1. *Discuss any primary to secondary leakage prior to shutdown.*

   Response: Primary to secondary leakage prior to SD was <0.5 GPD.

2. *Discuss results of secondary side pressure tests.*

   Response: No secondary side pressure test conducted.

3. *Provide general description of areas examined, including expansion criteria, type of probe's used. Discuss inspection of the tube within the tubesheet, particularly the portion below the expansion/transition region.*

   Response: Scope of the inspection is shown on the attachment A. The expanded region of the tube is inspected with qualified Plus-Pt from the roll transition to the tube end.

4. *Discuss the actions taken in response to Framatome's notification of the effect of tubesheet hole dilation on the service life of B&W welded plugs.*

   Response: FTI analyzed the allowed heatup/cooldown cycles for each plug type. Verified that we have not and will not exceed this limit prior to SG replacement scheduled for the next refueling. All repair products used, except those listed below, are fully qualified for original 40 year operating life.

Plug Type	# Plugs	Allowed Cycles	Current Cycles
OEM Welded Plugs	16	205	120
Remote Welded Plugs	52	33	13
Taper Welded	13	205	74

   In addition, each welded plug will be visually inspected for any signs of leakage or cracking.

5. *Describe the inspection/plugging plans with respect to industry identified severed tube issue.*

   Response: All plugged tubes that met the following criteria with rolled plugs in the inlet, were removed, tube dewatered if necessary, inspected and replugged.
   a. Tubes with rolled plug replaced in the inlet without dewatering and welded plug in outlet.
   b. Tubes with I-600 rolled plug inlet and repair welded plug in outlet.
   c. Tubes with rolled plug replaced in the inlet and explosive plug in outlet.
   d. Tubes with ribbed plugs replaced in inlet with I-690 rolled without dewatering and ribbed plug in outlet for drilled hole locations.
   e. Tubes with rolled plug replaced in inlet with original plug in outlet.

Deplugging Results:

A OTSG	13 Removed	None found with water in tube.	
B OTSG	25 Removed	4 water < 70%	1 water >70%*

*Tube B 32-8 water level was 87% and was swollen by approx. 0.030" to 0.040" along entire length of tube. Tube initially plugged in 93, inlet plug was found missing in 1994, traced to plug installation torque issue. Inlet plug replaced without dewatering in 1994. Tube B 31-7, immediately downstream, showed no indications of wear and eddy current verified tube B 32-8 was not severed. Tube B 32-8 will be replugged with a full length stabilizer installed.

A&B OTSG 11 tubes have welded or ribbed plugs in inlet and can not be removed. Will be captured by surrounding with stabilized plugged tubes in flow direction.

6. *Provide summary of number of indications to date of each degradation mode and axial location. Provide voltage, depth and length for most significant.*

Response: Details of most significant degradation will not be available until all the special interest MRPC is completed. Special interest is approx. 10% complete as of 10/24.

7. *Describe the repair/plugging plans for SG tubes that meet the repair/plugging criteria.*

Response: For hot leg roll transitions that meet criteria for reroll repair, rerolls will be performed and tube left in service. For all other degradation that meets the plugging criteria, tube will be removed from service by installation of I-690 rolled plugs in inlet and outlet.

8. *Discuss the previous history of SG tube inspection results, including any "look backs" performed for significant indications where used for dispositioning (MBM's)*

Response: All bobbin indications will have Plus-Pt exam and will be dispositioned based on this result. Previous data is not used directly in dispositioning process for ONS units.

9. *Discuss new inspection findings.*

Response: To date, no new degradation mechanism has been seen. Current active mechanisms for ONS-2:

a. Tube Support Plate Fretting Wear
b. Impingement
c. ODIGA in tubesheet crevice and freespan
d. PWSCC in upper tubesheet rolls and dents above 9th TSP.
e. ODSCC in dents above 9th TSP and freespans above the 7th TSP
f. Sleeve OD IGA/SCC in expansion transitions and parent tube adjacent to sleeve end

10. *For I-600 plants discuss actions taken based on Seabrook's recent findings.*

Response: No additional actions have been identified for ONS units as a result of what is known of the Seabrook results to date. ONS tubing is I-600 HTMA and would not be expected to perform similar to I-600TT tubing at Seabrook.

11. *Discuss any use of inspection probes other than bobbin and typical rotating probes.*

Response: Probes used are typical designs. 0.510 mid frequency bobbin, 0.460 Plus-Pt for RPC for tubes and 0.410 bobbin, 0.400 Plus-Pt for sleeves.

12. *Discuss in-situ pressure test plans and results.*

Response: To date, in-situ tests have not been completed or tubes identified. Selection criteria are based on EPRI guidelines utilizing depth, length and voltage of defect.

13. *Describe tube pull plans and preliminary results.*

Response: Currently no tube pulls are planned or anticipated.

14. *Discuss the assessment of tube integrity for the previous operating cycle.*

Response: Condition Monitoring will be completed following completion of inspection and results from in-situ pressure testing if required. No problems are anticipated.

15. *Discuss the assessment of tube integrity for next operating cycle.*

Response: Operational assessment for first 90 days will be completed following completion of inspection prior to unit startup. OA for complete cycle will be completed within 90 days of unit startup. Inspection to date is consistent with degradation projections and no problems with justifying full cycle operation are anticipated.

16. *Provide the schedule for SG related activities during the remainder of the current outage.*

Response: Eddy current should complete by 10/27. In-situ testing, if required, should complete on 10/28. All repairs should complete by 11/1. Current site schedule has installation of SG primary manways on 11/4.

Attachment A

The OTSG eddy current inspection scope planned for the Oconee Unit 2 EOC-19 Refueling Outage:

Bobbin Coil (0.510 dia. MF)	100% A-OTSG	100% B-OTSG
Lane and Wedge MRPC (0.460 dia. Plus Point)	Two Rows Around Sleeved Tubes A and B OTSG	
MRPC Upper Tubesheet Roll (0.460 dia. Plus Point)	100% A-OTSG 100% B-OTSG	
MRPC Re-rolls Upper Tubesheet (0.460 dia. Plus Point)	100% A-OTSG 100% B-OTSG	
MRPC Lower Tubesheet Roll (0.460 dia. Plus Point)	100% Original Re-expansion	
Bobbin Sleeve Exam (0.410 dia.)	100% Sleeves A-OTSG 100% Sleeves B-OTSG	
Sleeve Upper and Lower Rolls (0.400 dia Plus Point)	100% Sleeve Rolls A-OTSG 100% Sleeve Rolls B-OTSG	
Kidney Region (Sludge Pile) (0.460 dia. Plus Point)	100% A-OTSG 100% B-OTSG The inspection covers minimum 12 inches into the tubesheet	

RPC Special Interest (0.460 dia. Plus Point)

1) 100% Bobbin indications regardless of location
2) 100% of all dents regardless of size or location

Revised 10/30/02

1. *Discuss any primary to secondary leakage prior to shutdown.*

   Response: Primary to secondary leakage prior to SD was <0.5 GPD.

2. *Discuss results of secondary side pressure tests.*

   Response: No secondary side pressure test conducted.

3. *Provide general description of areas examined, including expansion criteria, type of probe's used. Discuss inspection of the tube within the tubesheet, particularly the portion below the expansion/transition region.*

   Response: Scope of the inspection is shown on the attachment A. The expanded region of the tube is inspected with qualified Plus-Pt from the roll transition to the tube end.

4. *Discuss the actions taken in response to Framatome's notification of the effect of tubesheet hole dilation on the service life of B&W welded plugs.*

   Response: FTI analyzed the allowed heatup/cooldown cycles for each plug type. Verified that we have not and will not exceed this limit prior to SG replacement scheduled for the next refueling. All repair products used, except those listed below, are fully qualified for original 40 year operating life.

Plug Type	# Plugs	Allowed Cycles	Current Cycles
OEM Welded Plugs	16	205	120
Remote Welded Plugs	52	33	13
Taper Welded	13	205	74

   In addition, each welded plug will be visually inspected for any signs of leakage or cracking.

5. *Describe the inspection/plugging plans with respect to industry identified severed tube issue.*

   Response: All plugged tubes that met the following criteria with rolled plugs in the inlet, were removed, tube dewatered if necessary, inspected and replugged.
   a. Tubes with rolled plug replaced in the inlet without dewatering and welded plug in outlet.
   b. Tubes with I-600 rolled plug inlet and repair welded plug in outlet.
   c. Tubes with rolled plug replaced in the inlet and explosive plug in outlet.
   d. Tubes with ribbed plugs replaced in inlet with I-690 rolled without dewatering and ribbed plug in outlet for drilled hole locations.
   e. Tubes with rolled plug replaced in inlet with original plug in outlet.

Deplugging Results:

A OTSG	13 Removed	None found with water in tube.	
B OTSG	25 Removed	4 water < 70%	1 water >70%*

*Tube B 32-8 water level was 87% and was swollen by approx. 0.030" to 0.040" along entire length of tube. Tube initially plugged in 93, inlet plug was found missing in 1994, traced to plug installation torque issue. Inlet plug replaced without dewatering in 1994. Tube B 31-7, immediately downstream, showed no indications of wear and eddy current verified tube B 32-8 was not severed. Tube B 32-8 will be replugged with a full length stabilizer installed.

A&B OTSG 11 tubes have welded or ribbed plugs in inlet and can not be removed. Will be captured by surrounding with stabilized plugged tubes in flow direction.

6. *Provide summary of number of indications to date of each degradation mode and axial location. Provide voltage, depth and length for most significant.*

Response: Following is the number of tubes plugged for categories shown:

	2A OTSG	2B OTSG
Capture Locations	16	18
Tube Defects		
IGA	7	
Wear	1	
Freespan SCC/IGA	380	
Roll Transition PWSCC	12	
Misc.	8	
Total Plugged 2EOC-19	424	
Total Cumulative Plugged	1,294	
	8.3%	

Details of the depth, length and voltage will be provided in future report of inspection findings.

7. *Describe the repair/plugging plans for SG tubes that meet the repair/plugging criteria.*

Response: For hot leg roll transitions that meet criteria for reroll repair, rerolls will be performed and tube left in service. For all other degradation that meets the plugging criteria, tube will be removed from service by installation of I-690 rolled plugs in inlet and outlet.

Reroll repairs A OTSG: 0* B OTSG: 38

*<10 locations identified for reroll repair, tubes were plugged and included in #6.

8. *Discuss the previous history of SG tube inspection results, including any "look backs" performed for significant indications where used for dispositioning (MBM's)*

Response: All bobbin indications will have Plus-Pt exam and will be dispositioned based on this result. Previous data is not used directly in dispositioning process for ONS units.

9. *Discuss new inspection findings.*

Response: No new degradation mechanism has been seen. Current active mechanisms for ONS-2:

a. Tube Support Plate Fretting Wear
b. Impingement
c. ODIGA in tubesheet crevice and freespan
d. PWSCC in upper tubesheet rolls and dents above 9th TSP.
e. ODSCC in dents above 9th TSP and freespans above the 7th TSP
f. Sleeve OD IGA/SCC in expansion transitions and parent tube adjacent to sleeve end

Freespan indications have increased in number from previous inspections. The prediction of freespan cracking based on Weibul distribution indicates that a significant increase was expected. It's difficult to establish when the increase will begin to occur but this data indicates that significant increases would be expected in future inspections, however, this is the last cycle of operation for these S/G's prior to replacement. The number of freespan defects is within the worse case projections previously performed.

10. *For I-600 plants discuss actions taken based on Seabrook's recent findings.*

Response: No additional actions have been identified for ONS units as a result of what is known of the Seabrook results to date. ONS tubing is I-600 HTMA and would not be expected to perform similar to I-600TT tubing at Seabrook.

11. Discuss any use of inspection probes other than bobbin and typical rotating probes.

Response: Probes used are typical designs. 0.510 mid frequency bobbin, 0.460 Plus-Pt for RPC for tubes and 0.410 bobbin, 0.400 Plus-Pt for sleeves.

12. Discuss in-situ pressure test plans and results.

Response: Following is the number of tubes identified for in-situ testing. All testing followed EPRI guidelines for hold times. Maximum pressure was approx. 4050 psig, which represents 3 times normal delta-P.

	2A OTSG	2B OTSG
Number Tested	10 (Axial)	TBD
Results	No leakage	

13. Describe tube pull plans and preliminary results.

Response: Currently no tube pulls are planned or anticipated.

14. Discuss the assessment of tube integrity for the previous operating cycle.

Response: Condition Monitoring will be completed following completion of inspection and results from in-situ pressure testing if required. No problems are anticipated.

15. *Discuss the assessment of tube integrity for next operating cycle.*

Response: Operational assessment for first 90 days will be completed following completion of inspection prior to unit startup. OA for complete cycle will be completed within 90 days of unit startup. Inspection to date is consistent with degradation projections and no problems with justifying full cycle operation are anticipated.

16. Provide the schedule for SG related activities during the remainder of the current outage.

Response: Eddy current testing is complete. In-situ testing, if required, should complete on 10/31. All repairs should complete by 11/5. Current site schedule has installation of SG primary manways on 11/5.

Attachment A

The OTSG eddy current inspection scope planned for the Oconee Unit 2 EOC-19 Refueling Outage:

Bobbin Coil (0.510 dia. MF)	100% A-OTSG	100% B-OTSG
Lane and Wedge MRPC (0.460 dia. Plus Point)	Two Rows Around Sleeved Tubes A and B OTSG	
MRPC Upper Tubesheet Roll (0.460 dia. Plus Point)	100% A-OTSG 100% B-OTSG	
MRPC Re-rolls Upper Tubesheet (0.460 dia. Plus Point)	100% A-OTSG 100% B-OTSG	
MRPC Lower Tubesheet Roll (0.460 dia. Plus Point)	100% Original Re-expansion	
Bobbin Sleeve Exam (0.410 dia.)	100% Sleeves A-OTSG 100% Sleeves B-OTSG	
Sleeve Upper and Lower Rolls (0.400 dia Plus Point)	100% Sleeve Rolls A-OTSG 100% Sleeve Rolls B-OTSG	
Kidney Region (Sludge Pile) (0.460 dia. Plus Point)	100% A-OTSG 100% B-OTSG The inspection covers minimum 12 inches into the tubesheet	

RPC Special Interest (0.460 dia. Plus Point)

1) 100% Bobbin indications regardless of location
2) 100% of all dents regardless of size or location

Duke Energy Corporation ONS-2 EOC-19 Preliminary Information 11/1/02

During in-situ pressure testing on OTSG 2B, Tube 37-27 failed to reach the full test pressure of 4300 psig representing the density corrected test pressure for 3 times normal delta-p. Upon reaching the 3900 psig test plateau, the hold period was just beginning and the leakage rate exceeded the capacity of the test system and pressure rapidly dropped to near zero. The in-situ test was a full length water pressure test. The defect of interest was an axial indication located at 15 TSP + 4.41 inches. The measured depth was 95% TW with a length of 2 inches.

The following attachments give the information currently available:

Attachment A: Defect location in relation to S/G TSP locations.

Attachment B: Test pressures for in-situ testing and method of calculation

Attachment C: Test pressurization curve for Tube 37-27

Attachment D: History of eddy current inspection of Tube 37-27 back to 1993.

Subsequent visual inspection indicates the axial defect at this location had opened to a gap of approx. 1/16"-1/8". Subsequent testing with a bladder was not deemed possible due to opening size. Subsequent bobbin exam indicates a length of approx 1.5 inches. MRPC exam was not performed due to likelihood that rotating element would not adequately rotate through the defect location.

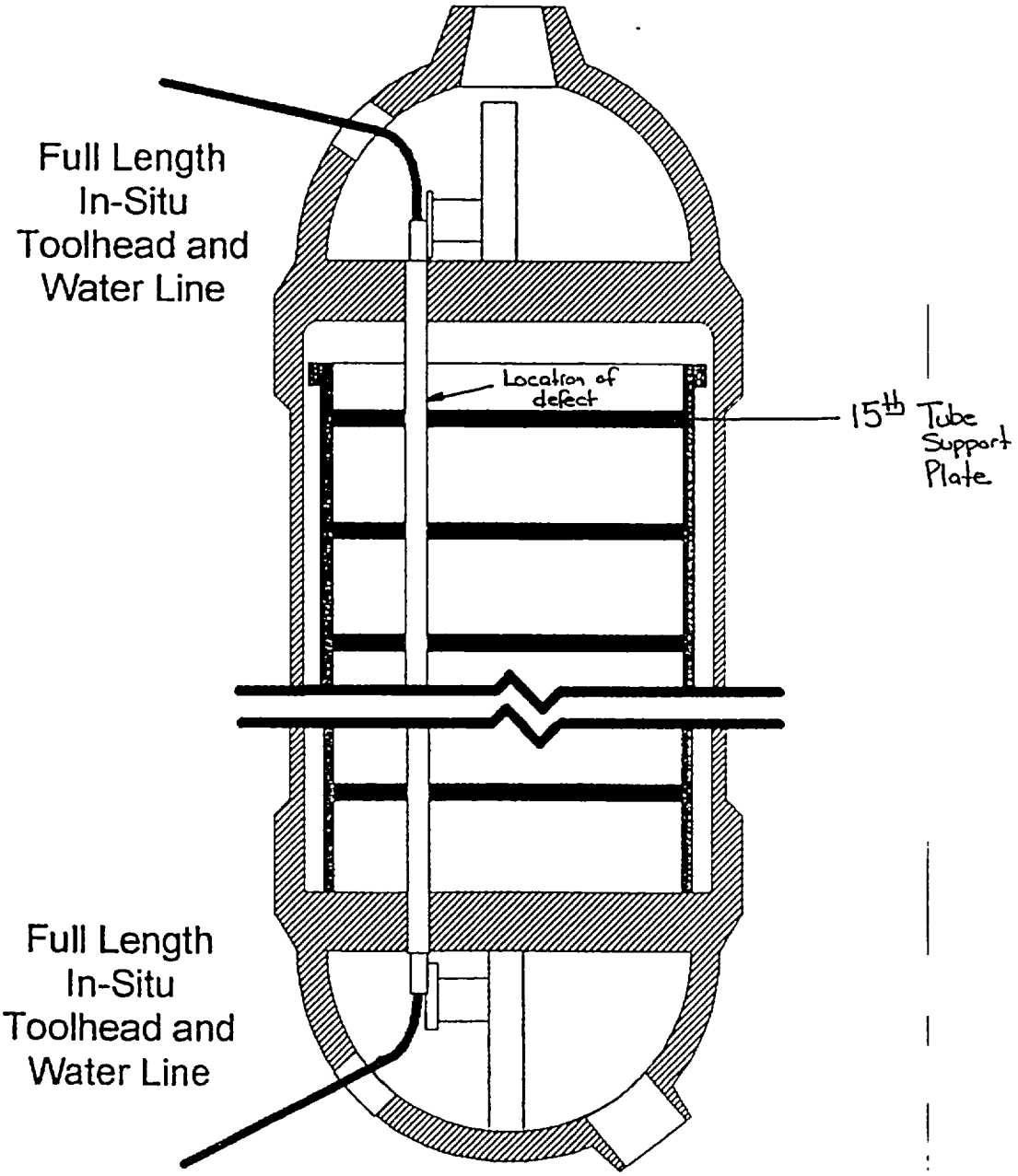
Enclosure 4

ONS 2B Steam Generator

In-situ - Tube 37-27

(A)

OTSG FULL LENGTH



IN SITU PRESSURE TEST LOADS ALL DEFECTS
PLANT Oconee 2

All Crack (Axial or Circ) Testing in All Tube Regions
Full Tube Setup or Localized

Inputs:

P_{prim}= 2200 psi Inputs Source 18-1236194-04
P_{sec}= 925 psi

ΔP_{no}= 1275 psi Normal Operating Differential Pressure
$\Delta P_{faulted}$= 2575 psi Faulted DP

OD_{tube}= 0 625 in ID_{tube}= 0 551 in $t_{wall,tube}$= 0 037 in

Safety Factors:

SF_{MSLB}= 1 43 SF_{NOOP}= 3

Correction Factors:

$CF_{thermal}$= 1 083 $CF_{bladder}$= 349 psi
CF_{gage}= 100 psi P_{sec}= 9 psi

TARGET TEST PRESSURES:

1 0 Normal Operating

$P_1 = \Delta P_{no} * CF_{thermal} + CF_{gage} + P_{sec}$

Water Testing
P_1= 1490 psi Target Pressure = 1500 psi

$P_{1B} = P_1 + CF_{bladder}$ Bladder Testing
P_{1B}= 1839 psi Target Pressure = 1850 psi

2 0 MSLB/FAULTED

$P_2 = \Delta P_{faulted} * CF_{thermal} + CF_{gage} + P_{sec}$

Water Testing
P_2= 2898 psi Target Pressure = 2900 psi

$P_{2B} = P_2 + CF_{bladder}$ Bladder Testing
P_{2B}= 3247 psi Target Pressure = 3250 psi

3 0 STRUCTURAL LIMIT

Condition1 = $SF_{NOOP} * \Delta P_{no} * CF_{thermal} + CF_{gage} + P_{sec}$

Condition1 = 4251 psi

Condition2 = $SF_{MSLB} * \Delta P_{faulted} * CF_{thermal} + CF_{gage} + P_{sec}$

Condition2 = 4093 psi

P_3 = Larger of Condition 1 or Condition 2

Water Testing
P_3= 4251 Target Pressure = 4300 psi

$P_{3B} = P_3 + CF_{bladder}$ Bladder Testing
P_{3B}= 4600 psi Target Pressure = 4650 psi