U.S. NUCLEAR REGULATORY COMMISSION
REGION I

DCS 50247/841008
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Report No. 50-247/84-33

Docket No. 50-247

License No. DPR-26 Priority -- Category C

Licensee: Consolidated Edison Company of New York, Inc.

4 Irving Place

New York, New York 10003

Facility Name: Indian Point Nuclear Generating Station, Unit 2

Inspection At: Buchanan, New York

Inspection Conducted: December 1-31, 1984

Inspectors: for _____ 2.7.85
T. Kenny, Senior Resident Inspector date

for _____ 2.7.85
B. Hillman, Reactor Engineer date

Approved By: for _____ 2.11.85
Leif Norrholm, Chief, Reactor Project Section 2B, DPRP date

Inspection Summary: Inspection on December 1-31, 1984 (Report No. 50-247/84-33)

Areas Inspected: This inspection report includes routine daily inspections, as well as unscheduled backshift inspections of onsite activities, and includes the following areas: Operational safety verification; maintenance; surveillance; review of monthly report; LER's; auxiliary feedwater steam isolation valves failure to close; allegation; and, new vice president. The inspection involved 57 hours by the resident inspector and 25 hours by a visiting inspector.

Results: This report identifies concerns in design change print updates, safety analysis of steam isolation valves in the auxiliary feedwater system, and operator attention to the boron injection tank.

DETAILS

1. Persons Contacted

Within this report period, interviews and discussions were conducted with members of the licensee management and staff to obtain the necessary information pertinent to the subjects being inspected.

2. Operational Safety Verification

A. Documents Reviewed:

- Selected Operators' Logs
- Senior Watch Supervisors (SWS) Log
- Jumper Log
- Radioactive Waste Release Permits (liquid & gaseous)
- Selected Radiation Work Permits (RWP's)
- Selected Chemistry Logs
- Selected Tagouts
- Health Physics Watch Log

B. The inspectors conducted routine entries into the protected area of the plant, including the control room, PAB, fuel building, and containment (when access was possible.) During the inspection activities, discussions were held with operators, technicians (HP & I&C), mechanics, foremen, supervisors, and plant management. The purpose of the inspection was to affirm the licensee's commitments and compliance with 10 CFR, Technical Specifications, and Administrative Procedures.

1. On a daily basis, particular attention was directed in the following areas:

- Instrumentation and recorder traces for abnormalities;
- Adherence to LCO's directly observable from the control room;
- Proper control room and shift manning and access control;
- Verification of the status of control room annunciators that are in alarm;
- Proper use of procedures;
- Review of logs to obtain plant conditions; and,
- Verification of surveillance testing for timely completion.

2. On a weekly basis, the inspector(s) confirmed the operability of a selected ESF train by:

   - Verifying that accessible valves in the flow path were in the correct positions;

   - Verifying that power supplies and breakers were in the correct positions;

   - Verifying that de-energized portions of these systems were de-energized as identified by Technical Specifications;

   - Visually inspecting major components for leakage, lubrication, vibration, cooling water supply, and general operable condition; and,

   - Visually inspecting instrumentation, where possible, for proper operability.

   Systems Inspected:

   - Nuclear Instrumentation System

   - Radiation Monitoring

3. On a biweekly basis, the inspector(s):

   - Verified the correct application of a tagout to a safety-related system;

   - Observed a shift turnover;

   - Reviewed the sampling program including the liquid and gaseous effluents;

   - Verified that radiation protection and controls were properly established;

   - Verified that the physical security plan was being implemented;

   - Reviewed licensee-identified problem areas; and,

   - Verified selected portions of containment isolation lineup.

C. Inspector Comments/Findings:

The unit had intermittent operation throughout the month as delineated below. The inspector selected phases of the unit's operation to determine compliance with the NRC's regulations. The inspector determined that the areas inspected and the licensee's actions did not constitute a health and safety hazard to the public or plant personnel. The following are noteworthy areas the inspector researched in depth:

1. The unit began this report period with the reactor in a hot shutdown condition. On December 2 at 10:59 p.m., the unit was returned to service after a 48-hour shutdown to repair steam leaks and Resistance Thermal Devices (RTD's) in #1 reactor coolant loop. The repair of the RTD's was only effective for one day when the circuits failed again. The licensee has determined that the RTD's will have to be replaced in the next cold shutdown of sufficient duration to do so.

2. On December 7, the licensee made a report to the NRC regarding non-conservative settings of the auxiliary feedwater motor operated pump regulation valves. This event and the circumstances leading to the non-conservative settings is documented in special report 84-34.

3. At 9:55 p.m., on December 19, a fire started on the exciter end of the main generator. The licensee extinguished the fire within 30 minutes. The local Verplanck fire department, called out by the licensee to assist, arrived 5 minutes after the fire was out and remained 45 minutes in the event of a re-flash.

   While rapidly reducing power, a Lo-Lo steam generator level reactor trip occurred. In conjunction with the trip, the main steam dumps opened causing a high steam line flow safety injection actuation. No actual injection of water occurred since reactor pressure never decreased to that of the safety injection pumps. All primary systems functioned as designed.

   Circumstances Leading Up to the Fire

   The licensee was aware of a hydrogen leak in the southeast hydrogen cooler. An oil leak was also present and was believed to originate in the generator-end exciter bearing. When the protective flashing was removed from the area, the oil leak was discovered to be from the main generator. Shift personnel manufactured an aluminum funnel device to contain the oil leak and while putting this in place, brushed the rotating shaft and started a small fire, apparently from hydrogen leaking from the generator. This fire was extinguished within one minute with CO_2 extinguishers. As a precaution, fire hoses were run out to the scene, and the control room operator began to ramp the unit off the line.

The senior watch supervisor decided to adjust the oil pressure in the hydrogen seal oil system in an attempt to stop the hydrogen and oil leak. Oil began spraying out along the shaft and the hydrogen-oil mixture ignited before the oil pressure could be re-adjusted. The area was immediately cooled with the fire hoses and only superficial damage resulted.

Repair and Return to Service

The licensee cleaned and flushed the seal oil system and removed debris from the filters in the air side and hydrogen side portions of the oil system. An inbalance in pressure of the air side to hydrogen-side oil was the cause of the oil leak past a worn exciter end seal of the main generator. The reason for the inbalance in oil pressure was attributed to the improper operation of the differential pressure regulator that maintains oil pressure (air side) at the seals 12 psi above hydrogen pressure. Some debris was discovered in the control mechanism of the differential pressure regulator valve which hampered proper operation. After the oil system was cleaned and flushed, a proper seal could not be obtained on the exciter end seal of the main generator. The seal was replaced by the licensee and the system functioned normally.

4. On December 27, the licensee began to return the unit to service and took the reactor critical, but could not obtain a high enough circuit to ground (megger) reading on the isolated bus duct system. Water and moisture had entered the system during the extinguishing of the fire. While the operators were working to obtain higher megger readings by incorporating various drying procedures on the main generator output leads, the next event occurred.

5. On December 28, while attempting to fill Safety Injection (SI) accumulators with SI pump #23, the licensee identified that the pump pressure fell from the normal 1200 psi output to 700 psi. A second pump, #22, was started, which did pump water to two SI accumulators, but then dropped off to 700 psi. The licensee declared the pumps inoperable and shut down the reactor and proceeded to cool the plant down.

Circumstances Leading Up to the Incident

After the safety injection incident identified in 3. above, the Boron Injection Tank (BIT) was refilled with 13% (20,000 ppm) boron concentration. The SI pumps were flushed back to the Refueling Water Storage Tank (RWST) as per Procedure E-4, "Recovery From a Spurious Safety Injection," however, the procedure did not refer to SOP 10.1.1, "Filling, Draining, Flushing

SI System," a procedure that more clearly defines the SI pump flusning and BIT filling procedure. The BIT parallel discharge valves leaked by and began to increase the boron concentration in the water that is present at the suction of the SI pumps. The concentration increased to approximately 9000 ppm concentration (which was determined by sampling). Without the proper heat tracing or circulation of the high concentrate, the solution solidified which made the pumps inoperable.

Licensee Actions Since the Incident

The licensee immediately performed valve line walks and determined the lines were intact and valve positions were correct. The operator vented the pump suction to determine if anything could be determined about the suction side of the pump. The operator got a small amount of gas and a solution, which was later determined to be of a higher than normal concentration of boric acid; however, the venting did not correct the pump problems. Heat was applied to the SI pumps and two of the three, numbers 22 and 23, were made operable and tested. No 21 SI pump was replaced by a spare pump, then tested and placed in service. The licensee also flushed the a cumulator fill lines as part of the testing.

The licensee also performed the following tests:

- A test to determine if the BIT can introduce nitrogen (BIT is normally pressurized by nitrogen) into the SI system from the BIT. The results indicated that the outlet valves close before the solution level gets low enough to allow nitrogen to enter the SI system.

- Hand tightening the BIT parallel outlet valves to close them tighter. Tests were performed to determine if the valves will open after hand tightening. The valves do open remotely after hand tightening.

The licensee has commissioned Lehigh University, who has a scale model of the SI system, to perform testing to determine how the gas or nitrogen got into the pump suctions. The licensee has also commissioned Westinghouse to perform analysis to determine the feasibility of removing the BIT or reducing the boric acid concentration of the BIT.

The licensee is currently monitoring and graphing several parameters concerning the BIT and SI system in accordance with a temporary procedure.

The parameters are:

- BIT level every four hours;

- Pump suction boric acid concentration every day; and,

- Venting the SI pump suctions once a day for nitrogen or gas.

The licensee has also revised Procedure E-4, delineating the use procedure SOP 10.1.1 for recovery of the BIT following a spurious SI.

The resident inspector has reviewed all testing and maintenance performed by the licensee concerning this event. Documentation of these tests can be found in Section 4 of this report. The licensee made the proper notifications related to this event.

No violations were identified.

3. Maintenance

The inspector reviewed Maintenance Work Packages related to the events that resulted in the shutdown of the unit. In his review, the inspector verified that the licensee used good engineering practices and that the licensee's commitments to NRC regulations were properly executed including quality assurance, where required.

The following work packages were reviewed:

- Replacement of #21 Safety Injection Pump - MWR 17171;

- Cleaning and inspection of Valve 256 (regulating valve in the seal oil system) - MWR 17991;

- Replacement of the hydrogen seal on the exciter end of the main generator - MWR 17938; and,

- Machining of the new hydrogen seal - MWR 17163.

No violations were identified.

4. Surveillance

During this inspection period, the inspector reviewed in-progress, as well as completed, surveillance packages. The inspector verified that the surveillances were performed in accordance with licensee-approved procedures and NRC regulations. The inspector also verified that the instruments used were within calibration tolerances and that qualified technicians performed the surveillances.

The following surveillances were witnessed, in part:

- PT-V2 Intermediate Range Channel Testing; and,
- PT-M12 First Stage Turbine Pressure Calibration.

The following surveillances were reviewed for completeness:

- PT-Q29 Safety Injection Pumps Functional Test:
  - Performed for all pumps, October 5, 1984;
  - Performed for #22 and #23, December 29, 1984; and,
  - Performed for #21, after replacement of the pump with a spare, December 31, 1984.

The inspector reviewed a special surveillance that was performed in order to verify the flow through the motor operated Auxiliary Feedwater Pump Feedwater Regulation Valves, which verified that two of the four valves, while set at 35%, will deliver the necessary 150 gpm per steam generator, while the remaining two valves would only deliver approximately 80 to 100 gpm to their respective steam generator. As a result of this surveillance, the licensee has documented and set all of the regulating valves to deliver 150 gpm to each respective steam generator. For more details about the regulating valves, refer to Report 84-34.

No violations were identified.

5. Review of Monthly Report

The Monthly Operating Report for November 1984 was reviewed. The review included an examination of selected maintenance work requests, and an examination of significant occurrence reports to ascertain that the summary of operating experience was properly documented.

The inspector(s) verified through record reviews and observations of maintenance in progress that:

- The corrective action was adequate for resolution of the identified item; and,
- The operating report included the requirements of TS 6.9.1.7 & 8.

The inspector(s) have no further questions relating to the report.

6. Licensee Event Report Followup

The inspector reviewed the following LER's to determine that reportability requirements were fulfilled, immediate corrective action was accomplished, and corrective action to prevent recurrence had been accomplished in accordance with Technical Specifications.

The following LER's were addressed in Inspection Report 84-30 and are considered closed by the inspector:

- 84-015 Spurious Safety Injection Signal
- 84-016 Premature Lifting of Secondary Safety Valve
- 84-018 Steam Generator Level/Flow Mismatch-Reactor Trip
- 84-019 Fire on Governor End of High Pressure Turbine

The following LER is considered closed by the inspector. Refer to Section 7 of this report:

- 84-022 Failure of Auxiliary Feedwater Pump Steam Isolation Valves

No violations were identified.

7. Auxiliary Feedwater Steam Isolation Valves Failure to Close

System History

The Auxiliary Feedwater (AFW) System was installed at Unit 2 as a non-Category I system during the original construction at Indian Point. When Unit 3 was being constructed, the system design was changed in 1973 to include isolation valves (designed to shut on high temperature in the AFW pump room) in the steam supply to the steam-driven AFW pump. The purpose of the valves was to protect the motor-driven AFW pumps in the event of a turbine or steam accident in the AFW pump building.

Inspector Concern

The system was reclassified Category I sometime in 1973. The resident inspector has reviewed Con Edison's submittal of April 9, 1973, to the AEC concerning the analysis of high energy lines. The inspector has also reviewed a safety evaluation performed by the AEC for Unit 3, but neither document addresses the inadvertent closure of these valves and the consequence it could have on the safe shutdown of the unit.

The valves referred to above (MS 1310 A&B) have been in a test program since October 26, 1977 when they were included in the Section XI valve and pump testing program. A quarterly test, PT-Q13, was developed and these valves were included as category "B" valves (valves that shift position for an accident condition). These valves have passed all requirements in accordance with PT-Q13 since 1977.

In 1981, Con Edison committed to NRR to address the valves' circuitry with regard to environmental qualifications. In 1982, a design change (MMC-81-210) was performed that replaced the temperature actuation switches with environmentally qualified class IE switches. It was later determined that the response time was too slow in closing these valves. A safety evaluation was performed and it was determined that if the roll-up door into the AFP room was kept open, then the motor-driven AFW pumps would be unaffected if a steam break accident occurred.

In April 1984, the switches were replaced by others with a faster response time and the system was returned to an operable status.

NOTE:

Neither Technical Specifications nor the FSAR address these valves and no testing is required by Technical Specifications on these valves.

Current Event Chronology

On November 27, 1984:

- PCV-1310 A&B failed PT-Q13
- A Significant Occurrence Report (SOR) 84-427 was initiated by the licensee.
- A Maintenance Work Request (MWR-17418) was issued to the I&C Department to repair or correct the cause of the failure.
- The I&C Department determined the wires were cut at the electrical junction box.
- The roll-up door in the AFW pump building was opened and a guard posted.

On November 28, 1984:

- The valves were reconnected and tested satisfactory.

On November 29, 1984:

- I&C prepared a drawing correction and submitted it to Engineering.

On November 30, 1984:

- The licensee determined that the safety evaluation performed for slow closing valves was not adequate for valves that would not close and determined that the plant was being operated outside an analyzed situation and reported same via a 50.72 report.

- The Quality Assurance General Manager was notified and an investigation was initiated by the QA department.

Licensee Actions Since the Event

The results of the investigation performed by the QA department identified the following:

- Modification Procedure EGS-82-15558 was started by Con Ed construction in March 1983, and worked intermittently until completion in September 1984.

NOTE:

Modification EGS-82-15558 was to rework the recirculation lines on the AFW pumps to allow more recirculation flow in order to protect the pumps per the manufacturer's suggestion.

- Control wires for the above modification were located in terminal boxes YN9 and YPI along with the wires for the controls of the steam stop valves PCV-1310 A&B.

- During the course of the work, all the wires were cut associated with the modification procedure, including the 1310 valves. The drawing being used stated all wires should be cut; however, this drawing did not reflect the 1310 leads.

- The workman recognized that the terminal boxes were not the same as the drawing, nor was the number of wires coming from the terminal box the same.

- A field engineer issued an urgent drawing change to the workers, but did not address the final position of the control wires for the 1310 valves.

- The terminal boxes were rewired in the field in accordance with the new drawing, and the modification to the recirculation system was tested satisfactory.

- The investigation performed by Con Ed could not identify any drawing with the 1310 valves lead termination.

The investigation identified the following action to be taken by Quality Assurance:

- Further discussions with field engineering, I&C, and construction management.

Actions to be taken by other departments:

- Issue a drawing specifying all termination points for SOV's 1310 A&B; and,

- Complete the SAO-132 report. (Report of abnormal conditions at the plant.)

The investigation identified the root cause of the problem as being, "Inadequacy of Drawings to Describe the Actual Field Conditions."

The investigation further recommends that the QA manual be followed more closely in that:

- Field walkdowns should be done by engineers prior to issuance of design changes to the construction forces; and,

- Training should be increased to the construction forces stressing that all work should be terminated when any variation between as found conditions and the drawings exist.

This investigation was completed by the QA department on December 17, 1984, and presented to the SNSC on December 19, 1984. The SNSC has formed an engineering task force to review similar events, as identified by past LER's, to identify and correct similar problems.

Inspector Findings:

As a result of the resident inspector's independent investigation of the issues involved with the aforementioned event, the following facts are presented:

- The licensee has identified problems and is currently working to deal with or correct these problems.

- The drawing control system in the past at Indian Point Unit 2 has been addressed in numerous reports, enforcement conferences and SALP's. As a result of these events, the licensee has embarked on a new approach to drawing control. This was observed by the resident inspector during recent plant modifications.

- Field activities were not controlled by the licensee.

No violations were identified.

8. Allegation

On November 20, 1984, a concerned former contract employee made an allegation that welding was being done by a non-qualified employee on a pipe hanger, and further alleged that weld rod was obtained without a rod issue draw slip.

The resident conducted an investigation into the matter with the following findings:

- The hanger in question was on piping that was being added to Unit 1 and is considered temporary. The piping is a non-class I piping;

- The non-qualified welder was a foreman (former welder) who misinterpreted orders "to get that last hanger completed today," and welded it himself; and,

- The contractor's practice was to issue weld rod with the draw slip only for Class I welding, where QC checked the issue as part of the design package. Weld rod for non-class I work could be obtained by non-qualified personnel.

The contractor was aware of the allegations, in that the former employee had informed him prior to calling the NRC. When the resident inspector began his investigation, the contractor had already changed the method of obtaining weld rod so that only qualified welders can draw weld rod and only with a weld metal draw slip. Con Edison has reviewed welding practices and has concluded that no Class I components were welded by non-qualified welders during this period. New procedures have been issued that delineate the methods for drawing weld rod and tighter controls have been established for the issuance of all weld rod. A re-indoctrination program was conducted by the contractor for all foremen and welders on the welding practices conducted at Indian Point Unit 2.

No violations were identified.

9. New Vice President

On December 1, 1984, Mr. Murray Selman, replaced Mr. Charles Jackson as Vice President of Nuclear Power at the Consolidated Edison Unit 2 facility. Mr. Selman was the former Vice President of the Manhattan Division, New York City.

10. Exit Interview

At periodic intervals during the course of the inspection, meetings were held with senior facility management to discuss the inspection scope and findings. An exit interview was held with licensee management at the end of the reporting period. The licensee did not identify 2.790 material.