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SUBJECT: Provides info, per 940805 request, re Unit 2 forced outage resulting from tube leak in 2A SG on 940727.

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DUKE POWER

August 9, 1994

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Subject: Oconee Nuclear Site
Docket Nos. 50-269, -270, -287
Steam Generator Tube Leak - Unit 2
Request for Information

Dear Sir:

On Friday, August 5, 1994 a request was made to Oconee Site to provide information concerning the Unit 2 forced outage resulting from a tube leak in the 2A steam generator. We were requested to address the scope and results of inspections performed and the evaluation process used to determine that required and appropriate inspections and repairs were completed prior to returning the steam generators to service. The following information is being submitted per your request.

On Wednesday, July 27, 1994 Oconee Unit 2 was taken off line due to primary to secondary side leakage of approximately 0.112 gpm in the 2A Once Through Steam Generator(OTSG). The leakage had been closely monitored for three weeks and the decision was made to bring the unit off line once the leakage had increased to a level which would ensure easy detection but prior to reaching any technical specification or administrative limits. The administrative limit for shutdown due to a primary to secondary leak is 0.2 gpm and the technical specification limit is 0.35 gpm. There are no technical specification required inspections since the limit was not reached prior to shutdown.

On Friday July 29, the leaking tube was identified as tube R77-T30. This tube is located adjacent to the open lane (Row 76) within the 288 tube, open lane and wedge region. Previous OTSG history indicates that failures in this region are normally located at the upper edge of the 15th tube support plate (TSP) or the upper tubesheet secondary face (UTSF) and are due to high cycle fatigue. High cycle fatigue failures typically exhibit rapid growth but are easy to identify and monitor prior to reaching technical

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specification leakage limits. Although these failures do not necessarily have a damage precursor, tubes within the open lane and wedge region are inspected by MRPC each refueling outage. Tubes exhibiting OD signals at the UTSF or the upper half of the 15th TSP are typically removed from service as a preventative measure.

Bobbin Coil and MRPC testing of tube R77-T30 confirmed the leaking defect to be at the upper tubesheet secondary face with a circumferential extent of 160 degrees. This is consistent with previous high cycle fatigue failures in this region. The remaining 220 tubes in this area (others have been preventatively sleeved or plugged) were inspected by MRPC at the 15th TSP and the UTSF +/- 2 inches. These tubes were inspected to identify the presence of adjacent tube damage and to identify the presence of any OD eddy current signal. The inspection is also a diagnostics tool to verify the damage mechanism. No additional circumferential crack-like indications were identified during this inspection. Nine additional OD indications were identified and those tubes were removed from service as a preventative measure. It was therefore concluded that tube R77-T30 failed due to high cycle fatigue.

The leaking tube was inspected during the last refueling outage in May 1993 with the bobbin coil and MRPC. Review of this data revealed a small (0.23 volt) OD indication by MRPC. Based on our experience in the lane and wedge area, this tube would probably have been preventatively plugged had this indication been identified. Therefore, the 2B OTSG MRPC data from the last refueling outage was reviewed. This review identified two tubes with OD indications at the 15th TSP. These tubes were preventatively removed from service during this outage.


It was determined that additional inspections were not warranted in the 2B OTSG for the following reasons. The tubes in the lane and wedge region are inspected at the 15th TSP and UTSF during each refueling outage by MRPC. As a preventative measure, tubes with OD signals at the UTSF or the upper half of the 15th TSP are removed from service. These indications may or may not be evidence of degradation and may or may not lead to high cycle fatigue failure. In fact, OTSG experience indicates that most tube leaks in the lane and wedge area have been in tubes without a previous history of OD indications. The B OTSG lane and wedge region MRPC data from the last refueling outage was reviewed and two tubes were preventatively removed from service. The inspection results of the A OTSG do not indicate the

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presence of an unusual mechanism which would increase our susceptibility to high cycle fatigue. Additionally, no primary to secondary leakage was identified in the B OTSG prior to unit shutdown. Therefore, there is no increased risk relative to tube integrity in the B OTSG.

Following the evaluation, inspections and repairs as described above, the steam generators were returned to service and Unit 2 restart activities commenced. It should be noted that the unit is scheduled for refueling in early October at which time the lane and wedge region of both steam generators will be inspected.

Very truly yours,

for 
J. W. Hampton

cc: Mr. S. D. Ebnetter, Regional Administrator
U. S. Nuclear Regulatory Commission, Region II

Mr. L. A. Wiens, Project Manager
Office of Nuclear Reactor Regulation

Mr. P. E. Harmon
Senior Resident Inspector
Oconee Nuclear Site