

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report Nos. 50-295/94002(DRP); 50-304/94002(DRP)

Docket Nos. 50-295; 50-304

License Nos. DPR-39; DPR-48

Licensee: Commonwealth Edison Company
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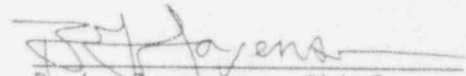
Facility Name: Zion Nuclear Power Station, Units 1 and 2

Inspection At: Zion, IL

Inspection Conducted: January 7 through February 10, 1994

Inspectors: J. D. Smith
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Approved By:


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2/15/94
Date

Inspection Summary

Inspection from January 7 to February 10, 1994 (Report No. 50-295/304-94002(DRP))

Areas Inspected: This was a routine, resident inspection. Areas reviewed included licensee action on previous inspection findings, operations, plant support, maintenance and surveillance, and engineering and technical support.

Results: One violation was identified which dealt with inadequate corrective actions. Following the 1992 failure of the 1A auxiliary feedwater pump due to foreign material, subsequent foreign material intrusion into critical areas, especially in the reactor cavity, was not prevented.

DETAILS

1. Management Summary

The inspectors met with licensee representatives (denoted in section 7) throughout the inspection period and at the conclusion of the inspection on February 10, 1994, to summarize the scope and findings of the inspection activities. The licensee acknowledged the inspectors' comments. The inspectors also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspectors during the inspection. The licensee did not identify any such documents or processes as proprietary.

Safety Assessment of Operations

In response to leaks in the new service water valves, the licensee conservatively identified, tested, and reworked additional valves. The rotational assignments between the operations and mechanical maintenance departments benefited both sides and continued to strengthen station interdepartmental cooperation.

Safety Assessment of Plant Support

Radiation protection has aggressively pursued actions to reduce Personnel Contamination Events and to keep exposures ALARA. These actions are considered a strength. Fire brigade responses have been excellent; however, the failure to identify transient fire loads in the crystallizer room area prior to a fire occurring was considered a weakness. Management actions to prevent foreign material intrusion following a 1992 event failed to preclude similar intrusion during the dual unit outage.

Safety Assessment of Maintenance and Surveillance

Purchase and use of the laser alignment system was a positive move for the mechanical maintenance department. The laser system resulted in improved pump alignments with fewer iterations required (as compared to the previous method). The canopy seal weld repair job was well organized and performed, and was completed ahead of schedule.

Safety Assessment of Engineering and Technical Support

Licensee action to inspect the cross-over and cross-under piping to ensure that turning vanes were intact was considered positive.

2. Licensee Actions on Previous Inspection Findings (92701, 92702)

- a. (Closed) Unresolved Item 295/90018-05(DRS) "Adequacy and Accuracy of Service Water Flow Instrumentation": This item encompassed two diagnostic evaluation team (DET) concerns (DET items 2.2.8-01 & -02). The first item involved cleaning and testing of all safety related heat exchangers using service water; this was accomplished during the dual unit outage. Inspection report 93023 discussed problems identified during cleaning of the component cooling water heat exchangers. Section 6.a of this report discusses problems found during cleaning and testing of safety-related room coolers.

The second item involved review and replacement of various flow instruments. The licensee identified the required SW flow accuracies, and identified those flow transmitters requiring replacement. All necessary modifications were completed during the dual unit outage. This item is closed.

- b. (Closed) Inspection Followup Item 295/90030-20(DRS) "Service Water Design Basis Documentation": This item encompassed six diagnostic evaluation team concerns (DET items 2.3.1-01, -02, & -05 and items 2.3.7-06, -07, & -08). To resolve these concerns, the licensee established a setpoint control program, rebaselined the Updated Final Safety Analysis (UFSAR), initiated improvements to their technical specifications, and began a design basis documentation program. The inspectors reviewed the status of the licensee's corrective actions. Although not all corrective actions are complete, they are well underway and the licensee has established sufficient controls to ensure that all actions are completed. This item is closed.
- c. (Closed) Unresolved Item 295/90030-22(DRS) "Service Water Vulnerability Concerns": This item encompassed seven diagnostic evaluation team concerns (DET items 2.3.7-01 through 07). In order to resolve these concerns, the licensee undertook studies of the vulnerability of the service water system to various accidents. Following review of these studies, the licensee revised procedures to incorporate necessary changes. The inspectors reviewed the licensee's corrective actions and found them to be adequate. This item is closed.
- d. (Closed) Unresolved Item 295/304/93023-02 "Foreign Material Exclusion Concerns": This item was determined to be a violation, as discussed in section 4.c of this report. Therefore, the unresolved item is closed.

No violations or deviations were identified.

3. Operations

a. Outage Status

During this inspection period, the component cooling water and service water systems were refilled and flow balanced. Problems encountered during the refill and flow balancing are discussed below. The 2A and 0 emergency diesel generator (EDG) successfully completed their performance runs and were returned to service on February 3. On February 7, Unit 2 fuel load began; fuel load was completed early on February 11.

b. Activities

Service Water Isolation Valves: On January 8, 1994, the licensee began refill of the service water (SW) system. During the fill, noise was heard coming from the three component cooling water system (CCS) heat exchangers. The licensee closed the SW inlet valves to the heat exchangers, in order to remove the end bells and identify the loose objects. Adequate isolation was obtained on the 0 CCS heat exchanger, the end bells removed, and the loose objects identified as sacrificial anodes which were supposed to be attached to the end bells. The anodes had a screwed connection, and the vibration of the SW fill jarred them loose. After consultation with the CCS heat exchanger vendor, and review of the system design basis, the licensee determined that the anodes were not required and removed them.

The licensee was unable to obtain adequate isolation on the SW inlet valves to the 1 & 2 heat exchangers. These valves were replaced during the outage with new 20-inch butterfly valves. Investigation into the design revealed that the valves were installed in a non-preferred direction such that normal coolant flow would hinder valve seating. This orientation was intended to allow valve packing replacement during operation. The licensee determined that the valves, although requisitioned to seat in either orientation, had not been tested for leak tightness in the non-preferred direction.

The licensee reworked the CCS heat exchanger inlet valves; however, satisfactory leakage in the non-preferred direction was not obtainable and the valves were reoriented to the preferred direction. Several other valves of the same design were also installed during the outage. These valves were also tested for excessive leakage and were reworked as necessary; none of these valves required reorientation. The inspectors witnessed portions of the valve testing and followed the licensee's root cause evaluation; licensee resolution of this issue was considered acceptable.

Operation and Maintenance Rotational Assignments: For an eight-week period, during the dual outage while both cores were unloaded, a total of twelve nuclear station operators, equipment operators and auxiliary equipment operators were loaned to the mechanical maintenance department. Additionally, one unit supervisor and one mechanical scheduler traded positions. These rotations were made to promote interdepartmental cooperation. All personnel returned to their normal positions by mid-January. Everyone involved considered the loan to be beneficial: the operations people learned of the many barriers affecting the maintenance groups, such as out-of-services, radiation work permits, and schedule and priority changes; while the maintenance workers benefited from the operators component and systems knowledge. An additional benefit was that the mechanical maintenance department was able to work over 150 extra work packages originally assigned to a construction contractor.

b. Safety Assessment of Operations

In response to the leaks in new service water valves, the licensee conservatively identified, tested, and reworked additional valves. The rotational assignments between the operations and mechanical maintenance departments benefited both sides and continued to strengthen station interdepartmental cooperation.

No violations or deviations were identified.

4. Plant Support

a. Radiation Protection

The inspectors verified that workers were following health physics procedures and examined radiation protection instrumentation for operability and calibration. By the end of the inspection period, the licensee estimated that the outage goal of 600 rem would most likely be exceeded by about two percent. The radiation protection (RP) department continued to closely monitor daily outage dose in order to ensure that excess dose was not accrued.

The licensee, including the new technical superintendent, has started an aggressive investigation into the cause of the higher Unit 1 source term in an effort to maintain exposures as low as reasonably achievable (ALARA). The inspectors, with input from regional radiation protection (RP) inspectors, will continue to follow this effort.

b. Security

During the inspection period, the inspectors monitored the licensee's security program to ensure that observed actions were being implemented according to their approved security plan. No problems were noted.

c. Fire Protection, Foreign Material Exclusion, and Housekeeping

The inspectors monitored the status of housekeeping and plant cleanliness for fire protection and protection of safety-related equipment from intrusion of foreign matter.

Crystallizer Room Fire: On January 12, a fire was discovered in the abandoned crystallizer room. The fire was caused by an extension cord overheating due to an excessive number of string lights connected to the cord. The cord was lying on top of an abandoned wooden wire reel, which caught fire. The wood and the extension cord were the only items burned in the fire. The response of the fire brigade was prompt and effective. Radiation Protection personnel were quick in containing the area and minimized the spread of any potential contamination. In addition, the setup of the control point to release fire brigade members was well organized and efficient.

The abandoned wire reel had not been identified as a transient fire load. During a post-fire tour of the crystallizer room, a plywood high radiation door used during construction was also noted as an unidentified transient fire load. The plywood door was removed and no replacement was necessary based on radiation levels. Since the room was abandoned several years ago, these items may have existed prior to use of the transient fire load program. However, the failure to identify these loads was considered a weakness.

Foreign Material Exclusion (FME) Program: In 1992, the station experienced several FME problems. The most notable was on September 17, 1992, when the 1A auxiliary feedwater pump (AFW) was declared inoperable due to damage caused by a 3/4 inch nut lodged in the pump impeller. Following the AFW event, the station conducted a level II investigation to determine the root cause and recommend corrective actions. One of the corrective actions resulted in a new procedure for FME (ZAP 400-01B, "Foreign Material Exclusion FME Program") which was approved on March 1, 1993. This procedure was applicable to all systems or equipment that could be damaged by the lack of control of foreign material.

Weaknesses in the FME program were identified early in the dual unit outage. Poor implementation of the FME procedure was reflected by the lack of FME zones and poor control of established zones. Several instances of debris were noted within FME zones which was further evidenced by foreign material being found in the reactor vessels, reactor cavity, and the service water side of the component cooling heat exchangers. Considering these three areas, the items in the reactor vessels had the greatest potential impact on the plant. The licensee evaluated the items recovered from the reactor vessels and the majority of the items were due to previous outages. However, tie wraps from the ISI inspection equipment and other miscellaneous items (tape, washers, wire, etc.) were the

result of the dual unit outage. Until the inspection of the reactor vessels by a submarine, these items were not reported as entering the system as required by the procedure.

The improvements in FME following the 1992 level II investigation and its corrective actions had been inadequate. While the use of a submarine improved the ability to detect and retrieve items never before possible, the FME program failed to prevent additional items from entering the vessel during this outage. This is an apparent violation of 10 CFR Part 50 Appendix B Criterion XVI, "Corrective Actions."

The FME problems during the dual unit outage were self-disclosing based on debris in FME zones and in the reactor cavity. As management recognized the scope of the problem, clear expectations were communicated to provide immediate changes. While there was a short-term improvement in FME control due to management attention, they were not adequate to control FME through the end of the dual unit outage.

During the fuel reload of Unit 2, a fuel assembly would not fully seat due to a small stainless steel nut on the lower core plate. The nut was removed and core loading continued.

d. Emergency Preparedness

During this inspection period, no activations of the emergency plan occurred, and no emergency plan drills were conducted. Therefore, this area was not evaluated by the inspectors.

e. Safety Assessment of Plant Support

Radiation protection has aggressively pursued actions to reduce Personnel Contamination Events and to keep exposures ALARA. These actions are considered a strength. Fire brigade responses have been excellent; however, the failure to identify transient fire loads in the crystallizer room area prior to a fire occurring was considered a weakness. Management actions to prevent foreign material intrusion following a 1992 event failed to preclude similar intrusion during the dual unit outage.

One violation was identified.

5. Maintenance and Surveillance (62703 and 61726)

Routinely, station maintenance and surveillance activities were observed and reviewed to verify that they were conducted in accordance with all regulations. Also considered during the observation and review were: proper obtaining of approvals, meeting of operability requirements, appropriate performance of functional testing and calibrations, resolution of identified discrepancies, maintenance of quality control records, and performance of all activities by qualified personnel.

a. Activities

Emergency Diesel Generator Frequency Permissive Relay: On January 3, the frequency permissive relay for 2B EDG was replaced due to small cracks in the relay housing. Following completion of a successful performance test, and return to service of the EDG, the operations analysis department (OAD) determined that the installed relay had not been calibrated onsite. The relay had been repaired and calibrated offsite in accordance with corporate guidance; however, it required onsite calibration. The station replaced the relay with a properly calibrated one; it was later determined that the initially installed relay was within acceptable calibration so that EDG operability was never compromised.

Laser Alignment of Component Cooling Water Pumps: The inspectors witnessed mechanical maintenance personnel performing alignment of two component cooling water pumps using a laser alignment system. The mechanics had appropriate procedures and sufficient training to set up and operate the laser system correctly. During observations, and in later discussions, the inspector noted that the laser system provided the mechanics with detailed adjustment information necessary to bring the pumps into alignment, including a line drawing which showed how much each corner of the pump had to be raised or lowered, shifted forward, backward, or moved to the right or left. Use of the laser system allowed the mechanics to achieve more exact alignments in less time and with fewer iterations than required by the previous systems and was considered a positive acquisition by the maintenance department.

Canopy Seal Weld Repairs: At the beginning of the outage, the licensee identified a leak from the canopy seal weld area on a spare reactor head penetration on Unit 2. It was later identified that a leak also existed on the same head penetration for the Unit 1 reactor vessel. After review of various options, the licensee decided to install a special clamp over the leak. The inspectors reviewed the proposed repair, and witnessed portions of the clamp installation on Unit 2. The inspectors considered the job to have been well prepared - including installation of extra shielding to reduce personnel exposures - and well executed. Good coordination was noted between personnel installing the clamp, the radiation protection technicians, and the mechanical maintenance crew operating the containment crane.

Instrument Data System: As part of the resolution of DET concerns regarding control of instrumentation setpoints, the licensee established an instrument data (I-Data) system. This computer based system provided the documented design basis for instrument setpoints. The inspectors discussed the system with the instrument maintenance department and witnessed a demonstration of its use. Data discrepancies were resolved through engineering reviews, and changes were controlled by corporate engineering.

This ensured the design basis data base was controlled. The data base program had numerous fields which would provide good information about the instruments; however, actual information was not available for many fields. Additionally, the program did not appear to be very user-friendly. The licensee noted that the system was being revised to add additional information; additionally the license was considering moving program control to the site engineering offices. The inspectors had no concerns regarding implementation of this system.

b. Safety Assessment of Maintenance and Surveillance

Purchase and use of the laser alignment system was a positive move for the mechanical maintenance department. The laser system resulted in improved pump alignments with fewer iterations required (as compared to the previous method). The canopy seal weld repair job was well organized and performed, and was completed ahead of schedule.

No violations or deviations were identified.

6. Engineering and Technical Support (37828)

The inspectors evaluated the extent to which engineering principles and evaluations were integrated into daily plant activities. This was accomplished by assessing technical staff involvement in non-routine events, outage-related activities, and assigned TS surveillances; observing on-going maintenance work and troubleshooting; and reviewing deviation investigations and root cause determinations.

a. Activities

Room Coolers: As part of the resolution of some DET concerns, the licensee committed to testing various safety related equipment room coolers. During this inspection period, the licensee completed inspections on the containment spray (CS), residual heat removal (RHR), safety injection (SI), and charging pump room coolers. The CS room coolers were found to have less than adequate flow; they were backflushed successfully and retested. The cause of the flow blockage appeared to be silt and zebra mussel shells. The 1A and 2B RHR coolers, the 1A SI cooler, and the 2A and 2B charging pump coolers were found to have leaks; all these coolers were replaced with the exception of the 2A charging pump cooler, which was repaired. The inspectors continue to follow the licensee's actions on these coolers.

Cross-Under Piping: As followup action to a steam leak in a Unit 1 cross-under pipe (see Inspection Report 93011), the licensee inspected the cross-over and cross-under piping from the high pressure turbine to the moisture separator reheaters on both units to ensure turning vanes were properly installed.

The Unit 1 inspection confirmed that all turning vanes and associated bracing were intact with some erosion of the bracing noted. The licensee determined that the bracing was acceptable for another operating cycle; however, inspection and repairs should be undertaken during the next refueling outage.

The inspection of Unit 2 revealed that six turning vanes were missing. Five of these vanes were removed early in plant life - three from one assembly and two from another. During the inspection, an additional vane was identified as having broken loose; no damage occurred, and the vane was located and removed. Additionally, the inspection revealed that vane assembly bracing was completely missing from the Unit 2 cross-under pipes. The erosion-corrosion test results for this piping showed insignificant wall thinning due to the missing vanes or bracing.

The station determined, with the vendor's concurrence, that the missing vanes, as well as some of the bracing, did not need to be installed during the current outage. The station planned to install bracing on at least one side of the turning vane assemblies this outage and to complete the bracing and replace the missing vanes during the next refueling outage, as new manways are required to obtain the proper access.

b. Safety Assessment of Engineering and Technical Support

Licensee action to inspect the cross-over and cross-under piping to ensure that turning vanes were intact was considered positive.

No violations or deviations were identified.

7. Persons Contacted

- *R. Tuetken, Vice President, Zion Station
- *A. Broccolo, Station Manager
- *S. Kaplan, Regulatory Assurance Supervisor
- *D. Wozniak, Operations Manager
- *R. Link, Technical Superintendent
- *W. Store, Performance Improvement Director
- *K. Hansing, Site Quality Verification Director
- *K. Moser, Unit 0 Operating Engineer
- *T. Koleno, Training
- *K. Dickerson, Regulatory Assurance - NRC Coordinator

* Indicates persons present at the exit interview on February 10, 1994.

The inspectors also contacted other licensee personnel throughout the inspection period.