

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 93-06
Docket No. 50-029
Licensee No. DPR-3
Licensee: Yankee Atomic Electric Company
580 Main Street
Bolton, MA 01740-1398
Facility: Yankee Nuclear Power Station
Rowe, Massachusetts
Inspection Period: August 1 - December 31, 1993
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Approved by:


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1/19/94
Date

Scope: Station activities inspected this period included: Operations, Maintenance, Engineering, and Plant Support. Twenty-one hours of direct inspection were performed over four inspection dates of August 26 and 27, November 1 and December 8, of which five hours were performed during backshift operations. Interviews and discussions were conducted with members of Yankee Rowe Nuclear Power Station management and staff as necessary to support this inspection.

Results: The conduct of operations and maintenance in the vapor containment to support the segmentation of reactor vessel internals and steam generator removal were safe. Good management oversight and coordination were observed during the final steam generator transportation to the rail loading area. An audit of design change no. 93-303, "Reactor Vessel Internals Segmentation and Component Removal Program 1993," identified no safety concerns. No violations of NRC requirements were identified.

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Note: Procedures from NRC Inspection Manual Chapter 2515, "Operating Reactor Inspection Program" which were used as inspection guidance are parenthetically listed for each applicable report section.

DETAILS

1.0 SUMMARY OF FACILITY ACTIVITIES

Yankee Rowe Nuclear Power Station continued component removal activities in accordance with the Possession Only License and Technical Specifications. The licensee (Yankee) removed and transported the pressurizer and four steam generators, and performed reactor vessel internal segmentation.

2.0 OPERATIONAL SAFETY VERIFICATION (71707, 93712, 90713)

This inspection consisted of direct observation of facility activities, plant tours, and operability reviews of systems important to safety. The facility was operated in accordance with license requirements. Plant operations were observed during regular and backshift operations in the control room, vapor containment (VC), service water (SW) intake structure, and turbine building.

2.1 Facility Tours

The inspector toured the SW intake structure and observed good material conditions. The inservice SW piping and pump and fire fighting systems were free of significant surface corrosion, piping was adequately mounted, and no system leakage was identified. The operating SW pump had adequate air flow and bearing temperatures were not elevated. Conditions observed supported system operability and reliability. A tour of the control room, verified that logs accurately documented plant conditions and activities. Control room and shift manning were in accordance with Technical Specification (TS) requirements. Operators were cognizant of system status and attentive to duty.

On August 27, 1993 the Deputy Director, Division of Radiation Safety and Safeguards, toured the facility and noted good material conditions and housekeeping. Discussions were held involving Yankee preparation for the transportation of the steam generators, efforts to reduce personnel radiation exposure, and the quantification of dose and curie loading. Programs to assure personnel health and safety and quality assurance were also discussed. A partial inspection of the transportation route to the Hoosic Tunnel was performed.

On November 9, 1993 the Chief, Projects Branch 3, Division of Reactor Projects, toured the facility during backshift operations. During a walkdown of the steam generator temporary storage areas and the onsite transportation route, Yankee reviews were discussed to assure the structural integrity of load paths, clearances, and radiation boundaries. Yankee demonstrated strategies to contend with cold weather conditions during steam generator transportation.

2.2 Steam Generator Transportation

On December 8, 1993, the inspector observed that Yankee senior plant management were actively involved with the transportation of the fourth and final steam generator to the low level radioactive waste (LLRW) facility in Barnwell, SC. Managers were sensitive to security measures and public safety considerations. Communications were prompt and accurate between Yankee, the transportation contractor, and the local law enforcement agency. Yankee management was specifically involved with issues arising from the conduct of a rail inspection within the Hoosic Tunnel. This inspection identified and prevented a potential personnel safety concern associated with a member of the public. Prompt and appropriate directions were implemented and the condition was corrected prior to the steam generator transportation by rail.

3.0 MAINTENANCE (71707)

3.1 Preventive Maintenance of the Refueling Cattle Shoot

The conduct of preventive maintenance and testing of the refueling cattle shoot on August 26, 1993, was generally well performed although some work control weaknesses were observed. Specifically, uncontrolled procedures were in use in the VC during the conduct of testing and confusion existed as to the current status of troubleshooting to correct problems identified during testing. In addition, the inspector questioned whether the corrective maintenance was allowed within the scope of the testing procedure. Recognizing the communication and administrative problems, a cognizant Operations Department representative stopped the test and informed appropriate department managers. A meeting was conducted to capture the difficulties experienced and to identify corrective actions needed to improve test control.

The work was conducted in accordance with plant procedure OP 4505, Rev. 13, "Inspection and Testing of Fuel Handling Equipment," however, a work order was necessary to complete the maintenance. In addition, Yankee acknowledged that command and control of the activity was weak, in part, because complex coordination and remote communication activities between different departments are not routinely performed in the current shutdown condition. The maintenance was subsequently completed and supported reactor vessel segmentation activities.

3.2 Pipe Cuts to Support Component Removal

Cutting of main coolant and small bore piping was performed by knowledgeable personnel who articulated strategies to mitigate personnel injury and to reduce radiation exposure. The work areas were well lit and clear of miscellaneous debris; this contributed to relatively low contamination levels. Staging also fostered safety through the use of kick boards, "reverse-oriented" ladders (inside the staging), and lateral supports as used for pressurizer piping cuts. Where plant configuration precluded effective staging, such as in the area of the feedwater piping, personnel safety restraints were necessary and adequately used. Based on discussions with the personnel performing pipe cuts, very little pipe movement occurred on pipe wall breakthrough indicating that stress relief and piping support were effective. Mockup training,

attended by individuals representing radiation protection, quality assurance (QA), and engineering, was conducted at the contractor's facility prior to the pipe cuts. The pipe cuts observed were performed safely.

4.0 ENGINEERING

4.1 Reactor Vessel Internal Segmentation - 10 CFR 50.59 Safety Evaluation

The inspector audited engineering design change request (EDCR) 93-303, "Reactor Vessel Internals Segmentation and Component Removal Program 1993," dated August 2, 1993, to assess whether: (1) segmentation and transportation of reactor vessel (RV) internals could be conducted safely, and (2) whether this activity represented an unreviewed safety question or change to the TS. Licensee procedures regarding the preparation and control of 10 CFR 50.59 safety evaluations (SE) were previously reviewed (NRC Inspection Report 93-05) and found acceptable.

EDCR 93-303

This design change documented Yankee assessment and evaluation of RV internal segmentation and removal, and packaging and transportation of the internals to the LLRW disposal facility. Components were classified with respect to their radioactive composition/characterization, based on power operation and location of the component within the RV. Radiological survey data from previous shipments of similarly configured RV internals, by both Yankee and other licensees, was used to improve the accuracy of the estimated isotopic and curie contents. Prior to any shipment, the estimates were verified by actual radiation measurement to confirm that the items were accurately classified prior to shipment. Of the nineteen components removed, eighteen qualified for LLRW disposal and would be transported offsite to the LLRW facility in approved shipping containers. Transportation will be performed using two types of shipping casks, each licensed pursuant to 10 CFR Part 71 and 10 CFR Part 61. These regulations limit the external dose rate of the casks and mandate structural integrity requirements to preclude cask rupture following a 30-foot drop onto a flat unyielding surface. The loaded casks will weigh approximately 35 tons and the curie loading will be balanced to minimize the number of shipments. The only item not qualifying as LLRW was the core baffle, which will be transferred and stored in the spent fuel pool to await long-term disposal.

Based on their evaluation, Yankee determined that segmentation and removal activities could be performed pursuant to 10 CFR 50.59. Subsequently, on August 13, 1993, the Plant Operating Review Committee reviewed this evaluation and identified no safety concerns. The licensee will provide management, technical, and radiological oversight of the contractor responsible for the conduct of this activity.

Audit of the Safety Evaluation for EDCR 93-303

The SE was conducted in accordance with the licensee's 10 CFR 50.59 program. The NRC staff positions regarding the use of decommissioning funds and component removal activities prior to NRC approval of the Decommissioning Plan (NRC letters dated April 16 and July 15, 1993, to Yankee Atomic Electric Company) were also incorporated into the SE and found to be properly addressed. The inspector concluded that the segmentation and removal of RV internals could be performed pursuant to 10 CFR 50.59 for the following reasons:

1. *The probability of occurrence or the consequences of an accident previously evaluated in the Final Safety Analysis Report (FSAR) would not be increased.*

The inspector concluded that any potential accident resulting from RV component segmentation and transportation are bounded by the fuel handling accident. This accident remains the only design basis accident analyzed as part of the current licensing basis, because the plant is permanently shut down. The offsite and onsite radiological consequences resulting from an accident occurring during the conduct of EDCR 93-303 would not exceed any potential consequences resulting from a fuel handling event. In addition, the segmentation activities do not pose a threat to the integrity of the fuel pool, fuel pool cooling, fire detection or fire suppression systems related to the fuel pool. Segmentation will be conducted in the vapor containment and under water. Load paths for liners and casks were identified and evaluated, and controls are implemented. No heavy load or potential projectile will pass over spent fuel. There is a possibility of airborne contamination and hot particle generation during the segmentation process, however, increased radiological surveys are planned and controls are established to mitigate the spread of contamination.

2. *The conduct of EDCR 93-303 does not present the possibility of an accident or malfunction not previously evaluated.*

The RV internals segmentation process will create airborne particulate radioactive material, however, under controlled conditions. Such material will be contained by the VC and filtered by ventilation systems through two independent sets of high efficiency particulate air (HEPA) filters operating at greater than 99% particulate removal efficiency. The HEPA filter discharge is instrumented to continuously monitor particulate activity. The ventilation system exhausts through the plant stack (elevated release). Segmentation will not generate any radioactive gasses. Based on the redundancy of the HEPA filters and constant monitoring, any potential unmonitored release of radiation due to the segmentation process would be bounded by the consequences of the FSAR fuel handling accident. The potential for an event involving a liquid radioactive release also exists, however, evaluations concluded that the potential radiological consequences are also bounded by the consequences of the FSAR fuel handling accident.

3. *The conduct of EDCR 93-303 does not reduce the margin of safety as described in the basis for the Technical Specifications.*

Based on a review of the bases of the TS, the inspector concluded that no margin of safety will be reduced. All of the work performed during the segmentation and removal program will be performed within the limits of the TS. The program will have no impact on plant equipment needed for the safe storage of spent fuel.

5.0 PLANT SUPPORT (71707, 93712)

5.1 Quality Assurance

On August 5, 1993, the Nuclear Safety Audit and Review Committee (NSARC) met to independently review and audit aspects of plant safety. The committee comprised of individuals representing multiple disciplines and experience included the Vermont Yankee Nuclear Power Station Radiation Protection Manager. The NSARC reviewed EDCR 93-302, steam generators and pressurizer removal, and EDCR 93-303, reactor vessel internals segmentation. Discussions included contractor-Yankee interfaces, industrial and radiation safety, and EDCR processes. The committee also revisited a scenario involving a postulated steam generator drop into the reactor vessel cavity and concluded that appropriate controls are implemented to preclude the event and mitigate consequences. The QA Manager summarized the QA Plan to committee members and described that the Plan focuses on component removal activities. Sub-components of the Plan involve assessment of personnel qualification, contractor control, design control, radiation protection, and personnel safety. In regards to the assurance of quality, Yankee had initiated a daily inspection requirement to assess component removal activities and to evaluate trends. The inspector observed that prior to August 26, 1993 findings primarily focused on housekeeping and material control and improvements resulted from the trends identified.

On August 26, 1993 the inspector discussed the maintenance observations documented in Section 3.1 with the QA Manager. During this meeting, the manager stated that he would consider strengthening QA oversight of activities involving operations and maintenance that were previously considered routine during plant operation. Similarly, the Maintenance Manager acknowledged that, because the plant has been shutdown for an extended period and complex testing is infrequently performed, personnel may not have had recent opportunity to exercise complex command and control functions that are often required during system testing. The Maintenance Manager discussed these performance issues with his work crew.

5.2 Radiological Controls

Radiological postings and boundaries were in accordance with Yankee radiological survey information. Within the VC, boundaries were placed to preclude unintentional entry into contaminated areas. These areas were well-defined and the control of portable materials used for contamination work was effective. Proper placement of dosimetry and use of anti-contamination clothing were observed. In addition, Yankee improved the VC anti-contamination clothing removal area. No concerns were previously identified (NRC Inspection Report 93-05), however, the method for clothing removal, contamination control, and human egress were

different from other nuclear plants and could have caused problems for the high number of contracted personnel not familiar with specific Yankee processes. Improvements included posted instructions regarding personnel radiation monitoring and human performance enhancements associated with contaminated clothing removal and disposal.

5.3 Security

Security officers demonstrated attention to detail while touring the plant perimeter and facilities. On November 9, 1993, officers were observed to evaluate conditions that potentially represented security concerns involving perimeter lighting and fencing, and concealment due to temporary materials. Communications between the officer and command post regarding the conditions identified occurred. Access prevention devices were in good material condition and contiguous. Admission to the facility was in accordance with station instructions. Security Officers stationed to support cattle shoot maintenance were cognizant of their duties and responsibilities.

5.4 Fire Protection and Housekeeping

An inspection of station fire fighting equipment identified no concerns. Portable breathing apparatus air supply hoses and face shields were in good material condition. Air packs were ready for use. Personnel protection equipment, such as boots and gloves, were staged and made of rugged material. Access to the equipment was unfettered and lighting was adequate. In accordance with the Yankee Fire Protection Technical Requirements Manual, sufficient equipment existed for the three member fire brigade.

Minor discrepancies were noted in the VC regarding the staging and identification of portable fire fighting equipment. Temporary materials stored near fire extinguishers challenged access and paper signs identifying the location of the extinguishers were in poor condition and difficult to read (the materials were stored and used in support of component removal activities). These discrepancies were immediately corrected by a Yankee personnel and Yankee QA was informed. Overall, the lack of significant fire fighting discrepancies and housekeeping issues indicated that activities were well controlled and coordinated.