

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-213/89-12
Docket No. 50-213
License No. DPR-61
Licensee: Connecticut Yankee Atomic Power Company
P. O. Box 270
Hartford, Connecticut 06141
Facility Name: Haddam Neck Plant
Inspection At: Haddam, Connecticut
Inspection Conducted: July 26 - September 5, 1989
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9/29/89
Date

Inspection Summary: Inspection on July 26 - September 5, 1989 (Inspection Report No. 50-213/89-12)

Areas Inspected: Routine safety inspection by the resident inspectors. Areas reviewed included plant operations, radiation protection, fire protection, security, maintenance, surveillance testing, licensee events, open items, opening of the new security access point, feedwater regulating valve repairs, licensee response to inoperable charging and auxiliary feedwater pumps, and shutdown activities for the fifteenth refueling outage.

Results: One new unresolved item was opened concerning verification of the operability of safety related equipment reliant upon necessary attendant instrumentation, controls, electrical power, cooling or seal water, and lubrication necessary to support the accident design basis (Section 6.2). Three previously identified unresolved items and one previously identified violation were closed. No unacceptable conditions were identified.

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TABLE OF CONTENTS

	Page
1. Summary of Facility Activities (IP 71707*)	1
2. Plant Operations (IP 71707, 71710)	1
3. Plant Operations Review Committee (IP 40500).	2
4. Maintenance and Surveillance Testing (IP 61726, 62703)	3
4.1 Steam Leak from Steam Generator Secondary Side Handhole	4
4.2 Feedwater Regulating Valve Leak Sealing	4
5. Followup of Open Items (IP 71707, 62703, 61726).	5
5.1 Motor Operated Valve T-Drains Missing	5
5.2 Improperly Installed T-Drains	5
5.3 Scheduler Exemption Request for Containment Leakage Testing	5
5.4 Inadequate Review of Design Changes to Service Water Pumps	6
6. Events Occurring During the Inspection (IP 71707, 92700, 93702).	6
6.1 Licensee Event Reports and Safeguards Event Reports	6
6.2 Inoperable Charging Pump	7
6.3 Inoperable Auxiliary Feedwater Pumps	7
7. Review of Periodic Reports (IP 90712).	9
8. Opening of New Security Access Point (IP 71707).	9
9. Exit Interview (IP 30703).	9

*The NRC Inspection Manual inspection procedure (IP) that was used as inspection guidance is listed for each applicable report section.

DETAILS

1. Summary of Facility Activities

At the beginning of the inspection period, the plant was operating at full power. A steam leak was discovered on the No. 1 steam generator secondary side handhole cover on July 26. The licensee elected to continue power operation and closely monitor the leak. The reactor core end-of-cycle life occurred on July 23. The plant then continued operation within the limits established by Amendment 120 to the facility Operating License for end-of-cycle 15 coastdown. During this period, reactor thermal power decreased from full to 91%, and electric generator output from 98.6% to 87.2%. The turbine generator was removed from the grid at 4:32 a.m., September 2 to commence the fifteenth refueling outage, after having been on line for 461 days. The reactor was shutdown on September 3, at 3:30 a.m. following surveillance testing.

2. Plant Operations

The inspectors observed plant operation during regular tours of the following plant areas:

- | | |
|-----------------------------------|----------------------------------|
| -- Control Room | -- Primary Access Point |
| -- Primary Auxiliary Building | -- Fence Line (Protected Area) |
| -- Vital Switchgear Room | -- Yard Areas |
| -- Diesel Generator Rooms | -- Turbine Building |
| -- Radiological Control Point | -- Intake Structure |
| -- Appendix R Switchgear Building | -- Auxiliary Feedwater Pump Room |

Control room instruments were observed for correlation between channels and for conformance with Technical Specification requirements. The inspectors observed various alarm conditions which had been received and acknowledged. Operator awareness and response to these conditions were reviewed. Control room and shift manning were compared to regulatory requirements. Posting and control of radiation and high radiation areas were inspected. Compliance with radiation work permits and use of appropriate personnel monitoring devices were checked. Plant housekeeping controls were observed, including control and storage of flammable material and other potential safety hazards. The inspectors also examined the condition of various fire protection systems. During plant tours, logs and records were reviewed to determine if entries were properly made and communicated equipment status/deficiencies. These records included operating logs, turnover sheets, tagout and jumper logs, process computer printouts, and plant information reports. The inspectors observed selected aspects of plant security including access control, physical barriers, and personnel monitoring.

In addition to normal utility working hours (7:00 a.m. to 3:30 p.m.), the review of plant operations was routinely conducted during portions of the weekend, midnight and evening shifts. Extended coverage was provided on the following days:

August 5, 1989	9:30 a.m. to 12:30 p.m.
August 19, 1989	10:00 a.m. to 4:00 p.m.
August 24, 1989	from 5:00 a.m.
September 2, 1989	10:30 a.m. to 6:00 p.m.
September 4, 1989	9:00 a.m. to 4:45 p.m.

Operators were alert and displayed no signs of inattention to duty or fatigue.

The reactor core end-of-cycle life occurred on July 23. That condition corresponds to the time when all control rod banks were fully withdrawn, there was essentially no boron concentration in the reactor coolant and either the reactor coolant system (RCS) average temperature no longer can be maintained at the normal operating temperature or the reactor normal rated thermal power can no longer be maintained. The plant then continued operation within the limits of Technical Specifications 3.17.1 and 3.17.2 for axial offset and linear heat generation rate authorized by Amendment 120 to the facility operating license for end-of-Cycle 15 coastdown. A detailed safety analysis developed by the licensee supported this change.

Reactor thermal power was initially kept near its licensed limit by opening the turbine control valves. After the control valves were opened fully, RCS average temperature decreased from the normal 563°F to 536°F. The turbine generator was removed from the grid at 4:32 a.m., September 2 to commence the fifteenth refueling outage; the reactor was shutdown on September 3, at 3:30 a.m.

The inspectors verified that the operating license restrictions for reactor power operation, including the new limits for core power axial offset and liner heat generation rate, were maintained. The inspectors also observed that the actual values for plant parameters compared reasonably well with their predicted value stated in the licensee's safety analysis addressing coastdown operations.

No unacceptable conditions were identified.

3. Plant Operations Review Committee

The inspectors attended several plant operations review committee (PORC) meetings. Technical specification 6.5 requirements for required member attendance were verified. The meeting agendas included procedural changes, proposed changes to the Technical Specifications and plant design change records (PDCRs). The meetings were characterized by frank discussions and questioning of the proposed changes. In particular, consideration was given to assure clarity and consistency among procedures. Items

for which adequate review time was not available were postponed to allow committee members time to review and comment. Dissenting opinions were encouraged and resolved to the satisfaction of the committee.

During this inspection period, many PORC meetings were held for review of PDCRs and special tests (STs) in preparation for the refueling outage. The inspectors noted that PORC reviews were especially thorough. An example is the August 16 PORC review of STs for preoperational testing of the Appendix R switchgear building. PORC members reviewed safety evaluations for the procedures and requested additional reviews prior to procedure approval. Particular attention was given to the condition of the reactor core and the residual heat removal and spent fuel pool cooling systems during testing. Questions also focused on operator training and control of test conduct. The inspectors found the thoroughness and consideration for reactor and personnel safety to be characteristic of routine PORC meetings.

4. Maintenance and Surveillance Testing

The inspectors observed various maintenance and problem investigation activities for compliance with requirements and applicable codes and standards, quality services department (QSD) involvement, safety tags, equipment alignment and use of jumpers, personnel qualifications, radiological controls, fire protection, retest, and reportability. Also, the inspector witnessed selected surveillance tests to determine whether properly approved procedures were in use, test instrumentation was properly calibrated and used, technical specifications were satisfied, testing was performed by qualified personnel, procedure details were adequate, and test results satisfied acceptance criteria or were properly dispositioned. Portions of the following activities were reviewed:

- Replacement of "C" Service Water Pump
- CMP 8.5-105, P-37-1A, 1B, 1C, 1D Service Water Pump Maintenance
- SUR 5.7-148, Inservice Testing of A, B, C and D Service Water Pumps Surveillance
- SUR 5.1-13, Auxiliary Feedwater Pump Monthly Functional Test
- SUR 5.7-143, Inservice Testing of A&B Steam Generator Auxiliary Feedwater Pumps Surveillance
- CMP 8.5-207, Leak Sealing of Main Feedwater Regulating Valves FW-FCV-1031-1, 2, 3, and 4
- No. 1 Feedwater Regulating Valve Leak Sealing

- SUR 5.1-17B, Emergency Diesel Generator EG-2B Manual Starting and Load Test
- SUR 5.1-14, Auxiliary Feedwater Pump Flow Capacity Test
- "A" Auxiliary Feedwater Pump Troubleshooting

4.1 Steam Leak from Steam Generator Secondary Side Handhole

During a containment tour on July 26, a steam leak from one of the No. 1 steam generator (SG) secondary side handhole covers was identified. Condensation from this leak dripped at about 2 drops per second down the side of the SG and collected in a dammed area under the skirt. When this leak was discovered, about 200 gallons of water had accumulated.

Daily containment entries were initiated to monitor the leak and note any increase in leakage. The water which had collected in the skirt area was pumped to the containment sump and a deflector was installed to divert water away from the side of the SG.

After evaluation of repair options and an ALARA review, the licensee elected to continue monitoring the leak and effect repairs during the refueling outage. This decision was based on no appreciable increase in leakage and limited area stay times due to radiation fields and extreme heat. The area radiation field is 50 millirem/minute and maximum stay time is 15 minutes.

Containment entries for inspection of the leak were reduced to every two to three days, no increase in leakage was identified.

4.2 Feedwater Regulating Valve Leak Sealing

On August 18, with the plant at full power, the No. 1 feedwater regulating valve (FRV) experienced a packing failure. For several months prior to this failure, maintenance personnel had been periodically injecting grease into the valve packing area in efforts to control stem leakage.

The repair process involved injection of ground packing material into the valve stuffing box to stop leakage past the valve stem. Initial efforts were unsuccessful because the rate of material injection was too slow. An additional, larger injection pathway was necessary.

A design change notice (DCN) to plant design change evaluation (PDCE) CY-89-26, Grease Valve Installation on FW-FRV-1301-1, was prepared. This DCN provided for an additional fitting to be installed opposite the existing connection. The second fitting was slightly larger and provided for faster injection of the packing material.

Packing injection efforts were successful and the leak was stopped on August 19.

The plant remained at full power and the FRV control was normal throughout the leak sealing evolution and for the remainder of the operating cycle. The inspector observed portions of the leak repair and attended one of the plant operations review committee meetings associated with this repair.

No deficiencies were identified.

5. Followup of Open Items

5.1 Motor Operated Valve T-Drains Missing

(Closed) Unresolved item 87-28-08: Four new motor-operated valves were installed during the 1987 refueling outage and the T-drains were inadvertently omitted. The T-drains for valves PR-MOV-596, -597, -598, and -599 were installed under automated work orders 86-5733, -5788, -5793, and -5790, respectively. The inspector reviewed the completed work orders; no deficiencies were identified.

5.2 Improperly Installed T-Drains

(Closed) Unresolved item 87-28-16: The inspectors identified several motor-operated valve motors with improperly installed T-drains and a broken gear case relief fitting on valve PR-MOV-598. Temporary procedure change 88-21 was made to corrective maintenance procedure 8.5-25, Limitorque Valve Motor Operators, to include clearly marked graphics indicating the correct T-drain placement. Corrective maintenance was performed on PR-MOV-598 under automated work order 86-5793. The inspector reviewed the procedure changes and work package and identified no discrepancies.

5.3 Schedular Exemption Request for Containment Leakage Testing

(Closed) Unresolved item 89-05-02: The licensee requested a schedular exemption request to provide temporary relief from the requirements of 10 CFR 50, Appendix J for Type A, B, and C tests of containment leakage. The testing intervals expired prior to the refueling outage and the tests require the plant to be shutdown and systems isolated and vented. By letter date August 14, 1989, the NRC granted the temporary relief and extended the test intervals until the upcoming refueling outage.

5.4 Inadequate Review of Design Changes to Service Water Pumps

(Closed) Violation 89-07-01: Between May 1984 and May 1989, the licensee replaced components of five service water pumps, thereby making design changes to these pumps, without implementing the requirements of procedure QA 1.2-3.1, Plant Design Change Requests, Revision 17, November 1, 1983. The licensee responded to this violation by letter dated August 10, 1989. This violation was determined to be an isolated case resulting from inadequate technical review during the pump part procurement process in 1984. With the design change and procurement procedural controls presently in place, it is unlikely that changes could be made without adequate reviews. Additionally, an audit of selected safety related spare parts currently in stock in the warehouse is ongoing. This spare parts review program is intended to verify the technical adequacy of stocked spare parts and will be completed by May 1990. The inspectors reviewed the evaluations performed for the service water pump changes and corrective actions and had no further questions.

6. Events Occurring During the Inspection

6.1 Licensee Event Reports and Safeguards Event Reports

The licensee event reports (LERs) and safeguards event reports (SERs) listed below were reviewed for clarity, accuracy of the description of cause, and adequacy of corrective action. The inspectors determined whether further information was required and whether there were generic implications. The inspectors also verified that the reporting requirements of 10 CFR 50.73, 10 CFR 73.71, and station administrative, operating and security procedures had been met, that appropriate corrective action had been taken, and that the continued operation of the facility was conducted within Technical Specification Limits. The following LERs and FER were received.

- 89-11 Surveillance Frequency Exceeded for Auxiliary Feedwater Initiation Test
- 89-12 Surveillance Frequency Exceeded for CO2 Fire Suppression Systems
- 89-S05 Safeguards Event Report

No unacceptable conditions were identified.

6.2 Inoperable Charging Pump

On August 11, the licensee notified NRC that the "B" charging pump was declared inoperable at 5:30 p.m. after identification of an underrated circuit breaker associated with the power supply to the charging pump auxiliary lubricating oil cooler. The underrated portion of the circuit was disconnected and the pump declared operable at 9:10 p.m.

The auxiliary lubricating oil cooler power supply is 480 volt and the underrated circuit breaker is rated for 240 volts. The 240 volt circuit supplies power to two radiation monitors; alternate power supplies were provided. At the close of the inspection period, the licensee had not yet identified when the underrated circuit breaker was installed. The licensee is evaluating plant modifications to correct this problem during the present outage.

This deficiency was identified by the licensee as part of an independent single failure review which included the primary auxiliary building ventilation systems. A review of building heat sources included the auxiliary lubricating oil cooler which is an air cooled backup to the normal component cooling water supplied lubricating oil cooler. In the event of a LOCA, the charging pumps are required for the containment sump recirculation phase. Under these conditions, component cooling may not be available and the auxiliary lubricating oil cooler is required.

The inspector reviewed the licensee's reportability evaluation and corrective actions. The inspector questioned whether the auxiliary lubricating oil cooler had been periodically tested to verify operability. The licensee stated that it is not periodically tested or maintained but that a performance test had been done during the 1987 refueling outage. The licensee agreed to perform a study to verify operability of safety-related equipment reliant upon necessary attendant instrumentation, controls, electrical power, cooling or seal water, and lubrication necessary to support the accident design basis. Pending completion of this study, this issue remains unresolved (89-12-01).

6.3 Inoperable Auxiliary Feedwater Pumps

During surveillance testing on September 2 with the plant in Mode 2, both auxiliary feedwater (AFW) pumps were determined to be inoperable. The "A" AFW pump became inoperable when the pump inboard packing became overheated during initial testing. The "B" AFW pump was declared inoperable after preliminary test results indicated inadequate flow. An additional flow test was performed on the "B" pump which proved operability. However, after packing replacement, the "A" pump failed the subsequent flow test.

On September 2, prior to entering Mode 3, surveillance testing of the steam driven AFW pumps was performed in accordance with procedures SUR 5.1-14, Auxiliary Feedwater Pump Flow Capacity Test, and SUR 5.7-143, Inservice Testing of A&B Steam Generator Auxiliary Feedwater Pumps Surveillance. The pump flow capacity test was required to be performed at refueling intervals by technical specification (TS) 4.8.3. During initial performance of SUR 5.1-14 and SUR 5.1-143, the "A" AFW pump inboard packing began to overheat and smoke. Operations personnel immediately shut the pump down. Maintenance personnel determined that the packing needed to be replaced. The "A" AFW pump was declared inoperable at 2:15 p.m. and the action statement of TS 3.8.A.2.b. entered. This requires that the inoperable pump be restored within 72 hours.

Concurrent with repair of the "A" AFW pump, the same two surveillances were performed on the "B" AFW pump. The tests were completed with unsatisfactory results. The pump delivered 400 gpm rather than the required 450 gpm. (reference TS 4.8.3.a). The "B" pump was declared inoperable at 4:45 p.m. on September 2, thereby making both AFW pumps inoperable. TS 3.8.A.2.c was entered which requires that corrective actions to restore one AFW pump be initiated immediately. Maintenance work on the "A" pump was ongoing.

The licensee conducted a reportability evaluation and determined that the identification of inadequate flow delivery on the "B" AFW pump was reportable per 10 CFR 50.72 (b)(2)(iii). Specifically, a condition existed that alone could have prevented the fulfillment of the safety function of a system necessary for the removal of residual heat. The appropriate notifications were made to NRC and the State of Connecticut.

Licensee review of procedure SUR 5.1-14 and associated test instrumentation determined that an accurate record of pump flow was not attainable because of the wide range of the demineralized water storage tank level instrumentation. Temporary procedure changes were written to both surveillances to include installation and use of instrument recorders with narrower ranges for pump flow determination. There is no installed pump discharge flow instrumentation. Pump capacity is determined through the use of tank level instruments.

Both surveillances were successfully performed on the "B" AFW pump and the pump was declared operable at 11:00 p.m. on September 2. The "B" AFW pump delivered 484 gpm.

After repair of the "A" AFW pump packing, the licensee performed the surveillances. The pump failed the flow test, delivering 196 gpm. The required action of TS 3.8.A.2.b is to restore the inoperable pump within 72 hours or place the plant in hot shutdown within the following twelve hours. The plant was placed in Mode 3 at 3:30 a.m. on September 3 for the planned refueling outage, and the "A" AFW pump remained inoperable at the end of the inspection period on September 5, 1989.

The AFW pumps are tested monthly. During that test each pump is verified to develop at least 800 psig discharge pressure with a steam supply pressure of 300 psig (reference TS 4.8.1.a). The pumps performed well in those tests during the last operating cycle.

The inspector observed portions of testing and maintenance on the "A" AFW pump and initial testing of the "B" AFW pump. The reportability and test results evaluations were also reviewed. The inspector also verified that TS requirements were met. The licensee is developing an engineering action plan to address this problem prior to undertaking any maintenance actions such as pump disassembly. No deficiencies were identified.

7. Review of Periodic Reports

Upon receipt, periodic reports submitted pursuant to Technical Specification 6.9 were reviewed. This review verified that the reported information was valid and included the NRC required data; that test results and supporting information were consistent with design predictions and performance specifications; and that planned corrective actions were adequate for resolution of the problem. The inspectors also ascertained whether any reported information should be classified as an abnormal occurrence. The following report was reviewed:

Haddam Neck Plant Monthly Operating Report No. 89-07, for the period July 1 through July 31, 1989

8. Opening of New Security access Point

For the past several months the licensee has been constructing a new building onsite which contains a new security access facility. The inspector observed security force training on use of the new facility and monitored switchover from the old access point. On August 24, the new access point was opened. The inspector observed employee entrance during the morning rush; access was smooth and without incident. The inspector noted that this new facility is a major improvement over the previous access point.

9. Exit Interview

During this inspection, meetings were held with plant management to discuss the findings. No proprietary information related to this inspection was identified.