U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-247/84-06

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, Unit 2

Inspection At: Buchanan, New York

Inspection Conducted: February 28 - March 1, 1984

Inspectors: _____ 4/26/84
S. D. Reynolds, Jr., date
Lead Reactor Engineer
M&PS, EPB, DETP

Approved by: _____ 5/4/84
J. Durr, Chief, Materials date
and Processes Section, EPB

Inspection Summary: Inspection on February 28 - March 1, 1984 (Report No. 50247/84-06)

Areas Inspected: Routine announced inspection by a region-based inspector of the licensee's actions following a reported primary to secondary tube leakage of the #22 steam generator. The inspector also reviewed the licensee's activities to upgrade the plant to improve operating reliability.

Results: No violations were identified.

DETAILS

1. Persons Contacted

Consolidated Edison (CONED)

*R. Landwaard, Senior Quality Assurance Engineer
J. Makepeace, Technical Consultant
*M. Smith, Director, Technical Support
D. Rush, Field Engineer
*J. Higgins, Chemistry Manager
*M. Blatt, Director Regulatory Affairs
C. Jackson, VP Nuclear Power
S. Rothstein, Senior Consulting Engineer
J. Bahn, Regulatory Affairs
R. Herrmann, QC Inspector
J. Deane, Level III NDE
H. Damsky, Level III NDE
*F. Phillips, Manager, Nuclear Power QC
R. Schuster, Senior QA Examiner
J. Schwartz, QA Examiner
C. Hacker, QA Examiner

Westinghouse Electric Corp NSID (Westinghouse)

R. Franklin, Manager Site Services

Nuclear Regulatory Commission (NRC)

*P. Koltay, Resident Inspector
T. Foley, Senior Resident Inspector

*Indicates those present at exit interview.

2.0 Steam Generator #22 Tube Leakage Repair

On February 11, 1984 at 5:05 p.m. the licensee started a controlled shutdown of Unit 2 due to a steady increase in primary to secondary leakage of steam generator 22. The leak which had been monitored since early January and had been in the 0.001 to 0.005 GPM range increased following return to power from a shutdown to the 0.25 GPM level. The leakage rate had previously changed following load changes which appeared to be indicative of a corrosion related leak. The unit was back on the line at 10:00 a.m. on February 27 and at full power on February 28 with no measurable indication of leakage. The inspector followed the activities of the licensee at the Regional Office and at the site reviewed the licensee activities upon completion of the repair.

The inspector reviewed the licensee and Westinghouse data related to the primary to secondary leakage reported to the NRC. The unit was removed

from service prior to the leakage exceeding the technical specification limit, therefore, an LER was not required to be written. The licensee is writing a document to NRR describing the leakage inspection conducted and plugging method utilized.

The inspector reviewed the maintenance system followed by the licensee in identifying the leak, eddy current (EC) examination of adjacent tubes and plugging the leaking tube. The Quality Control activities and Quality Assurance activities in regulating and monitoring the maintenance activities was reviewed and found to be acceptable.

The inspector reviewed Maintenance Work Order (MWO) 07918 dated February 12, 1984, Maintenance Procedure MP-1.74, Revision 0 dated February 13, 1984, Maintenance Work Request MWR 07918 and Work Permit 169149. Also reviewed were Eddy Current procedure MRS 2.4.2 GEN-23, MRS 2.3.2 GEN 13 (Mechanical Plugging) and MRS 2.2.2 GEN-12 (tube sheet marking). Secondary Side Pressure Test procedure PT-V9 Revision 9 was reviewed. This procedure limits secondary side condensate pressurization to 800 psig and indicates a minimum hold time of 15 minutes. The EC testing was conducted at 25,100, and 400 KHZ differential mode and 100 KHZ absolute mode. The 400 KHZ differential was for tube degradation, the 100 KHZ for OD effects, 25 KHZ for sludge profile and 100 KHZ absolute for low level wall thickness variations.

Disposition of the EC data collected on the 13 tubes tested in the area adjacent to the leak stated no indications in 9 of the tubes, apparent OD copper deposits on R30C15 and R29C16, and very minor "dents" at the backside of tube sheet on tubes R30C15, R30C16, R29C16, and R29C15. The "dents" were lift-off type signals with OD constriction estimated to be 1 MIL or less.

The inspector reviewed in detail the QC inspectors log book which describes the activities during the maintenance outage. It appears to adequately cover the work. The inspector also interviewed some of the QC personnel involved in the tube leakage-repair. The licensee QA involvement was also reviewed and found to be acceptable. The QC involvement was thorough.

During the next scheduled outage (May 1984) the licensee will visually inspect the bundle periphery and will consider profilometry on the tubes EC tested during the tube leakage outage if the geometry of the head permits this examination.

No violations were identified.

3.0 Steam Generator Tube Degradation History

The inspector reviewed the histroy of tube degradation in the four IP2 steam generators. Prior to service, Westinghouse plugged the entire first row (smallest radius) tubes due to potential damage caused by repairs made to the partition to tube sheet cladding attachment. This inadvertently increased the reliability of the steam generators by removing the heat

flux on these tubes which mimimized later denting induced hour glassing of flow slot in the tube support plates and removed from service the most highly stressed return bends. If these pre-service tube plugs are discounted from the total plugged tubes removed from service, the corrosion related plus precautionary plugging averages around 1%. Considering the length of service and phosphate to hydrazine water chemistry change, the condition of the steam generators must be rated on a relative basis as being healthy.

No violations were identified.

4.0 System Upgrading to Improve Steam Generator Performance

The inspector reviewed the licensee actions taken to upgrade the steam cycle and water chemistry to mitigate corrosion related tube degradation. The #26 HP feedwater heater (FWH) bundles in all three heater strings (which were originally tubes with 80-20 Cu-Ni) were replaced (in October 1982) with austenitic stainless steel to limit copper alloys which could contribute copper corrosion products to the sludge pile. The LP FWH's (#24 to #21) remain arsenical admiralty. Replacement of these LP heaters with stainless steels is being evaluated for future action.

The 90-10 Cu-Ni moisture separator reheater bundles were replaced at the October 1982 outage with 439 ferritic stainless steel bundles. This will also cut down on the available copper and will improve LP turbine and condenser efficiency.

The admiralty brass condenser continues to suffer minor tube leakage reportedly due to ID to OD circumferentially oriented stress corrosion cracking in the roll transition area. Current condenser leakage analysis methods include 24 hour flame photometer readings from the six hot wells monitoring Sodium (Na). The condenser condensate usually runs about 0.5 ppb Na. A rise in Na is more sensitive than conductivity changes and is reported by operations personnel to chemistry for increased analysis and triggers isolation and plugging of leaking tubes. The highest permitted Na is 4 ppb. Mechanical tube plugging methods have been well controlled and have been very successful with no plug leakage observed.

The licensee is evaluating a very sensitive liquid ion chromatograph for laboratory analysis of sulfates, very low levels of chlorides and organic carbon peaks. Since 1980 the make up system employs a string of water cleanup systems including cation resins, degassification, anion resins and a mixed bed demineralizer with inline analysis using Na control. The licensee is considering adding carbon filters in 1985.

Since 1978 the licensee has been utilizing boric acid additions to the feedwater which is maintained to 5-10 ppb in the blowdown to minimize denting corrosion reactions.

The location of the hydrazine addition has been changed to the turbine hood sprays to provide for longer residence time for oxygen removal and to permit better evaluation of the location of air-in-leakage than was possible with hot well additions.

The licensee is evaluating high temperature strong magnetic field filtration equipment on a specially designed 200 gallon/minute slip stream circuit. This equipment appears capable of removing 99.9% of the Fe and 87% of the copper in the small volumes being treated.

The licensee is evaluating retubing the surface condenser with Titanium tubes and tube sheets to further eliminate sources of copper to the feedwater, not specifically to eliminate the tube failures. Stainless steel replacement bundles are also being considered for the LP FWH's.

The inspector reviewed records indicating the sludge volumes decreased from 1980 to 1982. The sludge average in 1982 was approximately 72% of that of 1980.

The copper content of the sludge is decreasing. It was 31% in 1978 and was 20% in 1982. The lower sludge and copper content demonstrate that the oxygen control is improving. It is reported to be averaging approximately 8 ppb.

The feedwater pH is maintained at 8.8 which sacrifices Fe to minimize Cu. The rate of increase in tube support plate denting has decreased, but denting continues.

The licensee meets the steam generator owners guidelines for startup and power operation as applicable to the site specific design configuration limitations.

No violations were identified.

5.0 Review of Data Collected

The inspector discussed in detail his technical concerns about the uncertainties related to the tube leakage event. The tube that leaked did not follow any of the failure morphology characteristics of the "generic" failures. The axial location of the back side of the tube sheet in a peripheral tube does not appear to be in a normal "corrodant" environment, however, the leakage characteristics were most typical of a corrosion related tube degradation problem. The eddy current examination appeared to produce satisfactory evidence that there was not a foreign object fretting problem (the leakage characteristics also did not suggest this). Other unusual data was the EC report of very minor denting in a few tubes in the (peripheral) leakage area. While back-of-the-tube sheet denting has been reported in other steam generators, it has been confined to the sludge area in most cases and is not expected in the peripheral area. The licensee has committed to a thorough "visual" inspection of the periphery

of the bundle at the next scheduled outage and committed to evaluate the potential advantages of removing the mechanical plug to permit further fiber optics inspection of the leakage area.

No violations were identified.

6.0 Exit Interview

The inspector met with licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on March 1, 1984. The inspector summarized the scope and findings of the inspection. No written information was given to the licensee by the inspector during the course of the inspection.