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REGION I

Report No. 50-423/86-15

Docket No. 50-423

License No. NPF-49

Licensee: Northeast Nuclear Energy Company
P.O. Box 270
Hartford, CT 06101-0270

Facility Name: Millstone Nuclear Power Station, Unit 3

Inspection At: Waterford, Connecticut

Inspection Conducted: April 14, 1986-May 19, 1986

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Approved by: Ebe McCabe 5/21/86
E. C. McCabe, Chief, Reactor Projects Section 3B Date

Inspection Summary:

Areas Inspected: Routine on-site resident inspection (167 hours) of plant operations, radiation protection, surveillance and maintenance. Observations were made during off-normal plant events and power ascension testing.

Results: Licensee response to several events resulting in EHC fluid or steam leaks was prompt and minimized the potential for equipment damage or personnel injury (Detail 2). The licensee's initial corrective actions taken to correct a design deficiency in ITE Brown-Boveri K600 circuit breakers was found responsive in correcting a Substantial Safety Hazard reported under 10CFR21.

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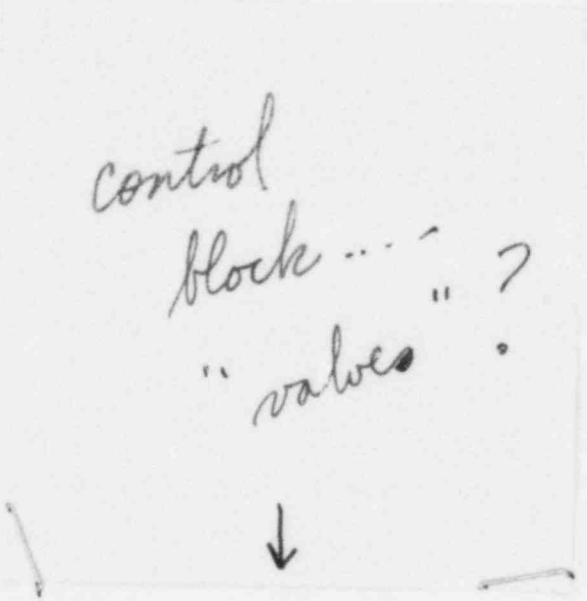
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1. Summary of Facility Activities

The plant was operating at 75% power at the beginning of the inspection period. Nuclear instrumentation in-core and ex-core axial flux difference calibrations were in progress. Power was increased to 90% following a brief power reduction to repair an Electro-Hydraulic Control System fluid leak. The plant reached rated thermal power, 3411MW(t), at 2210, April 17.

The final tests in the power ascension program were conducted on April 21, when 10% load swings and a full power generator load rejection test was completed from 1184MW(e). The reactor was made critical at 2300 the same day and the unit was declared to be in commercial operation at 0001 on April 23. A steam leak occurred on a bolted manway closure of the "A" Moisture Separator Reheat Steam Drain Tank at 0711 on April 23. Load was reduced and the turbine was tripped in an attempt to isolate the leak. Later, a reactor trip occurred from 10% power on low steam generator level when the operator lost level control.

Following repairs, the reactor was made critical at 1944, April 23 and was returned to full power at 0311, April 25 to begin the One-Hundred-Hour Warranty Run. This was completed at 0825, April 29. The plant operated at full power until 0909, May 9, when the turbine was manually tripped in response to the loss of two condenser circulating water pumps. This occurred when intake structure traveling screen clogging caused high differential pressure. The plant remained shutdown until 2024, May 12, when the reactor was again made critical.

A water hammer occurred at about 1900, May 12, while preparing to place the "C" First Point (High Pressure) Feedwater Heater in service. The plant startup had been made with the heater isolated to repair a crack on the supply line to a shell side relief. The water hammer damaged the heater emergency level control valve. The heater remained isolated to allow repairs to the valve operator and yoke.

2. Review of Plant Events

a. Power Reduction for EHC Repair

On April 14 , at about 0730, an Electro Hydraulic Control (EHC) System oil leak was discovered on the "D" main turbine governor valve. The plant was at 75% power, 878MW(e). Oil was spraying at approximately one gallon per minute; there was no danger of loss of reservoir level but there was a concern about possible damage of electrical cable insulation in the vicinity. A power reduction was started immediately. The generator was taken off-line, and the turbine was secured at 0838. Mode 1 was maintained; the reactor was borated to 10% power. Repairs were undertaken as soon as the affected portion of the EHC system was depressurized. The oil spill was well controlled and cleaned up. No electrical cable insulation was affected. The cause of the leak was determined to be an improperly seated "O" Ring in the control block to the governor valve.

Seating surfaces were cleaned and a new "O" ring installed. The ensuing pressure test was satisfactory; the turbine was rolled at 1124 and placed on the line at 1209. Plant recovery was timely and well done. The main generator breaker was closed at noon and plant power was then returned to 75%.

The inspector observed the licensee's actions taken in response to this event. He found that they were prompt, well-coordinated, and in conformance with station operating procedures and the Technical Specifications. The licensee minimized equipment and personnel exposure to the EHC fluid. No safety-related equipment was involved. There were no unacceptable conditions identified.

"O" rings on the other turbine control valves were replaced during a brief shutdown after the April 21 Full Load Rejection Test.

b. Secondary Plant Steam Leak

A manway cover gasket of the "A" Moisture Separator Reheat (MSR) Steam Drain Tank failed at 0711, April 23. The unit was at about 60% power at the time. The leak occurred with no warning; the rapid pressurization and steam jet force ruptured an insulation package which had been installed over the manway. Due to the significant amount of steam in the turbine building, the exact location of the leak was not determined until the reheat steam supply was secured.

Control room operators began reducing load at 0728 and tripped the turbine manually at 0753. This isolated the major source of steam. The Main Steam Isolation Valves (MSIVs) were shut at 1009 to further isolate the drain tank for maintenance. The licensee found that about one-third of the failed gasket, which was a flat asbestos composition material, had blown out, causing the leak at the bolted manway cover flange. Repairs were made to both Reheat Steam Drain Tanks by replacing the flat gaskets with reinforced spiral wound ones.

After the 0753 turbine trip, a reactor trip occurred at 0815 due to low-low steam generator (SG) level. This was found to be due to insufficient operator skill in maintaining manual level control of all four SGs simultaneously. Improvement of the operators' skill in manual SG level control is expected to require practice through experience during plant operation. The reactor was made critical at 1944 and the turbine generator placed on-line at 0738, April 24.

The inspectors monitored plant status and operator actions in the control room from shortly after the leak started until it had been isolated. The most significant equipment damage involved non-safety-related 480 Volt Bus 32A, located on the elevation below the source of the steam leak. At 0715, a ground was indicated on that bus, which was de-energized at 0734. The bus was cleaned, dried, and satisfactorily returned to service.

The inspectors found that the operators had taken appropriately conservative actions based on the best information on the source of the leak. Personnel from supporting departments (e.g., maintenance production test and security) were brought in and directed to take specific action which located the leak, minimized equipment damage, and prevented personnel injuries.

The inspectors observed the replacement of the manway gaskets. Although the seating surfaces were not steam cut, the "B" Drain Tank manway gasket exhibited degradation.

There were no unacceptable conditions identified.

c. Reactor Trip-Partial Loss of Circulating Water

A reactor trip at 0909, May 9 and accompanied a manual turbine trip from about 85% power. This was in response to the automatic trip of two main circulating water pumps. High differential pressure across the associated intake traveling screens initiated the pump trips. The screen wash system had been secured at 0630 to modify the supply piping. Although the licensee had scheduled this system outage when weather and sea conditions were favorable without wash water, all circulating water pumps had tripped by 0940 due to screen fouling. The service water system was not affected.

Following completion of the modifications, which involved connecting new replacement piping into the system, the circulating water system was returned to service. It has since operated satisfactorily.

The inspector observed control room activities from shortly after the turbine trip/reactor trip until decay heat removal systems were in effective operation. The control room operators responded well to the loss of condenser vacuum and implemented the unit abnormal operating procedures. After maintenance on a generator exciter bearing, a change in the main turbine balance weight placement, and implementation of a modification to the MSIV operating solenoid power supplies, the reactor was made critical at 2024, May 12, and the turbine-generator placed on line at 0513, May 13. There were no unacceptable conditions identified.

3. Review of Plant Operations

The inspector observed plant operations during regular and back shift tours of the following:

Control Room
Auxiliary Building
Diesel Generator Building
Intake Structure
Main Steam Valve Building
Waste Disposal Building
Fence Line (Protected Area)
Yard Areas
Turbine Building
Vital Switchgear Areas
Electrical Tunnels

The control room tours included observation of instrument parameters related to conformance to Technical Specification requirements. Alarm conditions in effect and alarms received at the control room during the period of observation were reviewed. The operators were cognizant of board conditions. Shift manning was compared with Technical Specifications. Plant housekeeping controls were observed. Also, during plant tours, the various logs in the Control Room, Chemistry department, and Health Physics department were reviewed. In addition, the inspector observed selected actions concerning site security including personnel monitoring, access control and placement of physical barriers. No deficiencies were identified.

4. Power Ascension Test Witnessing

The inspectors witnessed portions of various Power Ascension Tests performed under procedures INT-8000 and INT-9000. Test witnessing included review of the following:

-- Plant Technical Specification requirements were met.

-- Tests were preformed using current revisions of approved procedures with all prerequisites and initial conditions met.

-- Briefings were held for all personnel involved; operator actions during test performance were correct, timely and coordinated.

-- Communications were timely and accurate.

-- Supervisory personnel made initial summary analyses to verify plant response was as expected.

-- Preliminary test evaluation was consistent with the inspector's observations.

-- Test acceptance criteria were met.

Results:

a. Reactor Trip from 100% Power

This test verified the ability of the primary and secondary plants and automatic control systems to sustain a trip from 100% power and recover to stable conditions. Additionally, major transmission lines were monitored for grid stability during the loss of this large input.

At 0500 on April 21, the main generator output breaker was opened while the generator was loaded to 1184 megawatts. The generator trip initiated a turbine trip which initiated a reactor trip. All rods fully inserted. No pressurizer or steam generator safety valves lifted. Pressurizer level remained above 20%. Pressure reached approximately 2050 psia. Primary temperature remained above 551F. No safety injection occurred. The inspector had no questions.

b. Initial Performance Test

This test was performed on April 29 to verify turbine warranty requirements and to obtain baseline data for secondary plant performance monitoring. Section 7.4 of the test placed the plant in an abnormal condition to measure the turbine control valves' wide-open steam flow. Rod control was placed in manual at rated thermal power (3411MW). The plant was borated to reduce Tave. Pressurizer heaters were energized to force spray flow and induce mixing. As steam pressure lowered, the control valves came to full open. One hour of steady state data was collected. Boron concentration was then reduced to bring Tave back to normal, and control rods were returned to automatic control. The inspector verified that the Axial Flux Difference remained in the target band, the Tave-Tref difference did not exceed 20F, and Tave did not go below 553F. The inspector had no questions.

5. Maintenance and Modifications

a. Modifications to the Engineered Safety Features (ESF) Status Panel

As a result of the NUREG 0737 Control Room Design Review, six Human Engineering Discrepancies (HED TA 8) were found on the ESF status panel. The licensee had committed to resolving these discrepancies prior to fuel load, but extended the completion dates without informing NRC. The inspector verified that the later correction of these discrepancies did not impact Technical Specification operability requirements or have any adverse effect on execution of emergency operating procedures. (The modifications enhance acceptable operator aids and displays.)

The ESF status panel is a 70" X 16" bank of 1.5" square engraved windows that represent the condition of valves and pumps in ESF systems. The light behind a window is energized when the component satisfies the engraved condition. The lights are arranged in 6 groups. Grouping is such that all lights in a given group should be on or off depending on the phase of the hypothesized accident involved.

The Human Engineering Discrepancies found on the ESF status panel dealt with labelling of the six groups, illumination of blank tiles, consistency of tile colors, addition of Reactor Plant Component Cooling Water valves, and changes to related annunciators on Main Board 2.

In a letter to NRR dated January 29, 1986, the licensee committed to have HED TA 8 completed by April 30, 1986. Moreover, the scope of the work was expanded from the original six categories of modifications to 17 categories to further enhance display usefulness and accuracy.

As a result, to complete the modifications, the ESF status panel was de-energized for approximately 2 days with the plant at power. Retesting took about another 2 days after the panel was re-energized.

The inspector reviewed the Plant Design Change Request that initiated the modifications (PDCR MP3-86-094) and observed work in progress while the ESF panel was deenergized. Appropriate compensatory measures were taken to reasonably assure that information similar to that displayed in the ESF status panel would be available if needed. Work was well controlled and carefully completed. No unacceptable conditions were identified.

b. Main Steam Isolation Valve (MSIV) Operating Solenoids

The licensee installed current limiting devices supplied by the MSIV vendor in the power supply lines to the MSIV operating solenoids under AWO M3-86-09212. This change was made to reduce heat generation by the solenoids, thereby extending the lifetime of the cables. Valve stroke times were acceptable after the modifications were completed. The inspector had no further questions.

c. Plant Maintenance

The inspector observed and reviewed preventive and corrective maintenance to verify compliance with regulations, use of administrative and maintenance procedures, compliance with codes and standards, proper QA/QC involvement, use of bypass jumpers and safety tags, personnel protection and equipment alignment and retest. The following activities were included:

-- Refurbishing of #11 main turbine/generator bearing.

-- Repair of motor-driven and turbine-driven feed pump shaft seals.

-- "B" Emergency Diesel Generator monthly preventive maintenance.

-- Replacement of A&B Moisture Separator Reheater Drain Tank manway cover gaskets.

-- Fabrication of temporary screen wash piping.

No unacceptable conditions were noted.

6. Surveillance Testing

The inspector observed parts of tests to assess performance in accordance with approved procedures and Limiting Conditions for Operation, removal and restoration of equipment, and deficiency review and resolution. The following tests were reviewed:

-- Operational test of "A" Emergency Diesel Generator.

-- Operational test of the Turbine-Driven Auxiliary Fresh Water Pump.

-- Main Steam Isolation Valve Stroke time testing.

In addition, the inspector performed a check of the Turbine-Driven Auxiliary Feedwater System valve lineup referencing surveillance procedure SP3622.4. No unacceptable conditions were noted.

7. Review of Licensee Event Reports (LERs)

LERs submitted during this report period were reviewed. The inspector assessed LER accuracy, whether further information was required, if there were generic implications, adequacy of corrective actions, and compliance with the reporting requirements of 10CFR 50.73 and Administrative Control Procedure ACP-QA-10.09. Selected corrective actions were checked for thoroughness and implementation.

Those LERs reviewed were:

86-016-01, Area Temperature Monitoring

86-023-00, Containment Area Radiation Monitors Calibrated Non-Conservatively

86-024-00, P-8 Protective Interlock Setpoint High

86-025-00, Control Building Inlet Ventilation Radiation Monitor Inoperability

86-026-00, Failure to Perform Axial Flux Difference Surveillance

86-027-00, Partial Safety Injection

86-028-00, Feedwater Isolation and Reactor Trip Due to Steam Generator Water Level Transient

86-030-00, Reactor Trip on Steam Generator Low Level

8. Licensee Action on Previous Inspection Findings

a. (Closed) UNR (50-423/86-08-02)

A Brown-Boveri K600S Breaker control wiring harness location deficiency was verbally submitted as a 10CFR21 report on May 1, 1986; the written report was provided on May 9, 1986. The licensee commenced corrective modifications on May 3. These modifications entailed relocating the control wiring harness away from the breaker racking pawl by increasing the size of the access hole through which the wiring harness passes and drilling and tapping the breaker frame for a new harness support. Also, the control wiring was to be replaced if damage was discovered.

There are 140 K600S breakers used as the 480 load center output breakers to loads and motor control centers. Of these, 41 are safety-related and 17 of those are required to change position during an Engineered Safety

Features actuation. These 17 breakers were the first scheduled for rework. All 17 have been completed. Thirteen of the remaining 24 are motor control center feeder breakers, whose control power fuses have been pulled under a Bypass Jumper. These breakers are normally shut, remain shut during accident conditions, and will only be controlled locally. The remaining eleven 600S breakers are racked out because they are either spares or they supply fuel pool cooling pumps and fuel building ventilation system components which will not be required until spent fuel is present.

The licensee has committed to completing modifications on all 140 breakers by the end of the first refueling outage. The inspector reviewed the Plant Design Change Request (PDCR MP3-86-136), the 10CFR21 report and selected automated work orders directing the work to be accomplished. There were no unacceptable conditions identified.

9. Station Security Events

The inspectors reviewed three reported security events, including immediate actions, compensatory measures, cause analysis, and long-term corrective actions.

50-245/86-013-00 This event concerned maintenance without following established procedures. The licensee's corrective actions were found to address the root cause. Additionally, the security officer who discovered the condition performed well. There were no unacceptable conditions identified in review of this licensee identified and corrected problem.

50-245/86-14-00 The inspector reviewed the licensee's actions on a security-related telephone call. There were no unacceptable conditions identified.

50-245/86-016-00 A security officer's attention to duty was questioned. The licensee is considering disciplinary options. No unacceptable corrective action conditions were identified.

10. Management Meetings

During this inspection, periodic meetings were held with senior plant management to discuss the scope and findings. No proprietary information was identified as being in the inspection coverage. No written material was provided to the licensee by the inspector.