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LICENSEE: Jersey Central Power & Light Company

FACILITY: Oyster Creek Nuclear Generating Station

INTRODUCTION

On June 13 and 14, 1974, with D. Sellers of Technical Review, I visited the Oyster Creek site of Jersey Central Power & Light Company (JCPL) to investigate and discuss the leakage of primary coolant from around incore tube No. 05-28. The leak was discovered on May 28, 1974, during the present refueling outage of the facility when the reactor vessel was subjected to an 850 psi pressure test at 164°F. In an Abnormal Occurrence Report dated May 30, 1974, JCPL reported the measured leakage was 0.02 gpm under the above reactor pressure and temperature condition. Regulatory Operations reported the nature of this occurrence in a "Notification of an Incident or Occurrence" dated May 31, 1974. In a memo dated June 6, 1974, the lead responsibility for evaluation of the occurrence was transferred to the Assistant Director for Operating Reactors, Directorate of Licensing.

On June 13, 1974, Mr. Sellers and I examined records of incore tube weld inspections and repairs made in 1968, the procedures used during the repairs, and other information at the site relating to the area of the leak. On June 14, 1974, we met with J. T. Carroll, Jr., the plant superintendent, and Mr. L. Finney of General Electric Company (GE), who supervised the inspection and repairs performed in 1968.

DISCUSSION

Drawings of the incore tube installation and records of inspection and repairs of all incore tube welds performed in 1968 were reviewed at the site. Also inspection and repair procedures were reviewed. The incore tube is a nominal 2" O.D. 304 stainless steel tube that enters the bottom head of the reactor vessel through a 2" I.D. hole with about 10 mils diametral clearance between the tube OD and the hole in the reactor vessel. The inside surface of the reactor vessel around the penetration is machined to a "J" type weld preparation and is weld-buttered with inconel 182, about 1/4" thick, in the shop. The tube, which has a nominal wall thickness of 1/4", is inserted into the vessel and welded in the field with inconel

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182 T (low cobalt content). Several weld passes are required to build the weld to the specified thickness for strength. The completed tube installation extends about 12 feet below the reactor vessel head, terminating there in a flange, and extends through the core to the upper core grid terminating there as an open end. There are 69 such tubes penetrating the 8 3/4" thick bottom head of the reactor vessel, some of which are spares; incore tube 05-28 is a spare. Inspection and repair records show that the dye penetrant examination performed in 1968 indicated no defects in the field weld. The weld was ground smooth and only a small indication (~1/16") was found which was subsequently repaired by welding and grinding.

During discussions with J. Carroll and L. Finney on June 14, 1974, the possible reasons for the leak, the methods used to inspect, the degree of inspection and the proposed correction were discussed. Mr. Finney advised that slag resulting from welding inconel is very adherent and requires care to assure removal prior to welding succeeding layers of inconel. He postulated that random inclusions of slag may have joined in a tortuous path to form the small leakage path. This type of defect would not affect the required strength of the weld of the incore tube in the vessel. Tests utilizing reactor pressure and helium were performed to determine the location of the leak. These tests verified that the leak was not through the tube wall but was in the inconel weld joining the tube to the vessel. Examination by boroscope, eddy-current, and ultrasonic testing, in accordance with ASME Boiler and Pressure Vessel Codes Section XI, detected no defects in the walls of the tube nor in the weld. Based on these findings, JCPL proposed to expand the tube against the wall of the pressure vessel hole to stop the leakage. The tube would be expanded by rolling for a length of about 6 3/4 inches starting below the weld. This process was claimed to have been performed on the Senn reactor in Italy for the same type, but larger, leak in an incore tube weld about 8 years ago. We were advised that yearly inspections of the sealed area have verified the area to be leak tight. The tube rolling process has been used successfully for a number of years in other pressurized equipment. Furthermore, we were shown shop samples made from the mockups for verifying the process. After rolling the test specimen, it will be subjected to a hydro test of about 1250 psi to verify leak tightness following ten temperature cycles from ambient to 550F.

All incore thimble penetration areas have been inspected and shown to have no leakage nor spalling of the vessel paint as observed around the penetration for incore 05-28.

JCPL will submit a report for our review describing their corrective action.

John I. Riesland
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Directorate of Licensing

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