

DUKE POWER COMPANY
OCONEE UNIT 1

Report No.: RO-269/77-2

Report Date: January 31, 1977

Occurrence:Date: January 15, 1977

Facility: Oconee Unit 1, Seneca, South Carolina

Identification of Occurrence: Primary-to-Secondary System Leakage in "1B"
Once-Through Steam Generators

Conditions Prior to Occurrence: Unit at 100 percent full power

Description of Occurrence:

On January 15, 1977, an increase in radiation levels as registered by air ejector monitor RIA 40 indicated a possible primary-to-secondary system leak. Sampling of the steam lines and portable instrument readings confirmed that primary-to-secondary leakage was occurring in the "1B" once-through-steam-generator (OTSG). Within 1 hour from the time that high level readings were observed on RIA 40, a reactor shutdown was initiated. Within three hours, reactor shutdown was completed and preparations were made to drain the Reactor Coolant System and investigate the source of the steam generator leakage.

The Reactor Coolant System was cooled and drained within 2 days following the initial high radiation indication and an internal inspection of the "1B" OTSG was initiated.

The Nuclear Regulatory Commission was not notified of this incident within the required twenty-four hour time period. The error resulted from a combination of preoccupation with the outage recovery efforts and an inability to promptly reach the Technical Services engineer who is the station's primary NRC contact. The incident was reported to the NRC within forty-one hours.

Apparent Cause of Occurrence:

Eddy current testing was performed and revealed one leaking tube, identified as tube number 12 in row 75. The leaking tube was discovered to have a 350°F circumferential crack near the interface of the tube with the bottom of the upper tube sheet. The tube is located along the "open tube lane" towards the outer circumference of the tube bundle.

Eddy current and fiber optics examinations of 140 adjacent tubes revealed no additional tube leaks. An indication of a possible tube defect, however, did necessitate plugging both ends of one other tube. This tube was number 128 in row 81.

With regard to this and previous Oconee steam generator tube leaks, evaluation by Duke and the OTSG vendor, the Babcock & Wilcox Company, is continuing. However, there is no evidence to date to indicate that the leaks have resulted from tube wastage/thinning, chemical attack, or intergranular stress-corrosion cracking.

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Analysis of Occurrence:

Primary-to-secondary system leakage, resulting from this occurrence, was approximately 12 gallons per minute and was detected by installed radiation monitoring equipment. The leakage exceeded the operational limits of Oconee Technical Specification 3.1.6.1 and a reactor shutdown was initiated within 2 hours after the initial leakage indication, following extensive sampling and monitoring of components and systems during this period.

As of January 23, 1977 the calculated gaseous activity released to the environment via the air ejectors was 157 curies. This amount is considered insignificant in comparison to the station's annual release limit.

This report describes the fifth occurrence of steam generator tube leakage experienced on the three Oconee units. Defective tubes were previously reported in Reportable Occurrence Reports RO-287/76-10, RO-269/76-17, RO-270/76-15 and RO-269/76-19 submitted by our letters of August 5, 1976, November 15, 1976, December 20, 1976 and December 22, 1976, respectively. In the first three occurrences, and the fifth occurrence, the defective tubes edged an open tube lane (a radial row with no tubes, used for inspection purposes). In the fourth instance, the leaking defective tube was angularly located approximately 150° from the locations of the other defective tubes and was not adjacent to an open tube lane.

It is considered that this incident did not affect the health and safety of the public.

Corrective Action:

The leaking defective tube and one other tube identified to have probable tube damage, were explosive plugged in the bottom of the tube and plugged from the top by insertion of a metal rod in accordance with a vendor modification package. This method of plugging increases the tube's stability during unit operation.

As stated in RO-270/76-15 submitted by my letter of December 20, 1976, the OTSG vendor, Babcock & Wilcox, is currently involved in a program to further evaluate the cause of the tube failures. This program includes a review of deposit samples, a computer evaluation of all available eddy current data, a review of visual observations from fiber-optics and videotapes, and macro-microscopic analysis of two of the defective tubes that were removed from the Oconee Unit 2 "2B" OTSG. Additionally, since four of the five leaking tubes and two of the five other abnormal tubes were in the rows adjacent to the open lane (row 76), the open lane flow characteristics are being analyzed and a detailed stress/vibration analysis is being conducted on the tubes in rows 75 and 77. A review is also being made on the Oconee station operating history, the Oconee steam generator manufacturing history and on previously conducted OTSG analysis and testing results.

To assure prompt notification of the Nuclear Regulatory Commission in the event of future reportable occurrences, a representative of the section primarily responsible for NRC communications will contact the operations duty engineer every day on weekends and holidays to assure that all reportable occurrences are reported to the NRC with the specified twenty-four hours.