U.S. NUCLEAR REGULATORY COMMISSION
REGION I

INDIAN POINT NO. 2 NUCLEAR POWER STATION
REFUELING/STARTUP PHYSICS TESTING INSPECTION

REPORT NO.	50-247/93-06
DOCKET NO.	50-247
LICENSE NO.	DPR-26
LICENSEE:	Consolidated Edison Company of New York, Inc. Broadway and Bleakley Avenue Buchanan, New York 10511
FACILITY NAME:	Indian Point 2 Nuclear Power Station
INSPECTION AT:	Buchanan, New York, on March 16-26, and April 12-16, 1993
INSPECTORS:	Michael Buckley, Reactor Engineer Brenda Whitacre, Reactor Engineer

LEAD INSPECTOR: _____ 5/20/93
Daniel T. Moy, Reactor Engineer — Date
Systems Section, EB, DRS

APPROVED BY: _____ 5/24/93
Dr. P. K. Eapen, Chief — Date
Systems Section, EB, DRS

DETAILS

1.0 INSPECTION SCOPE

This announced safety inspection was conducted to: (1) verify that the licensee's refueling and low physics startup activities were consistent with NRC regulations, and (2) assess the ongoing development and implementation of the licensee's actions in response to NRC Generic Letter 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance".

Indian Point, Unit 2, was shutdown on January 30, 1993, for its refueling outage. The refueling activities inspection was conducted on March 16-26, 1993 and the startup physics test inspection was conducted on April 12-16, 1993.

The refueling inspection verified that the refueling operations were conducted safely in accordance with licensee's technical specifications. In addition, the inspectors examined the licensee's response to industry issues such as criticality monitoring, refueling shutdown margin, decay heat removal issues, and inadvertent removal of fuel assemblies during lifting of the upper internals. Licensee/vendor interface was observed to verify adequate supervision by the licensee of the vendor's safety-related work.

The inspection of startup testing involved the review of test procedures, witnessing of testing activities, and review of test results. The activities reviewed were power distribution and hot channel factor determination, control rod worth measurement, isothermal temperature coefficient, and low power startup physics testing. The objective of this inspection was to verify that special tests were being conducted in a safe and controlled manner and that test results were consistent with Final Safety Analysis Report (FSAR) assumptions.

The inspection of Generic Letter 89-10 reviewed the licensee's continuing actions for the testing and surveillance of motor-operated valves (MOVs).

2.0 REFUELING TECHNICAL SPECIFICATIONS

Indian Point 2 Technical Specification, Section 3.8, "Refueling, Fuel Storage and Operations with the Reactor Vessel Head Bolts Less Than Fully Tensioned," provides the requirements for core alterations. These requirements are to minimize the probability and consequences of a fuel handling accident. Selected surveillance requirements were reviewed by the inspector to assure the licensee was conducting refueling activities in accordance with the technical specification requirements.

The licensee uses System Operating Procedure 17.31, Revision 6, "Refueling Operating Surveillance," to assure that all applicable technical specification surveillance requirements have been completed prior to moving fuel. The completed Operating Procedure 17.31 for the reload was reviewed and was acceptable. The inspector reviewed and verified several technical specification surveillance tests completed in the procedure as described below:

- TS 3.8.B.2, Boron Concentration, requires greater than or equal to 2000 ppm boron concentration or a shutdown margin of 5% delta K/K (ΔK/K). The inspector verified that the boron concentration to maintain subcritical by 5% ΔK/K was 1706 ppm using data supplied by Westinghouse. The boron concentrations in the refueling canal and reactor cavity were measured daily and were recorded in the control room. The boron concentrations on March 19 and March 23, 1993, were 2140 ppm and 2135 ppm respectively. The inspector concluded that this surveillance was conducted in accordance with the technical specification requirements.

- TS 3.8.B.3, Communication, requires that direct communication be maintained between the control room and the refueling cavity manipulator crane on the refueling floor. During core alterations, the inspector observed that communications among the manipulator bridge, control room core monitor and fuel storage operator personnel were established. The inspector noted that the communications monitored were conducted in a clear and professional manner.

- TS 3.8.B.5, Dead-load Test Analysis, requires a dead-load test be performed on the spent fuel pit bridge refueling crane before fuel movement begins. The tested load must be equal to or greater than the maximum load that the crane would carry during the refueling operation. The inspector reviewed licensee's surveillance test, PT-EM16, Revision 0, "Spent Fuel Pit Bridge Refueling Crane," and verified that the crane was adequately tested.

- TS 3.8.B.7, Radiation Levels, requires spent fuel storage area radiation levels to be monitored continuously during the spent fuel movement. The inspector verified that this surveillance requirement was satisfied.

- TS 3.8.A.4, Reactor Water Level, requires that both residual heat removal (RHR) heat exchangers are operable, with at least one in operation, when water level is less than 23 feet above the top of the reactor vessel flange during refueling. The inspector verified that the water level was greater than 23 feet above the top of the reactor vessel flange. The inspector also verified that one of the RHR heat exchangers was ready for operation if needed.

3.0 REFUELING SHUTDOWN MARGIN

During core loading operation, plant technical specifications provide requirements for maintaining adequate shutdown margin. Technical Specification 3.8.3 requires the minimum boron concentration to be the more restrictive of either ≥ 2000 ppm or that which is sufficient to provide a shutdown margin of ≥ 5% ΔK/K, whenever fuel is being loaded or unloaded from the reactor vessel. The inspectors met with Westinghouse personnel to discuss the methodology for calculation of shutdown margin for the new core configuration. Westinghouse completed the calculations using an NRC approved reload computer model (LTR 9272 Topical Report), with specific requirements given by the licensee (type of fuel,

power output and technical specification requirements). Using these parameters an optimal core configuration is determined. Results indicated that a boron concentration of 1706 ppm (based on a conservative reactor coolant temperature of 68°F) is required to bring the plant from 100% power to cold shutdown. The inspector reviewed the input parameters and assumptions used in the determination of the shutdown margin and found them to be acceptable.

4.0 CORE PHYSICS MONITORING DURING REFUELING

4.1 Use of Source Range Nuclear Instrumentation During Refueling

During the refueling process, one of two permanently installed nuclear instrumentation source range detectors, channel N31, failed. Technical Specification Section 3.8 requires that a minimum of two source range neutron flux monitors be operating, each with continuous visual indication in the control room, and one audible indication in the containment and control room during refueling.

As a replacement for the failed source range detector, a spare (Appendix R source range detector) was installed at 90°. The permanent installed source range monitors are located on the 0-180° vessel axis as are the in-core sources. The spare source range detector is located on an axis perpendicular to those permanent sources. Because of the failed source range monitor N31, all reload sequences were changed from 0 and 180° configuration pattern to 0 and 90° pattern. The core reload resumed and technical specification requirements were met using the permanent source range N32 and the spare monitor at 90°.

The inspector interviewed Westinghouse technical personnel to ensure that the Westinghouse reload guidelines for coupling the fuel were implemented into the refueling procedure. No unsafe or unacceptable conditions were identified by the inspector.

In addition to the above, the inspector reviewed the safety evaluation No. NS-2-78-018, dated February 10, 1978, for using spare wells as source range detectors. The purpose of this safety evaluation, as stated by the licensee, is to eliminate the need to drain down to repair the presently installed source range monitors should they fail during refueling. The safety evaluation was technically adequate per 10 CFR 50.59 requirements.

4.2 Core Map

Following the completion of the core reload, a "core map" is performed to verify that the fuel assemblies were properly aligned and located in their designated positions. The core map is performed by visually verifying fuel assemblies identification numbers and insert types, using underwater cameras. The inspectors independently verified the core loading by viewing video tapes made during the core map verification. The inspector verified that the fuel assemblies had been loaded to their proper locations and the fuel assembly inserts were correctly installed.

4.3 Temporary Procedure Changes for Refueling Activities

The inspector reviewed several temporary procedure changes (TPCs) for refueling activities. The inspector noted that eight (8) out of twenty (20) refueling TPCs were not consistent with the licensee's maintenance administrative directive procedure (MAD-4, Rev.20). These inconsistencies included missing markups and missing signature/date.

Although these changes did not affect equipment operability or system safety, the discrepancies indicate a lack of attention to details in the area of administrative controls. The licensee immediately corrected these omissions. A memo was issued on April 27, 1993 to the staff to reinforce the requirement to follow MAD procedures for making procedure changes.

5.0 RELOAD SAFETY EVALUATION ANALYSIS FOR CYCLE 12

The inspector reviewed 10 CFR 50.59 Safety Evaluation (RSE) for IP-2 cycle 12, dated March 1993. The inspector selected for review, on a sampling basis, nuclear kinetics parameter characteristics, and found them to be technically adequate.

6.0 UNIT 2 CYCLE 12 STARTUP TESTING ACTIVITIES

The startup test program was conducted according to startup physics test program, RFE-S-16, 013, Rev. 10 dated 4/13/93. This test procedure outlines the steps in the test program, sets initial conditions and prerequisites, specifies calibration or surveillance procedures at appropriate points in the sequence and references detailed test procedures and data collections in the appendices.

The inspector reviewed and observed the following procedures and startup activities:

- Initial criticality, RFE-S-16.007, Rev. 9
- Control rod worth measurement, RFE-S-16.009, Rev. 9
- Isothermal temperature coefficient, RFE-S-16.008, Rev. 9
- Power distribution and hot channel determination, RFE-S-16.002, Rev. 7

The inspector verified that the test procedures were technically adequate and the test results met technical specification requirements.

6.1 Licensee Startup Operating Briefing

The inspector attended the startup briefing conducted by the general manager of technical service and the reactor fuel manager. During the briefing, the core physics manager reviewed the procedure, precautions and safety issues in detail. The inspector observed excellent communication between the core physics and operations staff during the startup activities.

6.2 Quality Control of Refueling Activities

The quality control department has developed a surveillance program for refueling activities (QA procedure, QA-714-1, dated 8/6/91). This surveillance program consists of observations checklists for each task performed during the refueling. The checklist includes the control of the tasks, housekeeping, safety, material and ALARA.

The inspector reviewed the following surveillance reports, completed during the refueling:

Surveillance Report Nos.
- 93-SR-002 Plant Shutdown
- 93-SR-012 Reactor Head Removal
- 93-SR-018 Reactor Internal Lift
- 93-SR-024 Core Reload
- 93-SR-029 Interim Upper Internal Assembly Removal
- 93-SR-037 Startup Activities (draft dated 3/29/93)

The inspector concluded the quality control department made good observations during refueling activities. Concerns identified during these surveillances were resolved in a timely manner.

7.0 MOTOR-OPERATED VALVE TESTING AND SURVEILLANCE

The inspector reviewed the licensee's methodology for performing design-basis diagnostic testing of safety-related MOVs. The licensee uses general procedures for setting up an MOV prior to testing and to perform static testing. A specific test procedure is used for dynamic testing of the valves in the Generic Letter 89-10 program. The operations department has worked with technical support to ensure that the conditions of dynamic testing reflected the design-basis differential pressure under maximum flow.

The inspector observed the dynamic testing of MOV 1810 on February 23, 1993. This valve was overthrusted in the open direction. The valve had a thrust limit of 8593 lb. for the valve hold down bolts. The measured total thrust on the valve was 10,906 lb. during the static test. The valve was subsequently evaluated to be undamaged and declared operable on April 4, 1993.

The licensee's Motor Operated Valve Evaluation (MOVE) software manual was reviewed by the inspector to determine if customer service bulletin 92-06 warning of an error regarding thrust/torque multipliers found in version 3.1 of the software had been properly addressed. The licensee took appropriate action by including the service bulletin in the manual, evaluating the effects of the possible error at IP-2, and limiting access to the multiplier portion of the software.

The inspector concluded that the licensee is continuing the implementation of the MOV program through effective design-basis testing.

8.0 CONCLUSION

In summary, the inspector concluded that the observed refueling and low power physics startup activities were conducted safely and that the procedure was good. However, during the refueling activities, several temporary procedure changes were not implemented according to maintenance administrative procedures. Although these TPC changes did not affect equipment operability or system safety, the failure to follow maintenance administrative procedures indicates the need for increased attentiveness in the area of administrative control.

The inspector noted a continuation of the trend of improvement in the implementation of the licensee's MOV program. Requirements of Generic Letter 89-10 continue to be adequately satisfied, with the exception of the test control concern discussed in Section 7.0 of this report.

9.0 EXIT MEETING

The inspector met with those denoted on Attachment A on April 29, 1993 to discuss the preliminary inspection findings as detailed in this report. The licensee did not indicate that this inspection involved any proprietary information. With the exception of the test Control Concern discussed in Section 7.0 of this report.

ATTACHMENT A

Refueling Startup Inspection

PERSONS CONTACTED

ConEdison of New York

*Anthony Adinofi	Maintenance Manager
*Michael A. Whitney	NS&L/Sr. Engineer
*Michael J. Spall	Public Affairs/PIO
*Melissa Driscoll	Reactor & Fuel Engineering Manager
*Michael L. Miele	Tech Serv./Gen. Mgr.
*Stephen B. Bram	Vice President - Nuclear Power
*John McAvoy	NPG/Operations Manager
*Steve Quinn	NPG/Gen. Manager
*Charles W. Jackson	Manager/NS&L
*Arthur P. Ginsberg	NS&L/Principal Eng.
*V. G. Mullen	Chief Plant Engineer
*G. Hugo	Tech Spt./TTP
*Mary Stauber	Tech. Svcs/Specialist
Charles Limoges	Principal Reactor Engr./R&FE
Charles Laverde	System Engr./PE
Jeffrey Lomm	Project Engr./PEN
Will Duncan	MOV Engineer/PE
James J. Maylath	Sr. Engr./NS&L
Pedro J. Franceshi	Sr. Engr./NS&L
Bob Eifler	MOV Program Mgr./Tech Services
Joe Goeber	Outage Mgr./NPG
John Beck	EQ Engineer
Joseph Bahr	NS&L/Acting Mgr.
Robert Fifleic	MOV Program Manager/TS

U.S. Nuclear Regulatory Commission

*G. Hunegs	Senior Resident Inspector, IP-2
L. Scholl	Acting Resident Inspector, IP-2

* Denotes those personnel attending the exit meeting on April 29, 1993.