

DUKE POWER COMPANY  
OCONEE UNIT 2

Report No.: RO-270/76-15

Report Date: December 20, 1976

Occurrence Date: December 4, 1976

Facility: Oconee Unit 2, Seneca, South Carolina

Identification of Occurrence: Primary-to-Secondary System Leakage in "2B"  
Once-Through Steam Generator

Conditions Prior to Occurrence: Unit at 97 Percent Full Power

Description of Occurrence:

On December 4, 1976, air ejector vent monitor 2RIA40 registered an increase in radiation levels indicating a possible primary-to-secondary system leak. Subsequent sampling of the steam line and portable instrument readings confirmed that primary-to-secondary leakage was occurring in the "2B" once-through steam generator (OTSG) and within 10 hours a reactor shutdown was initiated. Approximately three hours later, reactor shutdown was completed and preparations were made to cool and drain the Reactor Coolant System and investigate for the source of steam generator leakage.

The Reactor Coolant System was cooled and drained within three days following the high radiation indication and an internal inspection of the "2B" OTSG was initiated.

Apparent Cause of Occurrence:

Eddy current testing revealed one leaking tube in the "2B" OTSG. The leaking tube, identified as number 23 in row 77, was examined by the use of fiber optics and was determined to have a circumferential crack on the inside of the tube near the interface of the tube with the bottom of the upper tube sheet. The crack extended approximately 270° of the tube's circumference. From the tube exterior, the fiber optic inspection indicated a small indentation. Around the indentation a white powder buildup, suspected to be boric acid, was noted.

Inspection of 133 adjacent tubes revealed no other defective tubes. A questionable signal was obtained during the eddy current testing of two of the other tubes inspected. The cause of the damage to the defective tube and the possible damage to the other tubes is undetermined.

Analysis of Occurrence:

Primary-to-secondary system leakage, resulting from this occurrence, was approximately 2½ gallons per minute (gpm) and was detected by installed

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radiation monitoring equipment. The leakage was within the operational limits of Oconee Technical Specification 3.1.6.1. In this instance, a reactor shutdown was initiated within approximately 10 hours after the initial leakage indication, following extensive sampling and monitoring of components and systems during this interval. The calculated gaseous activity released to the environment via the air ejectors was 1.23 curies. This amount is considered insignificant in comparison to the station's annual release limit.

In addition to the defective tube described in this report, three other leaks have been detected on the three Oconee units. Defective tubes were reported in Reportable Occurrence Reports RO-287/76-10 and RO-269/76-17 submitted by our letters of August 5, 1976 and November 15, 1976, respectively, and a defective tube has been found on Oconee Unit 1 and will be reported in RO-269/76-19 by December 22, 1976. Three of the four leaks have been on an open tube lane (a radial row with no tubes, used for inspection purposes) and all have been near the upper tube sheet. Eddy current inspections conducted during each refueling and after each leak have revealed that these leaks have been isolated occurrences, not indicative of generic problems.

Therefore, it is concluded that this incident did not affect the health and safety of the public.

Corrective Action:

Approximately three feet of the leaking steam generator tube and a portion of another tube, identified as tube number 27 in row 77 have been extracted for further testing and evaluation. These tubes and one other tube with possible damage have been plugged with explosive plugs. Inspection of 133 tubes was performed and no additional indications of tube degradation were noted.

In order to evaluate the cause of the tube failures, the OTSG vendor, Babcock and Wilcox, has undertaken a program which will consist of an examination of the extracted tubes and an analysis of eddy current inspections and fiber optic examinations.