Contributing to this failure was the minimal guidance for reviewing the FTI. As a result, Maine Yankee stated the intention to take the following actions to prevent recurrence: (1) revise Procedure 0-16-3, Work Order Processing Procedure, to provide guidance for individuals reviewing FTIs; (2) revise Procedure 0-16-3 to emphasize the use of existing approved surveillance procedures to perform post maintenance function testing, if appropriate; and, (3) review the list in the common test section to determine if additional surveillance procedures, currently approved, should be referenced for consideration when preparing FTIs.

The inspector reviewed Procedure 0-16-3, Revision 8, and verified that the procedure was revised to meet the Maine Yankee commitments. Attachment A contained a step for the reviewer to ensure that the characteristics of the component or system continue to meet Technical Specification and operational requirements. Appendix D provided additional guidance on FTI guidelines and included a step to use PORC approved procedures, when possible. Based on these revisions to the procedure, this item is closed.

#### 5.3.2 (Open) Unresolved Item 50-309/93-23-03

In Section 4.1.1 of previous NRC inspection report number 50-309/93-23, problems associated with the Radiation Monitoring System were addressed. The reliability of the system was questioned because there had been several corrective maintenance activities and unavailable periods in the past two years. The licensee had agreed to conduct an investigation and make a determination of overall system reliability. This issue was left open pending completion of licensee's assessment of the system. (Unresolved Item 50-309/93-23-03).

## 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 50-309/93-27, Engineering.

## **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.

During the inspection period the inspectors conducted backshift inspection on November 22, 23, 29, December 8 and 20, 1993 and deep backshift inspection on November 22, 1993.