



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

*Docket 716*

June 14, 1977

DOCKETS NOS.: 50-269, 50-270, 50-287

LICENSEE: Duke Power Company

FACILITY: Oconee Nuclear Station

SUMMARY OF MEETING HELD ON MAY 13, 1977, TO DISCUSS THE STEAM GENERATOR  
TUBE PROBLEM AT OCONEE NUCLEAR STATION

On May 13, 1977, representatives of Duke Power Company (DPC) and Babcock and Wilcox (B&W) met with the NRC staff to discuss the subject topic.

A list of attendees is attached.

Duke Power Co. and B&W were told that the purpose of the meeting was to discuss the status of the S-G tube leak problems at Oconee and the plans that Duke and B&W have for resolving these problems.

Mr. Hooker of B&W made a presentation which included an overview of the tube failure problem which included a history of tube leaks and accomplishments since the previous NRC meeting on February 15, 1977. Mr. Hooker's presentation is attached. The data in the attached presentation do not include the tube leak which occurred on May 7, 1977.

At the present time, Duke Power Co. and B&W have not determined the cause of the surface defects where cracking of the tubes initiates and then propagates due to flow induced vibration.

Investigations are continuing to determine the cause of the S-G tube problem. One potential cause has been identified which could aggravate the tube cracking problem. The testing of steam stop and control valves at Oconee have been tested at a frequency of daily and weekly, respectively. Recent tests have confirmed that the cycling of the components induces system pressure transients which may propagate to the steam generators. The frequency of this testing has been changed to monthly and additional analyses are planned of the possibility of this being the cause.

*R memo 4*

At our request, Duke Power Company has committed to do the following:

1. Provide documentation for the basis for safe continued operation of the Oconee steam generators. This documentation will include analyses of the probabilities of the failure of the tubes under several failure mechanisms. This will be provided within 60 days.
2. Provide us with Duke Power Company's and B&W plans and schedule for investigating the possible resolution of this problem. This will be provided within about 60 days also.
3. Inform NRC of its proposed course of action before any tube is plugged and before the facility is returned to operation in the event that the facility is shutdown to investigate or to plug a steam generator tube or to otherwise correct steam generator tube leakage.
4. Propose a Technical Specification for a reactor coolant to secondary coolant steam generator leakage rate of 1 gpm and propose iodine limits for the reactor and secondary coolants by June 5, 1977.

*Don Neighbors*

Don Neighbors, Project Manager  
Operating Reactors Branch #1  
Division of Operating Reactors

Enclosures:

1. List of Attendees
2. Presentation by Mr. Hooker, B&W

ATTENDEES AT  
NRC MEETING WITH  
DUKE POWER COMPANY AND BABCOCK AND WILCOX

MAY 13, 1977

NRC

J. Reese  
K. Goller  
A. Schwencer  
L. Shao  
J. Scinto  
R. Stuart  
F. Almeter  
B. D. Liaw  
J. Strosnider  
R. La Grange  
J. Guibert  
G. Millman  
L. Frank  
G. Zwetzig  
L. Barrett  
D. Neighbors

DPC

M. Tuckman  
H. Tucker  
K. Canady  
C. Sansburg

B&W

G. Geissler  
W. Keyworth  
N. Hooker  
F. Burke  
C. Creacy  
D. Nitti  
R. Coad

Meeting Summary for  
Duke Power Company

- 3 -

June 14, 1977

Docket  
NRC PDR  
LOCAL PDR  
ORB#1 Reading  
NRR Reading  
E. G. Case  
V. Stello  
K. R. Goller  
D. Eisenhut  
A. Schwencer  
D. Davis  
G. Lear  
R. Reid  
L. Shao  
B. Grimes  
W. Butler  
R. Baer  
Project Manager  
Attorney, OELD  
OI&E (3)  
Licensing Assistant  
Each NRC participant  
T. B. Abernathy  
J. R. Buchanan

## OTSG TUBE FAILURES - OVERVIEW -

- . OF THE 14 OTSG'S IN OPERATION, TUBE LEAKS HAVE OCCURRED IN 4.
- . TOTAL NUMBER OF LEAKING TUBES = 9.
- . ALL OF LEAKS WERE IN OCONEE UNITS, 5/9 IN GENERATOR 1B.
- . MOST OF LEAKS (7/9) IN LANE TUBES, AT UPPER TUBESHEET OR SUPPORT PLATE.

# OTSG TUBE LEAKS

## - HISTORY -

JULY 1976

FIRST LEAKING TUBE (3-B).

NOVEMBER 1976

SECOND LEAKING TUBE (1-A).

NOVEMBER 1976

B&W INITIATED EVALUATION/CORRECTION PROGRAM:

- . INSPECTION CAPABILITY.
- . TUBE SAMPLE REMOVAL CAPABILITY.
- . TUBE STABILIZER DEVELOPED.

DECEMBER 1976

LEAKS SIMULTANEOUSLY IN OCONEE 1&2.

- . THOROUGH INSPECTION OF BOTH UNITS.
- . TUBE SAMPLES (2) REMOVED FOR LABORATORY EXAMINATION.

JANUARY-MARCH  
1977

ADDITIONAL LEAKS IN OCONEE 1&3.

FEBRUARY 1977

DUKE POWER IDENTIFIED TURBINE STOP VALVE TESTING.

MARCH 1977

ADDITIONAL TUBE SAMPLE OBTAINED FROM OCONEE 1-B.

MARCH 1977

B&W RECOMMENDED ACTIONS TO PREVENT REPEATED SHUTDOWNS.

SUBJECT

**3M**

CATALOG NO.  
3M CENTER ST

ACCOMPLISHMENTS SINCE PREVIOUS  
NRC MEETING (2/9/77)

REMOVAL AND EVALUATION OF ADDITIONAL TUBE SAMPLE  
(77/25, Ocone 1-B)

EVALUATION OF TURBINE STOP VALVE TESTS AT Ocone  
AND TMI-1.

QUALIFICATION OF TUBE STABILIZER (WELDED AND EXPLOSIVE).

DEVELOPED GENERATOR INSTRUMENTATION PROGRAM.

FLOW ANALYSIS OF UPPER END OF OTSG.

EDDY-CURRENT INSPECTION OF TMI-1.

# SUMMARY OF MAJOR OTSG TUBE EXPERIENCE AT QCONEE

<u>GENERATOR</u>	<u>ROW</u>	<u>TUBE</u>	<u>ELEVATION</u>	<u>DATE</u>	<u>LANE</u>	<u>LEAKER</u>	<u>COMITION</u>	<u>DISPOSITION</u>
1-B	114	109	14TH PLATE	12/76	No	YES	NO VISUAL INSPECTION	STABILIZED
1-B	113	110	14TH PLATE	12/76	No	No	SIMILAR TO 114/109	STABILIZED
1-B	75	18	TUBESHEET	12/76	YES	PROBABLE	300° CRACK	STABILIZED
1-B	75	12	TUBESHEET	1/77	YES	YES	345° CRACK	STABILIZED
1-B	81	128	14TH PLATE	1/77	No	No	EDDY-CURRENT INDICATION, 80%	STABILIZED
1-B	32	13	14TH PLATE	3/77	No	YES	NO VISUAL INSPECTION	STABILIZED
1-B	33	14	14TH PLATE	3/77	No	No	31-45% EDDY CURRENT INDICATION	STABILIZED
1-B	77	25	TUBESHEET	3/77	YES	No	EDDY-CURRENT DISTORTION	REMOVED
1-B	2	7	13TH PLATE	3/77	No	No	EDDY-CURRENT INDICATION	PLUGGED
1-B	2	8	13TH PLATE	3/77	No	No	EDDY-CURRENT INDICATION	PLUGGED
1-B	101	4	4TH PLATE	3/77	No	No	EDDY-CURRENT INDICATION	PLUGGED
1-B	77	3	15TH PLATE	3/77	YES	No	EDDY-CURRENT INDICATION	STABILIZED
1-B	77	5	15TH PLATE	3/77	YES	No	EDDY-CURRENT INDICATION	STABILIZED
1-B	77	8	15TH PLATE	3/77	YES	No	EDDY-CURRENT INDICATION	STABILIZED
1-B	77	22	15TH PLATE	3/77	YES	PROBABLE	45° CRACK	STABILIZED
1-B	77	29	TUBESHEET	3/77	YES	No	EDDY-CURRENT INDICATION	STABILIZED



# SUMMARY OF MAJOR OTSG TUBE EXPERIENCE AT OCONEE

<u>GENERATOR</u>	<u>ROW</u>	<u>TUBE</u>	<u>ELEVATION</u>	<u>DATE</u>	<u>LANE</u>	<u>LEAKER</u>	<u>CONDITION</u>	<u>DISPOSITION</u>
1-A	77	17	TUBESHEET	11/76	YES	YES	CRACK	PLUGGED
2-B	77	23	TUBESHEET	12/76	YES	YES	270° CRACK, HOLE	REMOVED
2-B	77	27	15TH PLATE	12/76	YES	NO	WEAR APPEARANCE	REMOVED
2-B	124	42	12TH PLATE	12/76	NO	NO	EDDY-CURRENT INDICATION	PLUGGED
3-B	77	11	15TH PLATE	7/76	YES	YES	NO VISUAL INSPECTION	PLUGGED
3-B	77	19	15TH PLATE	2/77	YES	YES	45° CRACK	STABILIZED
3-B	75	2	15TH PLATE	2/77	YES	NO	EDDY-CURRENT INDICATION	STABILIZED

## CONCLUSIONS

1. TUBE LEAK PROBLEM APPEARS TO BE RESTRICTED TO OCONEE.
  - . OTHER PLANTS HAVE OPERATED PAST TIME OF OCONEE FAILURES
  - . EDDY-CURRENT SIGNALS APPEAR NOT TO BE INDICATION OF IMPENDING LEAKS.
2. LEAKS IN LANE TUBES CAUSED BY PROPOGATION OF LOCAL DEFECT BY HIGH-CYCLE FATIGUE FROM VIBRATION.
3. LOCAL DEFECTS TO START CRACKS MAY HAVE DIVERSE CAUSES.
4. LEAKS OCCUR PREDOMINANTLY IN LANE TUBES BECAUSE FLOW IS HIGHER.
  - . GREATER POTENTIAL FOR VIBRATION EXISTS.
  - . LARGE AMPLITUDES COULD RESULT FROM TEMPORARY FLOW INCREASES.
5. NO EVIDENCE OF INTERGRANULAR STRESS CORROSION.
6. NO EVIDENCE OF PROBLEMS ASSOCIATED WITH RECIRCULATING STEAM GENERATORS (WASTAGE AND DENTING).
7. NO DIRECT EVIDENCE AVAILABLE ON CAUSE OF OFF-LANE LEAKS.

Name

George Geissler  
W.J. Keyworth  
Neil Hooker  
FRED R. BURKE  
M.S. TUCKMAN  
H.B. TUCKER  
C.A. CREACY  
DONALD A. NITTI  
Robert B. Cord  
K.S. Conolly  
J.R. Sant  
R.J. Stuart  
F.M. Almeter  
B.D. Liaw  
J.C. Guibert  
L.C. Shaw  
Karl R. Goller  
JOE W REECE  
R.G. LaGrange  
JACK STROSNIDER  
H.C. Millman  
L. Frank  
C.L. Sansbury

Organization

B&W Licensing  
B&W Licensing  
B&W Component Engr.  
B&W Component Engr.  
DUKE  
DUKE  
B&W  
B&W  
B&W  
Duke  
NRC  
NRC/DOR/EB  
NRC/DOR/EB  
NRC/DOR/EB  
NRC/DOR/OT  
NRC/DOR/EB  
NRC/DOR  
NRC/DOR  
NRC/DOR/EB  
NRC/DOR/EB  
NRC/OSD/SCSB  
NRC/OSD/SCSB  
Duke

Lake Barrett

GERALD B. ZWETZIG

A. Schwenen

D. Mignola

NRC/DOR/EEB

NRC/DOR/ORB#4 TMI-1

NRC

1.