U. S. ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS
REGION I

RO Inspection Report No. 50-247/72-08

Subject: Consolidated Edison Company

Indian Point 2 License No. DPR-26

Location: Buchanan, New York Priority

Category B

Type of Licensee: PWR (873 Mwe) Westinghouse

Type of Inspection: Special, Announced

Dates of Inspection: May 26 & June 2, 8, and 15, 1972

Dates of Previous Inspection: April 29 & May 8 & 9, 1972

Principal Inspector: _____ 7/7/72
G. L. Madsen, Reactor Inspector Date

Accompanying Inspectors: E Brunner for _____ 7/7/72
L. Beratan, RO:HQ (6/8 & 15/72) Date

_____ _____
Date

Other Accompanying Personnel: E Brunner for _____ 7/7/72
R. Lofy, Parameters, Inc. Date

Reviewed By: E Brunner _____ 7/7/72
E. J. Brunner, Chief, Reactor Testing & Startup Br. Date

Proprietary Information: _____

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Enforcement Action

None

Licensee Action on Previously Identified Enforcement Matters

None

Unresolved Items

Inspection of the fuel assembly rod guide tubes revealed undersized conditions and internal surface scoring. (Paragraph 2)

Status of Previously Unresolved Items

A. Control rods failed to operate in accordance with design during preoperational rod drop testing. Corrective actions relating to these malfunctions is in progress. (Paragraph 1 & 2)

B. The eight accumulator valves received a partial overlay to obtain acceptable thickness. This subject is still under review.

C. The Contingency Plan implementation. No change.

D. Resolution of two radioactive waste system deficiencies. No change.

E. Dynamic analysis of a "full blow" condition for the main steam safety valves disclosed a potential overstressed condition. Corrective actions are in progress.

F. The residual heat exchangers developed tube leaks. Clarification of code data sheets has not been completed.

Design Changes

None

Unusual Occurrences

None

Persons Contacted

Consolidated Edison Company

Mr. W. Cobean, Manager Nuclear Power Generation
Mr. J. Coulch, Indian Point Station Manager
Mr. J. Makepeace, Chief Engineer, IP-2
Mr. W. Monti, Assistant Superintendent Operations, IP-2
Mr. M. Shatkowski, Reactor Engineer

Westinghouse

Mr. R. Schrieber, WNFD, Manager Fuel Design
Mr. W. Werber, WNES, Drive Line and Instrument Engineer
Mr. R. Marmo, WNFD, Principal Engineer

Wedco

Mr. R. Barclay, Manager Operations
Mr. D. Anderson, Vice President, Construction

Management Interview

The following subjects were discussed:

A. Fuel Assemblies

The inspectors indicated a concern relative to possible reversion of the dashpot to the pre-expanded dimensions, when subjected to normal operating conditions. The inspectors were informed that the dimensional repair procedure qualification provided a representative condition. Additionally, the inspectors questioned the degree of conservatism included in the repair qualification, in that the wall thickness of the tubing used was somewhat thinner than the dashpot wall thickness at IP-2. The inspectors were informed that Westinghouse metallurgists had considered this and provided an opinion that the approach used was indeed conservative.

The inspectors stated that a repair program for the rework of the internal surfaces of the guide thimbles was needed. Mr. Makepeace indicated that this is planned; however, the nature of the problem to be corrected has not been fully determined.

B. Control Rods

The inspectors indicated some concern relative to the surface condition of the rodlets following rework and was informed that the intent is to return the surface condition to the initial design condition smoothness.

Upon questioning the inspector was advised that a repeat of the entire preoperational rod drop testing program is planned.

C. Schedule

Mr. Makepeace indicated that the control rod and fuel assembly rework has caused readiness for initial criticality to be delayed until August 1, 1972.

D. Report to Licensing

Mr. Makepeace stated that Con Ed plans to issue a report to Licensing pertaining to the control rod malfunctions and the rework activities on the control rod and fuel assemblies.

Section II

Additional Subjects Inspected Not Identified in Section I, Where No Deficiencies or Unresolved Items Were Found

None

Details of Subjects Discussed in Section I

1. Control Rods

As previously reported*, control rod malfunctions were encountered during preoperational control rod drop testing. Subsequently, the reactor vessel head was removed to facilitiate an examination to determine the cause for these malfunctions. On May 26, 1972 the inspector was informed that initial observations and proposed actions included the following:

a. Core Location H-10

The control rod for core location H-10 was observed to be extending some 40 inches out of the reactor. Upon inspection, one vane of the rod assembly spider was found to have separated from the spider hub. Following removal of the entire control assembly from the reactor, the presence of a metal object was observed on the third card from the top (total of 9) of the upper core internals guide assembly. The metal object was recovered and was determined to be type 316 material and is believed to be casting material from the fabrication machining associated with the reactor coolant pump castings. Con Ed indicated that the metal object (4" x 0.4" x 0.070") caused the spider body to vane braze failure because of the rod drop impact. Additionally, it was reported that the other rodlets of the control rod assembly showed some distortion. This distortion is believed to have caused the rod to stick. The upper internal guide assembly and control rod assembly was scheduled for replacement.

b. Core Location N-7

Heavy linearly oriented scuffing of the bottom of one rodlet of the control rod assembly was observed. Borescoping of the associated fuel assembly rod guide thimble revealed no indication of jamming or debris; however, surface scoring of the guide thimble dashpot (lower end) was observed. Con Ed indicated that these findings implied that preferential

*RO Report No. 50-247/7206, Paragraph 10.

friction in the fuel assembly dashpots caused the control rod spider to "heel" and result in surface roughening of the control rodlets and the guide thimble dashpot. The control rod assembly was scheduled for replacement and the associated guide thimbles were scheduled to be reworked.

c. Core Location K-2

The same conditions were observed as for core location N-7; except, the severity of the surface roughening was considerably greater on one rodlet. The severe surface roughness was observed to be on the lower 19 inches of the rodlet and covered the entire circumference. This condition was believed to be associated with insufficient clearance in the guide thimble dashpot area.

The control rod assembly and guide thimble were scheduled to be polished and the upper internals guide assembly was scheduled for close examination. The associated fuel assembly was designated for use in non-control rod locations only.

d. Core Location G-5

Inspections revealed indications of control rod assembly jamming by a foreign object. A light marking pattern was evident over the entire length of one rodlet. The foreign material was not physically identified or retrieved. The control rod assembly was scheduled for replacement and the associated upper internals guide assembly was scheduled to be reworked.

e. Foreign Objects

Inspection of the upper internals revealed one additional metal fragment (1" x 5/8" x 0.050"), which had the appearance of a metal turning. This fragment was located on the lower ledge of the upper internals and was not in contact with a rod assembly.

f. Additional Proposed Actions

As a result of the above findings the following actions were scheduled:

(1) Inspection and rework of all control rod drives.

(2) Inspection and smoothing of the surfaces of all control rod assembly rodlets.

(3) Borescoping and rework surfaces of the upper internal guide assembly. Subject the upper internals package to a high pressure water flush.

On June 2, 1972, I&E representatives observed the condition of control rod assemblies which were being inspected and reworked in the fuel storage building. The surface of several rodlets were observed to have surface blemishes. These surfaces were being smoothed with emery cloth. The inspectors were informed that the initial surface condition would be attained. Additionally, the inspectors were informed that the rodlet tip sections were being checked with a six inch long plug gauge with a 0.4435 inch diameter and the rodlet diameters would be checked. The rod specification includes the following:

Diameter of rodlets - 0.438 to 0.440 inches.
Maximum tip weld diameter - 0.443 inches.

Westinghouse personnel indicated that all findings relative to the various dimensional measurements and corrective actions would be documented.

During a subsequent visit the inspector verified that the control assemblies for core locations H-10, N-7 and G-5 were to be replaced. A review of records for the remaining 50 control and shutdown rod assemblies revealed the following:

a. Inspection findings for the rodlet surfaces shows that about 68% of the rodlets required rework. The degree of surface scoring was classified as follows:

Degree of Scoring	% of Rodlets
Severe	1
Medium	4.
Light	64
None	31

Records indicate that these surface conditions were removed with emery cloth.

b. Inspection of the rodlet tips with a 0.4435 plug gauge revealed that about 5 percent of the rodlets had diameters greater than the 0.443 design maximum. Discussions indicated that these rodlet tips did not show evidence of wear or scoring. Records indicate that the rodlet tips were dressed to bring diameters within design specifications.

c. Measurement of the rodlet tubing external diameter after rework indicates that the dimensions were within the design range of 0.438 to 0.440 inches, with the exception of two rodlets which had diameters near 0.437 inches. These conditions were evaluated by Westinghouse and Con Ed design engineers and were declared acceptable.

Discussion revealed that drag tests of the control assemblies were conducted following completion of the above repairs and withdrawl forces were ranging between 174 and 179 pounds. (Design allowable delta pressure - 20 pounds.)

2. Fuel Assemblies

As a result of the control rod assembly findings*, Con Ed and Westinghouse initiated an inspecton of the four fuel assemblies associated with core locations H-10, K-2, N-7 and G-5. Borescoping of the rod guide thimbles revealed no foreign material; however, the thimble tubes had surface markings, especially in the dashpot (lower) section. An air gauge was utilized for measurement of internal diameters of the dashpots. The inspector was informed that these measurements confirmed that the internal dimensions were less than the minimum design of 0.4525 inches in the dashpot. As a result of this finding Con Ed and Westinghouse concluded that an inspection of all fuel assemblies was appropriate. Movement of the fuel assemblies from the reactor vessel to the fuel storage building was initiated on May 26, 1972. The procedure for movement of the fuel assemblies was reviewed by the inspector. The procedure incorporates the initial core loading requirements and precautions with a revised movement sequence. The procedure had been approved for use. No deficiencies were identified. Additonally, the inspector verified that approved procedures were available for the fuel assembly inspection activities at the IP-2 site.

During a subsequent visit the inspectors were informed that 60 additional fuel assemblies were inspected. This inspection indicated that about 30% of the guide thimble dashpots contained undersize conditions. The inspectors were informed that the undersize condition was centered around the fuel assembly grid plate which is located about six inches from the top of the dashpot. Westinghouse personnel indicated that the undersize condition was caused by the attachment of grid plate tabs to the outer surfaces of the dashpots by spot welding. Upon inquiry the inspectors were informed that the deformation of the dashpot tubing was controlled during weldment of the grid

*Paragraph No. 1 of this report.

tabs by placing a 0.453" brass "chill" inside the tubing at the grid plate location. Additionally, the inspectors were informed that final checks of the dashpots at the fabrication shop included:

a. Checking with an 0.447" concentrity gauge
b. Checking with an 0.451" pin gauge
c. Some number of fuel assemblies subject to a control rod assembly drag test.

As a result of the above, Westinghouse prepared a repair procedure which was evaluated and approved by Con Ed. The repair program includes the following steps:

a. Eduction of water from the guide thimbles using a vacuum pump. Monitoring of the educted water for foreign material was included.

b. Checking of the thimble dashpot sections with a 0.452" burnishing tool. (Tungsten carbide head)

c. If general restrictions were found the burnishing tool was moved in an up and down direction to clear the restrictive conditions.

d. If the restriction remained a manual expansion tool was to be utilized and a recheck of the dashpots with the 0.452" burnishing tool was to be performed.

e. Data sheets were provided for documenting the inspection and repair actions.

Upon inquiry the inspectors were informed that the repair procedure was qualified at the Westinghouse (Cheswick) Fuel Fabrication Shop and was witnessed by Con Ed personnel. The procedure qualification consisted of:

a. Attachment of grid tab welds to 15 tube sections, using an undersize copper "chill". ~~Dimensional~~ Dimensional measurements revealed that the internal diameter was reduced from 0.453" to 0.446".

b. The tubes sections were then expanded using the manual expansion tool. Resulting internal diameters were 0.450" to 0.451".

c. The tube sections were placed in an autoclave at 560°F.

d. Subsequent measurements indicate diameter reductions to be less than 0.001 inch.

The inspectors were informed that based on the results of this qualification the revision of the expanded area during plant operation was not considered to be a problem.

A records review revealed that the initial repair program (burnishing and expansion) for the 193 fuel assemblies was completed. The records indicated the following:

a. Less than one percent of the dashpots required manual expansion.

b. About 18% of the dashpots were reworked using the burnishing tool.

c. Fuel assemblies A-06, A-18, A-39 and C-25 were declared unfit for use in conjunction with a control rod assembly.

Subsequent to the above mentioned fuel assembly repair program, a sample borescopic examination of the rod guide thimble internal surface was initiated. Four of 20 guide thimbles were being examined. The selection of guide thimbles to be examined was based on the following order of priority:

a. Guide thimbles whose associate rodlet showed medium to severe surface scoring.

b. The remainder of the 4 of 20 per assembly were selected on a random basis.

c. If more than 4 rodlets for a fuel assembly had medium or severe scoring the sample size was increased to include all guide thimble associated with medium to sever scoring conditions.

The sample examination of 12 fuel assemblies revealed the presence of surface scratching, metal galling, and conditions that had the appearance of weld splatter, in all thimbles inspected. The inspectors asked if the 4 of 20 guide thimble borescopic examination had a statistical significance, how examination results were to be used as a basis for rework, and if a formalized repair program was available. After considerable discussion, the inspectors were informed that the sample audit provided qualitative data only, present efforts were directed towards inspection, and that a formalized repair program will be prepared once the nature of

the problem has been defined. Additionally, Con Ed stated that two fuel assemblies (A-06 and A-34) were being returned to the fabrication shop for examination and evaluation. Additionally, it was stated that some of the rod guide thimbles for one of these assemblies were scheduled to be removed and sectioned to facilitate inspections. Some of the guide thimbles are to be utilized for the qualification of a repair procedure.

3. Reactor Coolant System

As a result of the control rod drive malfunctions, Westinghouse and Con Ed* decided that the reactor coolant system would be inspected for foreign material. The inspector was informed that detailed inspection procedures and data sheet are being prepared. Present plans include:

a. Removal of the reactor coolant water from the system.

b. Visual inspection of the reactor vessel; reactor loop piping; reactor coolant side of the steam generators; and the upper and lower core internals.

4. Upper Core Internals

Discussion with personnel revealed the upper core internals guide assembly for core location H-10 has been replaced. Additionally, the remaining guide assemblies were borescoped and repaired to a condition equal to original requirements.

*Paragraph No. 1 of this report.