

LICENSEE EVENT REPORT

CONTROL BLOCK: (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

LICENSEE CODE NYIP S2 00-00000-000 411111

REPORT SOURCE L 050002477030281050881

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES

As a result of an investigation the source of the loose objects retrieved from the reactor during refueling was determined to be the RCP-24 labyrinth seal ring and mounting bolts. The missing ring did not affect performance of RCP-24 nor did the loose objects adversely affect components of the primary system. Future operation has been evaluated and safe plant operation will not be affected.

SYSTEM CODE CB CAUSE CODE E CAUSE SUBCODE B COMPONENT CODE PUMPX COMP. SUBCODE B VALVE SUBCODE Z LER/RO REPORT NUMBER 81 EVENT YEAR 81 SEQUENTIAL REPORT NO. 006 OCCURRENCE CODE 01 REPORT TYPE T REVISION NO. 1 ACTION TAKEN C FUTURE ACTION Z EFFECT ON PLANT Z SHUTDOWN METHOD Z HOURS 0000 ATTACHMENT SUBMITTED Y NPRD-4 FORM SUB. N PRIME COMP. SUPPLIER N COMPONENT MANUFACTURER W120

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS

The most likely cause of the failure of the RCP-24 labyrinth ring/mounting bolts is an overload condition (most probably in shear) following entry of foreign material into the small gap between the ring and the RCP impeller. This pump has been replaced.

FACILITY STATUS H % POWER 000 OTHER STATUS N/A METHOD OF DISCOVERY C DISCOVERY DESCRIPTION Special Internals Inspection

ACTIVITY CONTENT RELEASED OF RELEASE Z AMOUNT OF ACTIVITY N/A LOCATION OF RELEASE N/A

PERSONNEL EXPOSURES NUMBER 000 TYPE Z DESCRIPTION N/A

PERSONNEL INJURIES NUMBER 000 DESCRIPTION N/A

LOSS OF OR DAMAGE TO FACILITY TYPE Z DESCRIPTION N/A

PUBLICITY ISSUED N DESCRIPTION N/A

ATTACHMENT

Docket No. 50-247

Consolidated Edison Co. of N.Y., Inc.

LER-81-006/01T-1

Indian Point Unit No. 2

During the Cycle 4/5 refueling outage, a number of loose objects were retrieved from the lower portion of the reactor vessel. An extensive inspection of the primary system, including the area of the energy absorbing device in the reactor vessel, was then performed revealing no additional loose objects. An evaluation of the possible sources of these objects indicated the most likely source to be a reactor coolant pump (RCP) labyrinth seal ring and mounting bolts. The labyrinth ring is attached to the bottom of the RCP thermal barrier by sixteen mounting bolts.

In order to confirm that a RCP was the source of the loose objects, a review of past pump performance including pump vibration data for all the RCP's was undertaken. Based on a review of pump operational data, RCP No.s 21 and 24 appeared to be the most likely candidates although no abnormal characteristics were found on either pump. The present RCP No. 23 was not placed into service until 1977, and its seal ring was intact at that time. RCP No. 21 was disassembled first. The labyrinth ring on this pump was found to be intact. RCP No. 24 was disassembled next. An inspection of its internals revealed the labyrinth ring to be missing. This pump has been replaced.

Several of the loose objects retrieved from the reactor vessel were delivered to Southwest Research Institute (SWRI) for chemical, metallographic and radiochemical analysis to establish the source of the objects. The SWRI results indicate that the objects are 304 stainless steel which is the specified material of the RCP labyrinth ring and mounting bolts. Furthermore, on the basis

of chemistry, hardness and grain structure, all the flat objects analyzed appear to have come from the same part.

Westinghouse has completed a detailed investigation of the failure of the labyrinth ring and the mounting bolts from RCP No. 24. The Westinghouse investigation included detailed thermal and stress analyses, material chemistry and fractographic analysis. No evidence of fatigue failure was found.

Based on these investigations, it is concluded that the failure was due to an overload condition of the bolts, most probably in shear. This allowed the ring to come into contact with the impeller and be worn away over a period of time by the impeller until the ring was thinned to a point at which it broke into discrete pieces. The pieces entered the main loop piping when RCP No. 24 underwent seal maintenance during which time the rotating assembly was lowered on its back seat, thus opening the design gap between the upper hub of the impeller and the diffuser. The loose objects recovered were appreciably worn and it is probable that the remainder of the ring essentially disintegrated into fine particles which were dispersed into the primary system and were removed.

A loose object was detected shortly after the 1976 refueling which was subsequently retrieved during the 1979 refueling. A comparison of the analysis of that object with the analysis of the recently recovered objects indicates that it was from the same source. Therefore, the failure of the seal ring probably occurred prior to the 1976 Cycle 1 refueling outage.

Westinghouse has performed an analysis of the effects of loose objects in the reactor vessel. This analysis included:

-Evaluation of the possible effect of the largest recovered loose object impacting on the core barrel, thermal shield flexures and bottom mounted vessel instrumentation penetrations.

-Evaluation of the effects of unrecovered bolts becoming wedged between the energy absorbing device and the reactor vessel bottom during plant heatup.

An impact analysis was performed by Westinghouse assuming the largest recovered loose object traveling at the velocity of the coolant. The stresses resulting from postulated impaction on the core barrel, thermal shield flexures and/or bottom mounted vessel instrumentation penetrations were found to be within ASME code allowable limits.

Based on the Westinghouse heatup analyses, it is concluded that the plant can be heated up safely from cold shutdown to hot zero power. Using a special heatup procedure which considers heatup rates and RCS pressure, applicable ASME code stress limits would not be exceeded even assuming wedged bolts. The special heatup procedure will be followed until further evaluation shows it is no longer required.

During power escalation following hot zero power tests, neutron noise measurements will be carried out at different power levels to monitor the cantilever beam mode core barrel frequency. This will provide assurance that nothing is wedged between the energy absorbing device and the vessel bottom.

The thermal/hydraulic effects of local flow blockage due to potential loose objects has been evaluated and it is concluded that the blockage that could result would have no significant effect on subchannel enthalpy rise.

Additionally an analysis of the potential effects of a loose object positioned but not wedged, under the energy absorbing device during operation has been performed and it has been concluded that the plant can be operated safely.

Based on the visual, metallographic and analytical evidence described in this report, Con Edison has concluded the following:

- The source of the loose objects is the labyrinth seal ring and mounting bolts of Reactor Coolant Pump No. 24.
- The presence of the loose objects has not had an adverse effect on the primary system.
- Potential residual loose objects will not have any significant effect on the safe operation of the plant.